CORONAVIRUS DISEASE (COVID- 19): THE IMPACT ON PSYCHOLOGY OF SUSTAINABILITY, SUSTAINABLE DEVELOPMENT, AND GLOBAL ECONOMY

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CORONAVIRUS DISEASE (COVID- 19): THE IMPACT ON PSYCHOLOGY OF SUSTAINABILITY, SUSTAINABLE DEVELOPMENT, AND GLOBAL ECONOMY

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EDITORIAL
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Editorial: Coronavirus Disease (COVID-19): The Impact on Psychology of Sustainability, Sustainable Development, and Global Economy

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Editorial on the Research Topic

Coronavirus Disease (COVID-19): The Impact on Psychology of Sustainability, Sustainable Development, and Global Economy

INTRODUCTION

The novel coronavirus disease (COVID-19) has rapidly spread across the entire globe, thus threatening human civilization. In 2019, the infectious disease was initiated from Wuhan, the city of China, leading the flare-up of the COVID-19 widespread to wagered the world socio-economic foundation. The terrifying characteristics of this pernicious disease have left an erratic impact on the world's safety conditions. In recent years, the increased epidemic has imposed magnificent challenges to worldwide societies, compelling them to experience unprecedented consequences in terms of transitory disclosures, travel confinements, and social distancing. The high COVID-19 susceptibility has imposed health challenges for the general population. The increasing COVID-19 fear has made the entire world bear psychological challenges, affecting the world's populace.

Indeed, the vindictive repercussions of the pandemic outbreak have intensified the damage while causing severe turbulence in the global economic sector. The expanding pandemic (COVID-19) has halted human settlement, causing the entire world to experience adverse outcomes of the epidemic. The unwanted ramification of the pandemic has compelled societies to battle against its intensity, affecting the physical and psychological aspects of individuals' well-being. Undoubtedly, the pandemic (COVID-19) outbreak has caused immense global disruptions' (e.g., social, economic, and health) in various sectors, thus affecting sustainable development.

Psychological sustainability development determines the standards of living where the quality of life influences the individual's health (i.e., physical and psychological). Arguably, the COVID-19 widespread has created global chaos, thereby damaging the world's economic foundation. The increasing uncertainty of pandemic has drastically altered the individuals' way of living (i.e., quality of life), severely affecting the socio-economic sustainability of global economies. Indeed, the abrupt changes initiated by the pandemic have affected individuals' quality of life while psychologically influencing sustainability development.

Due to the expanding significance of this Research Topic, the call for a special issue had submitted. The special issue aimed to determine the effect of COVID-19 on individuals'

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psychological wellbeing and economic sustainability. Further, it examined the socio-economic status affecting the individual lifestyle, especially the vulnerable groups (e.g., health workers, students, and professionals). Hence, the psychology of sustainable development states that the COVID-19 pandemic has drastically influenced global economies.

Moved by the COVID-19 uncertainty, the editors proposed the following topic *Coronavirus Disease (COVID-19): The Impact on Psychology of Sustainability, Sustainable Development, and Global Economy* in which new thoughts and insight had stimulated and incorporated in the COVID-19 context. Perhaps, in response, several pioneers' studies heeded the call, thus supporting the intended development with their valuable contributions. All the papers were successfully published, enriching the literature and accelerating future possibilities toward the topic development.

This Research Topic brings together 24 relevant articles fundamentally fulfilling the research aims. The papers written by the authors belong to different disciplinary sectors. The contributions from diverse geographical regions extend the scope of the research by empirically questioning the impact of COVID-19 from the social and economic perspective. Specifically, the articles probe the research from various geographical places, such as Vietnam, the United States, Europe, China, Turkey, Italy, and Germany. Indeed, the research articles offer a different perspective of the impact of COVID-19 on the psychology of sustainability through promoting interdisciplinary research in the field of Social Sciences and Occupational Health and Safety.

Furthermore, the additions made to the Research Topic present a comprehensive view of research design, excavating a significant understanding of the psychology of sustainable development during the COVID-19 period. The extensive range of articles provides new avenues for future researchers. In particular, these distinct themes have embedded psychological and sustainable context in the COVID-19 world. Thus, this editorial article presents a brief overview of all the papers organized under the Research Topic.

Unsurprisingly, the COVID-19 pandemic has severely damaged the worldwide economic foundation (Schneider et al., 2021). Shehzad, et al. state that COVID-19 effects on socio-economic activities have recorded a decline in the world's GDP, capital flows, and investment opportunities. The research showed that financial instability is not limited to economic loss only. But it also influences the psychology of sustainable development. In explanation, the authors stated that the COVID-19 picture lacked socio-economic development, directly affecting the individual's psychological sustainability. Indeed, the study concluded that COVID-19 had shaken the global marketplace by making the nations report a global market meltdown.

In addition, the other study shows that the devastating impact of coronavirus has ruined the individual's psychological health causing the vulnerable population to suffer its intended consequences in the shape of poor living (Xiang et al., 2020). However, by considering the perspective of various authors, the research illustrates that COVID-19 repercussions have significantly compelled the global economy to bear the negative consequences of the pandemic on household income, employment, and health status, subsequently influencing the quality of life. The study featured by Tran et al. shows COVID-19 has made the global economies experience huge income loss, thus adversely affecting the socio-economic status and individuals' wellbeing.

Furthermore, in line with the above research, the study demonstrated that the COVID-19 pandemic has drastically halted the global industries (Abbas et al., 2021), making the hospitality and tourism industry experience a declining effect. The staggering impact of the pandemic has taken a severe toll on individual psychological and physical health (Alonzi et al., 2020), thus causing them to face unprecedented consequences in the shape of economic stress and social isolation. According to Teng et al. the psychological impact of the pandemic (COVID-19) susceptibility has transformed the employees' lives by risking their mental wellbeing. Likewise, concerning the effect of sustainable psychological health, the study by Keshky et al. discusses the importance of improved psychological performance. Perhaps, both the studies report that the COVID-19 vulnerability has adversely affected individuals' mindset, unfavorably influencing individuals' psychological stability. Moreover, the fifth article indicates that financial resources are the most significant factors accelerating the nations' socio-economic progress. In recent years, the coronavirus outbreak has increased financial instability (Wilmarth, 2021), affecting the world's economic sustainable development. The study conducted by Castiglioni and Lozza shows the financial volatility has promoted prosocial choices such as compliance with the tax payment and giving charity to the general public, thus influencing economic stability.

In contrast, the COVID-19 pandemic has dramatically affected human lives, eventually influencing psychological sustainability development. This ultimate effect has deteriorated the living standards, thereby threatening the individual's psychological health. In explaining this notion, Çelmeçe and Menekay conducted a study on healthcare professionals and found that prolonged working hours have raised anxiety among individuals. Besides this, during the COVID-19 pandemic, the development projects (e.g., CPEC) have initiated colossal socio-economic benefits for nations like Pakistan and China. The research presented by Li, et al. reveals that the pandemic made the business enterprises perform exceptionally well by considerably contributing to the country's (i.e., Pakistan) economic sustainability. Surprisingly, this article provides a novel insight regarding the positive effect of the pandemic, subsequently fostering the country's sustainable development.

Additionally, the research shows that during the COVID-19 widespread, the high pace of work intensifies the effect of stress, anxiety, and burnout in the health workers, ultimately damaging their quality of living (Vafaei et al., 2020). By reviewing the home-quarantine activities of students', the researchers state that psychological distresses have disturbed students' social lives. Li, et al. showed that the feeling of helplessness, loneliness, and anxiety had changed the lifestyles while positively manifesting the symptoms of depression among the individuals. Indeed, the information gathered from this article records that increased

health issues have a constant effect on individual psychological health, subsequently affecting the psychological sustainability development (i.e., quality of life).

However, in the wake of the pandemic, the COVID-19 restrictions (e.g., traveling, social) posed substantial challenges to achieving sustainable development goals. The ninth article holds paramount importance in highlighting the damaging effects of the widespread, thereby suggesting novel ways of mitigating the COVID-19 socio-economic adversity. Richter, Gabe-Thomas, et al. state that the COVID-19 pandemic has increased the strain on individuals' health, climate change, and socio-economic activities. Hence, the authors encourage promoting new practices, minimizing the COVID-19 effect, thus gaining long-term sustainable development. Moreover, Naseem et al. also support the findings by stating that the global outbreak has damaged the socio-economic conditions, paving the way toward the financial meltdown. The economic and health crises related to COVID-19 widespread had derived the behavior of the financial markets creating unbearable psychological resilience among the individuals' (i.e., health professionals). Verily, both the articles provided crucial information for future researches.

Considerably, several researchers have studied the prolonged effect of the global pandemic on various topics such as demographic characteristics, psychological effects, and mortality rates (Bonanad et al., 2020). In the illustration, the study conducted by Bilgili et al. revealed that the older population between the age of 65–70 were significantly affected by the deadly spread of the pandemic. Furthermore, the authors also suggested that government should adopt strict policies to control the increasing rate of worldwide deaths. In addition to this, COVID-19 has strengthened the work-life conflict by increasing the workload on the labor force. This statement has supported by Abdullah et al. who advise introducing social and psychological rewards to boost the employees' loyalty and job performance. Hence, these recommendations tremendously add value for achieving the sustainable goal during the pandemic.

Undoubtedly, the Coronavirus adverse impact has opened the black box of psychological sustainability, slowing down the market trend. The study by Ain et al. states that the pandemic has led the countries to experience an economic slowdown. In particular, the economic and health crises related to COVID-19 widespread had derived the behavior of the financial markets creating unbearable psychological resilience among the individuals' (i.e., health professionals). In explanation, other authors' Shehzad, et al. state that COVID-19 negativity has urged the investors to experience anxiety due to the drastic value decrease in the stock market. Indeed, the COVID-19 global pandemic has overburdened the world's economic system. Given the explanation, Szulc and Smith suggest that government must subsidize the employees' wages to reduce the workload, thus enhancing the employees' abilities and motivations to work. Perhaps, in the same vein, Dragan et al. illustrate that investing in the financial and psychological factors is essential in achieving organizational innovation. The study states that motivation, learning attitude, and behavior play a significant role in recording firms' sustainable development. In support, Güler and Haseki, in their study, also explained that positive psychological factors during the lockdown days have resulted in workers' motivation and happiness, thus enhancing individual's culinary skills and knowledge, ultimately contributing toward self-development. Potentially, all these articles emphasize achieving sustainability development by understanding the profound effects of the pandemic.

In contrast, the study by Hou et al. states that the increasing market volatility has significantly influenced the prices of Bitcoin currency. As a result, these progressing market inefficiencies have imposed immense psychological pressure on the investors, thus affecting market sustainability. Furthermore, in response to the COVID-19 vulnerability, the protection measures implemented by the government has limited businesses activities. Consistent with the given statement, the research by Xiang et al. showed that economic losses during the pandemic have resulted in global economies looking up to the future recession. The catastrophic consequences of the pandemic (i.e., poverty and unemployment) have badly affected business activities, driving the need for economic rehabilitation. In support, Richter, Richter, et al. call for quick action (e.g., government fund policies, building knowledge, and developing tailor-made solutions) for strengthening future opportunities.

The COVID-19 pandemic had a hard hit on the world's economy, leading numerous industries to face its vulnerability in the shape of declining revenues and earnings (Ozili and Arun, 2020). The economic environment of the pandemic has raised multiple questions on the expanding financial anxieties. This escalating market volatility during the COVID-19 has stopped the growth and development in many countries. Basyouni and Keshky explains that COVID-19 has provoked financial distress among the employees. In particular, this increased stress and depression have directly affected individuals' quality of life. The paper by Obrenovic et al. explained that the underlying mechanism is needed to control the COVID-19 events, heightening the psychological challenges.

However, among the COVID-19 vulnerability, financial instability and future unpredictability are the most significant factors affecting the psychological conditions, thus weakening economic sustainability. The growing volatility has worsened the global economies', thus fading the worldwide economic structure. Consistently, many studies indicated job insecurity to be the prime factor contributing to financial instability. The pandemic has made most people unemployed (Petrosky-Nadeau and Valletta, 2020). The study conducted by Wojtkowska et al. illustrates that the dread of COVID-19 vulnerabilities had caused severe disruptions in individuals' lives. Perhaps, the above studies help individuals understand the COVID-19 emerging factors (e.g., psychological and financial) linked to an individual's wellbeing and the country's economic progress.

In addition to this, the last paper reveals that the pandemic has also provided numerous benefits to firms' by accelerating their innovation process (Gopalakrishnan and Kovoor-Misra, 2021). Jialu et al. concluded that enterprise participation had enhanced the firm's technological innovation performance by colossally bringing advantages based on the firm's knowledge characteristics. This inevitable knowledge trend has remarkably

increased the structural holes, thus strengthening the enterprise position in organization sustainable performance.

Undoubtedly, the COVID-19 pandemic has caused severe disruption to the worldwide economies', thereby compelling individuals and firms to face its psychological and financial vulnerabilities. Indeed, all the articles highlight the need to adopt transformational development solutions for restoring individuals' psychological wellbeing and the world's economic sustainability.

We hope that all 24 papers selected under the intended topic expand the understanding of the effect of COVID-19 psychological sustainability on the socio-economic context. All the published papers add value for the general public, professionals, and future researchers, thus inspiring them to improve their lives while valuably adding to the desired research. All these contributions will serve as a guide model for future researchers, making them challenge this complex phenomenon of COVID-19 psychology.

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Investigating the Psychology of Financial Markets During COVID-19 Era: A Case Study of the US and European Markets

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The novel coronavirus (COVID-19) has imperatively shaken the behavior of the global financial markets. This study estimated the impact of COVID-19 on the behavior of the financial markets of Europe and the US. The results revealed that the returns of the S&P 500 index have been greatly affected by a lockdown in the US owing to COVID-19. However, the health crisis generated due to the novel coronavirus significantly decreased the stock returns of the Nasdaq Composite index. The results also showed that the economic crisis generated from the pandemic in Spain has had more impact on the IBEX 35 as compared to the health crisis itself. On the other hand, in the long-run, Italy's stock markets are more affected by the health crisis as contrasted with the economic crisis, while, in the short-run, both lockdown conditions and economic instability lower the stock returns of FTSE MIB. The UK stock markets witnessed that in the short-run, deficiency of health management systems imperatively damaged the stock returns of the London Stock Exchange. The investigation revealed that deficiency of health systems and lockdown conditions have imperatively damaged the structure of financial markets, inferring that sustainable development of these nations is at risk due to COVID-19. The study suggested that governments should allocate more of their budget to the health sector to overcome a health crisis in the future.

Keywords: COVID-19, financial stability, financial markets psychology, sustainable development, global development, health crisis, economic crisis

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INTRODUCTION

Historically, countries affected by a pandemic or epidemic that have seen large loss of life also see an impact within the economy and in their financial markets; a specific example would be the spread of Ebola disease in 2013–2016, which caused a loss of 53 billion dollars in the US (Fernandes, 2020). However, the potential damages of the current virus are still largely unknown. Significantly, the Coronavirus (COVID-19) infection disease was first reported in Wuhan on December 31, 2019 and spread rapidly to almost the whole world within the next few months (Albulescu, 2020). Compared to Severe Acute Respiratory Syndrome (SARS), COVID-19 is more contagious, which has been indicated by

a different fatality rate[1]. COVID-19 has infected 1,865,413 individuals, and 110,008 deaths had been documented throughout the globe until mid-April 2020 (Financial Times, 2020). In order to eradicate this pandemic, the World Health Organization (WHO) recommended maintaining social distance, which generated the severe lockdown situation on the globe (WHO, 2020). Accordingly, the economic circle in the whole world has been disturbed. Notably, the sale of Online Travel Agencies (OTAs), Airlines, and Hotels has unexpectedly declined (World Economic Forum, 2020). Even oil prices have nosedived due to the sudden outbreak of this pandemic (EIA, 2020). Due to globalization, the current coronavirus outbreak will aggravate the economic condition, which can pave the way toward financial meltdown (Huang et al., 2020). This pandemic has caused a severe psychological impact on the economy while agitating service industries and financial markets.

Moreover, the coronavirus outbreak has severely affected the financial markets while declining the value of stock index up to 10% in 1 day (Daube, 2020). Surprisingly, news or specific events can fluctuate stock values (Shehzad and Sohail, 2018). **Figure 1** revealed the market value in the European, American, Chinese, and Hong Kong markets from January 1, 2020–March 18, 2020. The period is divided into three rounds for comparison purposes; the first time-lagged is from January 1, 2020 to January 23, 2020, the second time-lagged is from January 23 to March 6, and the third time-lagged denoted the period of March 6, 2020 to March 18, 2020. The results showed that the market values of these indices significantly declined in the third time-lagged as COVID-19 approached its peak in western countries. Spain's stock market share value was decreased by 27.3% in the third time-lagged. COVID-19 tremendously shrank Greece stock markets.

Moreover, **Figure 2** illustrates the volatility index (VIX) from January 2005–March 2020. It denotes that the world has faced severe financial crises in 2007–2009. The stock markets collapsed, and the economies went through enormous pressure. A similar scenario has been built up during the global pandemic COVID-19. The stock market variance is at its highest for the second time after the Global Financial Crises (GFC).

In this regard, the novel coronavirus's impact is also detrimental, and pandemic behavior is unknown, so its effect on the stock return can last longer. Relevant to this, the US stock volatility has been agitated due to the enormous spread of this pandemic resulting in severe economic crisis (Sharif et al., 2020). In such circumstances, it is quite significant to analyze coronavirus short-term and long-term impacts on the advanced countries' stock return. This investigation argued that as the confirmed patients of novel coronavirus increase, the lockdown conditions becomes stricter, which lead to a significant economic crisis and shocked the economic stability of one's nations. Moreover, deaths that befell as a result of novel coronavirus specified the deficiency of health facilities, which had caused a substantial health crisis. Particularly, this examination analyzed the effects of the economic and health crisis due to the novel coronavirus on the behavior of financial markets of the United States (US), Germany, United Kingdom (UK), Italy, and Spain for the period of February 10, 2020 to April 9, 2020.

This study elucidates the effects by executing a Non-linear Autoregressive Distributed lagged (NARDL) model. This investigation provides remarkable policies on how to handle the impacts of COVID-19 on the financial market and answers the momentous queries of the researchers, policymakers, Government officials, and academicians, e.g., firstly, does COVID-19 have a non-linear impact on financial markets' behavior? Secondly, does the health crisis or economic instability generated by COVID-19 have a more significant impact on the S&P 500 index? Thirdly, does the Nasdaq Composite index or S&P 500 index respond more critically to the COVID-19 crisis? Fourthly, does the economic crisis generated by COVID-19 or the health crisis have a more significant impact on stock returns? Fifthly, how does this suspended circle of economy, due to lockdown, begin again? According to the author's best knowledge, this is the first study that examines the asymmetrical impact of COVID-19 on the psychology of stock markets of mostly infected nations of the world. Firstly, this project ascertained the stationary level of study variables and discovered that all the variables are stationary at I(0) and I(1), and no one is stationary at I(2). Hence, a Non-linear version of the Autoregressive Distributed Lag (ARDL) model can be applied.

DATA AND METHODOLOGY

Data

This study utilized the daily data of the number of confirmed patients and deaths due to COVID-19 and stock markets of the US, Spain, Italy, Germany, and the UK, from the period of February 10, 2020–April 9, 2020. This study has taken the data from the database of Yahoo Finance and the European Center for Disease Control and Prevention. Further, this investigation analyzed the daily returns of IBEX 35, FTSE MIB, DAX 30, and London Stock Exchange (LSE) for the nomination of Spain, Italy, Germany, and the UK. However, S&P 500 and Nasdaq Composite Index represents the US.

Methodology

This investigation utilized each stock market's daily returns as the dependent variable and confirmed cases and deaths as the independent variable. The daily returns used in this study are computed as follows (Syllignakis and Kouretas, 2011; Shehzad and Sohail, 2018),

$$R_{ti} = (ln(CS_{ti}/CS_{t-1i}))^{*}100 \quad (1)$$

here R_{ti}, CS_t, and CS_{t-1} denote the return value at time t, closing price at time t, and previous day closing price at time t, for a stock market *i*, respectively. The linear association between these variables can be defined as;

$$\Delta SPR_t = \beta_0 + \beta_1 USC_t + \beta_2 USD_t + \varepsilon_t \quad (2)$$

$$\Delta NSR_t = \beta_0 + \beta_1 USC_t + \beta_2 USD_t + \varepsilon_t \quad (3)$$

[1]The SARS fatality rate was 11% while the fatality rate by novel coronavirus is 4% all around the globe.

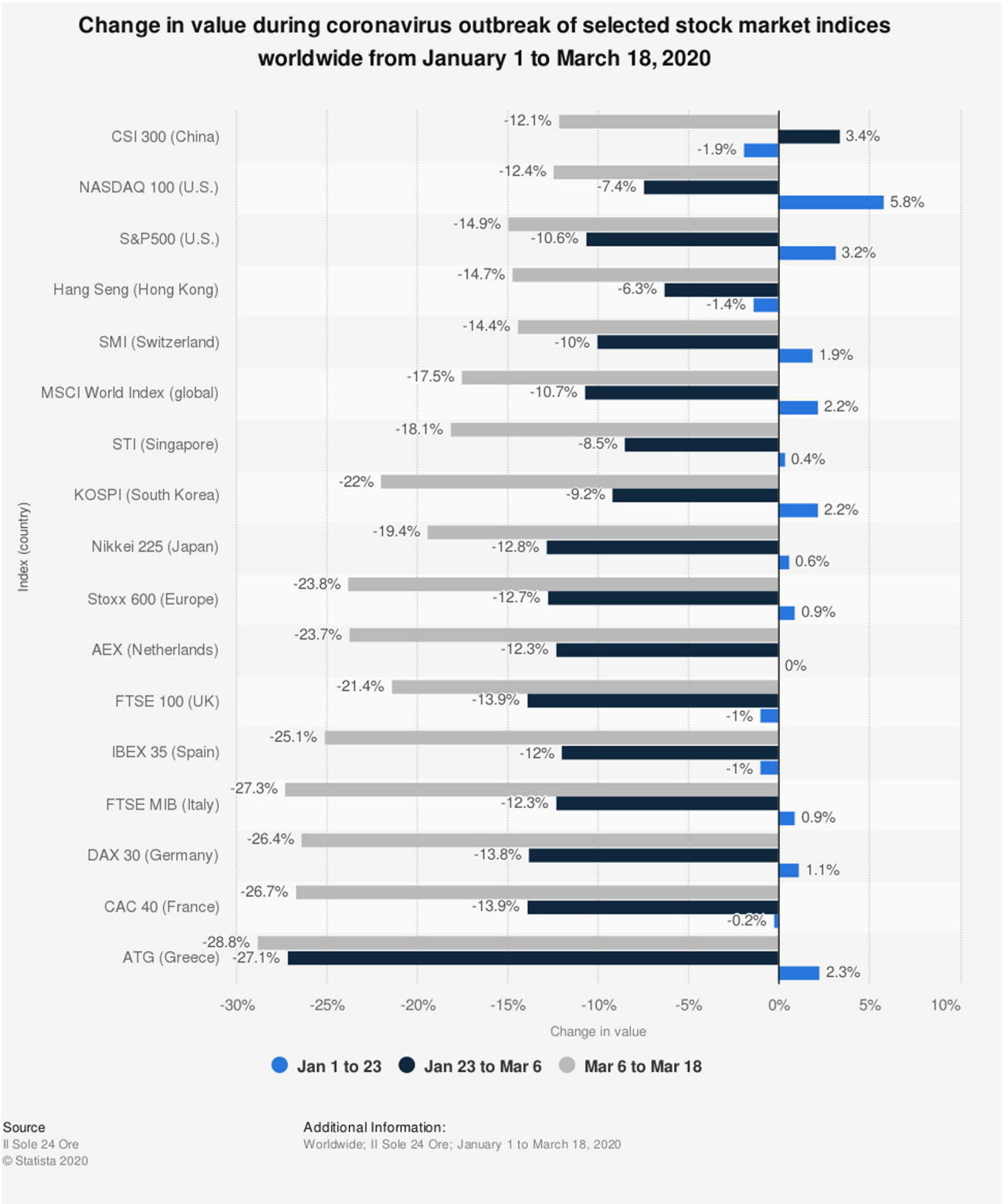

FIGURE 1 | Deterioration in the stock markets owing to novel coronavirus.

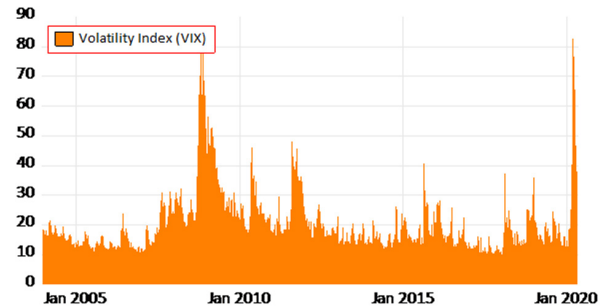

FIGURE 2 | Variations in VIX due to Global Financial Crisis 2007–2009 and COVID-19 Crisis.

$$\Delta IBER_t = \beta_0 + \beta_1 SPC_t + \beta_2 SPD_t + \varepsilon_t \quad (4)$$

$$\Delta FTMR_t = \beta_0 + \beta_1 ITLC_t + \beta_2 ITLD_t + \varepsilon_t \quad (5)$$

$$\Delta DAXR_t = \beta_0 + \beta_1 GERC_t + \beta_2 GERD_t + \varepsilon_t \quad (6)$$

$$\Delta LSER_t = \beta_0 + \beta_1 UKC_t + \beta_2 UKD_t + \varepsilon_t \quad (7)$$

where Δ signifies the first difference and $\beta_0\beta_1\beta_2$ are the independent parameters. However, NSR, SPR, IBER, FTMR, DAXR, and LSER defines the return values of the Nasdaq Composite index, S&P 500, IBEX 35, FTSE MIB, DAX 30, and London Stock Exchange, respectively. Moreover, USC, SPC, ITLC, GERC, and UKC indicate the confirmed cases of COVID-19 in the US, Spain, Italy, Germany, and the UK, respectively. Further, USD, SPD, ITLD, GERD, and UKD refer to confirmed deaths due to COVID-19 in the US, Spain, Italy, Germany, and the UK, respectively.

To ascertain the short- and long-run asymmetries, this study employed the Non-Linear Autoregressive Distributed Lag (NARDL) model introduced by Shin et al. (2014). This model performs best with a small number of observations and can be applied on a mixed level of stationary data, i.e., I (0) and I(1). It evaluates the non-linearity and cointegration between variables in one equation; and shared the short-run variations to long-run asymmetries after taking the long-run parameters into account (Shin et al., 2014). The NARDL model is the extended form of the ARDL (Pesaran et al., 2001) model; hence, the full form of NARDL model for each stock market can be specified as,

$$\Delta SPR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta SPR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta USC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta USC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta USD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta USD^{-}_{t-1} + \gamma_1$$

$$SPR_{t-i} + \gamma_{2a} USC^{+}_{t-1} + \gamma_{2b} USC^{-}_{t-1} + \gamma_{3a} USD^{+}_{t-1} + \gamma_{3b}$$

$$USD^{-}_{t-1} + \mu_t \quad (8)$$

$$\Delta NSR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta NSR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta USC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta USC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta USD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$USD^{-}_{t-1} + \gamma_1 NSR_{t-i} + \gamma_{2a} USC^{+}_{t-1} + \gamma_{2b} USC^{-}_{t-1} + \gamma_{3a}$$

$$USD^{+}_{t-1} + \gamma_{3b} USD^{-}_{t-1} + \mu_t \quad (9)$$

$$\Delta IBER_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta IBER_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta SPC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta SPC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta SPD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$SPD^{-}_{t-1} + \gamma_1 IBER_{t-i} + \gamma_{2a} SPC^{+}_{t-1} + \gamma_{2b} SPC^{-}_{t-1} + \gamma_{3a}$$

$$SPD^{+}_{t-1} + \gamma_{3b} SPD^{-}_{t-1} + \mu_t \quad (10)$$

$$\Delta FTMR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta FTMR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta ITLC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta ITLC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta ITLD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$ITLD^{-}_{t-1} + \gamma_1 FTMR_{t-i} + \gamma_{2a} ITLC^{+}_{t-1} + \gamma_{2b} ITLC^{-}_{t-1} + \gamma_{3a}$$

$$ITLD^{+}_{t-1} + \gamma_{3b} ITLD^{-}_{t-1} + \mu_t \quad (11)$$

$$\Delta DAXR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta DAXR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta GERC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta GERC^{-}_{t-1} + \vartheta_{3a} \sum_{i=1}^{p} \Delta GERD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$GERD^{-}_{t-1} + \gamma_1 DAXR_{t-i} + \gamma_{2a} GERC^{+}_{t-1} + \gamma_{2b} GERC^{-}_{t-1} + \gamma_{3a}$$

$$GERD^{+}_{t-1} + \gamma_{3b} GERD^{-}_{t-1} + \mu_t \quad (12)$$

$$\Delta LSER_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta LSER_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta UKC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta UKC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta UKD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$UKD^{-}_{t-1} + \gamma_1 LSER_{t-i} + \gamma_{2a} UKC^{+}_{t-1} + \gamma_{2b} UKC^{-}_{t-1} + \gamma_{3a}$$

$$UKD^{+}_{t-1} + \gamma_{3b} UKD^{-}_{t-1} + \mu_t \quad (13)$$

here $\vartheta_0\vartheta_1$, ϑ_{2a}, $\vartheta_{2b}\vartheta_{3a}$and ϑ_{3b} are the short-run factors, while γ_1, γ_{2a}, γ_{2b},γ_{3a}, and γ_{3b} indicates the long-run parameters. Whereas, i symbolizes the number of lag used by the model based on Akaik Information Criterion and Schwarz Information Criterion. The above stated equations Eqs 8–13 assumed that confirmed number of cases and deaths due to COVID-19 have asymmetrical impact on stock returns.

Thus, USC^{+}_{t-1},USD^{+}_{t-1},SPC^{+}_{t-1}, SPD^{+}_{t-1},$ITLC^{+}_{t-1}$, $ITLD^{+}_{t-1}$,$GERC^{+}_{t-1}$, $GERD^{+}_{t-1}$, UKC^{+}_{t-1}, and UKD^{+}_{t-1} designates a positive shock, though USC^{-}_{t-1}, USD^{-}_{t-1}, SPC^{-}_{t-1}, SPD^{-}_{t-1}, $ITLC^{-}_{t-1}$, $ITLD^{-}_{t-1}$,$GERC^{-}_{t-1}$, $GERD^{-}_{t-1}$,UKC^{-}_{t-1}, and UKD^{-}_{t-1} implies a negative shock for each variable, and it is computed as follows,

$$\varrho^{+}_{ti} = \sum_{j=1}^{t} \Delta \varrho^{+}_{ji} = \sum_{j=1}^{t} \max(\Delta \varrho_{ji}, 0) \quad (14)$$

$$\varrho^{-}_{ti} = \sum_{j=1}^{t} \Delta \varrho^{-}_{ji} = \sum_{j=1}^{t} \min(\Delta \varrho_{ji}, 0) \quad (15)$$

here ϱ^{+}_{ti} delineates the positive shock in a variable i and j denotes the asymmetric distributive lag. The error correction form for these factors can be written as follows,

$$\Delta SPR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta SPR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta USC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta USC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta USD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$USD^{-}_{t-1} + \phi_1 ECT_{t-1} + \mu_t \quad (16)$$

$$\Delta NSR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta NSR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta USC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta USC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta USD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$USD^{-}_{t-1} + \phi_1 ECT_{t-1} + \mu_t \quad (17)$$

$$\Delta IBER_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta IBER_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta SPC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta SPC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta SPD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$SPD^{-}_{t-1} + \phi_1 ECT_{t-1} + \mu_t \quad (18)$$

$$\Delta FTMR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta FTMR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta ITLC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta ITLC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta ITLD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$ITLD^{-}_{t-1} + \phi_1 ECT_{t-1} + \mu_t \quad (19)$$

$$\Delta DAXR_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta DAXR_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta GERC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta GERC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta GERD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$GERD^{-}_{t-1} + \phi_1 ECT_{t-1} + \mu_t \quad (20)$$

$$\Delta LSER_t = \vartheta_0 + \vartheta_1 \sum_{i=1}^{p} \Delta LSER_{t-1} + \vartheta_{2a} \sum_{i=1}^{p} \Delta UKC^{+}_{t-1} +$$

$$\vartheta_{2b} \sum_{i=1}^{p} \Delta UKC^{-}_{t-1} \vartheta_{3a} \sum_{i=1}^{p} \Delta UKD^{+}_{t-1} + \vartheta_{3b} \sum_{i=1}^{p} \Delta$$

$$UKD^{-}_{t-1} + \phi_1 ECT_{t-1} + \mu_t \quad (21)$$

here ECT_{t-1} directs the error correction term. The long-run cointegration among variables is examined through the bound test approach of Pesaran et al. (2001). This method relies on *F*-test to evaluate the null hypothesis, H0: $\gamma_1 = \gamma_{2a} = +\gamma_{3a} = 0$. For this purpose, Pesaran et al. (2001) has defined two bounds, i.e., upper and lower bound. If the estimated *F*-statistics are the higher than upper bound limit then the null hypothesis of no cointegration is rejected. However, if the projected value of *F*-test is lower than lower bound limit then null hypothesis cannot be rejected; besides, if the value of *F*-test remains between both limits then the results are not conclusive. At the end, this project employed the Wald test to verify the asymmetric long-run, $\frac{\gamma^{+}_{2a}}{\gamma_1} = \frac{\gamma^{-}_{2b}}{\gamma_1}$, $\frac{\gamma^{+}_{3a}}{\gamma_1} = \frac{\gamma^{-}_{3b}}{\gamma_1} and short-run \frac{\vartheta^{+}_{2a}}{\vartheta 1} = \frac{\vartheta^{-}_{2b}}{\vartheta 1}, \frac{\vartheta^{+}_{3a}}{\vartheta 1} = \frac{\vartheta^{-}_{3b}}{\vartheta 1}$ asymmetric relationship between study variables.

STUDY FINDINGS

The descriptive summary showed, in **Table 1**, during the COVID-19 era, the mean of stock returns is negative. Further, skewness values of these markets are also negative except LSER with high kurtosis, which predicts high chances of loss these days. **Table 2** presents the results of the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979) and Phillip Perron (PP) test (Phillips and Perron, 1988). It showed that the study variables have diverse stationary levels, i.e., I (0) and I (1), and no variable is cointegrated at I (2).

Bound Test Cointegration Fallouts

The outcomes of the Bound test displayed in **Table 3** disclosed significant statistical evidence of a long-term association between study variables for each equation. The *F*-statistics for joint significance of lagged level parameters are stated as 63.02, 39.11, 5.4, 5.1, 38.2, and 14.03 for Eqs 1–6, respectively. These values surpass the upper bound limits of Shin et al. (2014), implying that long-run cointegration exists among economic crisis, health crisis, and financial markets of each equation.

Long- and Short-Run Asymmetric Cointegration Reckoning

Table 4 exhibited the upshots of the Wald-test. The statistics particularized that USC and USD have a non-linear association with SPR. However, USC revealed short-run asymmetric affiliation with NSR. Besides, SPD caused an asymmetric influence on IBER for both long-term and short-term periods, while SPC possessed short-run asymmetry only. Additionally, the

TABLE 1 | Descriptive statistics.

	IBER	SPD	SPC	LSER	UKC	UKD	SPR	USC
Mean	−0.41737	147.2222	1463.792	−0.08997	621.2083	71.70833	−0.28187	3658.956
Skewness	−1.68003	1.687765	1.641313	0.027343	2.392073	3.081854	−0.35422	2.186996
Kurtosis	10.36907	4.166164	4.206693	4.903565	7.778953	11.75376	5.380136	6.389965
Jarque.Bera	196.7798	38.26244	36.69524	10.87966	137.1793	343.8589	17.47298	86.76708
Probability	0	0	0	0.00434	0	0	0.000161	0
	USD	**NR**	**GERC**	**GERD**	**DAXR**	**ITLD**	**ITLC**	**FTMR**
Mean	109.3088	−0.18523	1446.396	30.54717	−0.42086	174.9577	1365.254	−0.40245
Skewness	2.927378	−0.53985	1.120857	2.230936	−0.65869	1.232889	1.058817	−2.31595
Kurtosis	10.43888	5.59924	2.573906	7.120135	7.135106	2.868864	2.472667	14.04434
Jarque.Bera	253.9095	22.44518	11.49843	81.45175	41.59309	18.03773	14.08892	424.3192
Probability	0	0.000013	0.003185	0	0	0.000121	0.000872	0

Source: Author's calculation.

TABLE 2 | Unit root test.

	ADF *F*-statistics		PP *F*-statistics	
Variable	**Level**	**1st Diff.**	**Level**	**1st Diff.**
DAXR	−6.893713***	−8.54426***	−7.057616***	−37.2059****
GERC	−1.293963	−3.969976**	−0.971366	−14.51473***
GERD	−5.935247***	−4.359161***	3.147762	−6.393867***
FTMR	−4.631659	−11.55646***	−9.451458***	−30.1619***
ITLD	−1.127702	−4.174362***	−0.400067	−11.35456***
ITLC	−1.300231	−5.849862**	−0.488626	−8.372171***
IBER	−4.27056	−9.985616***	−9.446574***	−63.65801***
SPD	−1.506727	−10.32241***	0.159422	−10.09496***
SPC	4.552953	−7.028486***	−0.374729	−7.97616***
LSER	−8.775255***	−8.591517***	−8.768878***	−47.87539***
UKC	−7.816325***	−1.578091	2.746256	−9.61778***
UKD	7.429147***	−12.36282***	2.571441	−12.31254***
SPR	−12.89506***	−6.022076***	−12.13962***	−37.8073***
USC	−6.847753***	−5.567572**	4.310638**	−7.46537***
USD	3.138569	−5.097646**	7.384682***	−5.006879***
NSR	−13.66594***	−13.40744***	−12.64235***	−34.28961***

, ** and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

TABLE 3 | Results of *F*-bound test.

Test statistic	Value	Signif.	I(0)	I(1)	Test statistics	Value	Signif.	I(0)	I(1)
SPR		10%	2.2	3.09	FTMR		10%	2.2	3.09
F-statistic	63.02410	5%	2.56	3.49	*F*-statistic	5.165881	5%	2.56	3.49
K	4	2.5%	2.88	3.87	K	4	2.5%	2.88	3.87
		1%	3.29	4.37			1%	3.29	4.37
NSR		10%	2.2	3.09	DAXR		10%	2.2	3.09
F-statistic	39.11238	5%	2.56	3.49	*F*-statistic	38.23325	5%	2.56	3.49
K	4	2.5%	2.88	3.87	K	4	2.5%	2.88	3.87
		1%	3.29	4.37			1%	3.29	4.37
IBER		10%	2.2	3.09	LSER		10%	2.2	3.09
F-statistic	5.490181	5%	2.56	3.49	*F*-statistic	14.03259	5%	2.56	3.49
K	4	2.5%	2.88	3.87	K	4	2.5%	2.88	3.87
		1%	3.29	4.37			1%	3.29	4.37

Source: Author's calculation.

TABLE 4 | Wald test.

Long-run asymmetry		Short-run asymmetry		Long-run asymmetry		Short-run asymmetry	
SPR	*F*-stat		*F*-stat	FTMR	*F*-stat		*F*-stat
USC	8.093***	USC	6.224**	ITC	1.242605	ITC	0.2916
USD	4.779**	USD	6.815**	ITD	5.864**	ITD	0.1767
NSR				DAXR			
USC	1.574046	USC	4.228**	GERC	5.208**	GERC	17.24***
USD	2.589403	USD	1.609162	GERD	2.338933	GERD	18.87***
IBER				LSER			
SPC	1.569179	SPC	2.8616*	UKC	0.725822	UKC	0.640751
SPD	2.61007*	SPD	6.8974**	UKD	0.786146	UKD	0.718125

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

results of FTMR designated that ITLD has a long-run asymmetric relationship with it. The Wald-statistics of GERC enlightened that it has both long and short-run non-linear impacts on DAXR, but GERD has a short-term non-linear affiliation with DAXR. Moreover, UKC denotes a long-run asymmetric liaison with LSER. Hence, the existence of non-linearity in the study variables led us to choose the NARDL model for computing long-and short-run factors.

Modeling NARDL Parameters

The non-linear fallouts of SPR, presented in **Table 5**, illustrated that expansion and contraction in USC brings a reduction and increase in SPR, respectively. It indicates that strict lockdown substantially decreases the market returns of the S&P 500 and vice versa. Further, a positive shock in USD caused a significant rise in SPR. In the short-run, lagged values specified that a negative shock in USC amplified SPR. Besides, all the lagged terms described that an uptick effect in USD improved the SPR. Also, a negative shock in USD and its second lag augmented the SPR, but the first and third lag represents the reverse impact. Furthermore, the negative and significant value of ECT_{t-1} stated that disequilibrium occurred in SPR today due to COVID-19 will adjust with the speed of 1.3 units on a subsequent day. The *R*-squared value indicated that the 91% volatility in SPR is owing to COVID-19.

The NSR model results exhibited in **Table 6**, particularized that both positive and negative shocks in USC escalate the NSR, while enlargement (reduction) in USD instigate decrease (increase) in NSR. It specifies that an upsurge in the health crisis in the US expressively distressed the Nasdaq Composite Index and vice versa. Nonetheless, in the short-run, a negative shock in USD and USC demonstrated an imperative decrease in NSR, whereas an expansion in USC lessens the NSR. The negative and significant ECT_{t-1} parameter stated that financial instability generated due to COVID-19 would be settled with a speed of 1.5 units on the next day. The *R*-square value signified that 81% of instability occurring in NSR is the result of COVID-19.

The finding parameters of the IBER model (**Table 7**) identified that an assertive shock in SPD has an encouraging effect on IBER. Besides, adverse shocks remain insignificant. On the other hand, an escalation (decline) in SPC has a negative (positive) influence on IBER, implying that strict lockdown considerably caused the financial crisis in Spain for the long term period. In the short term period, an intensification in SPC, SPD, and a decline in SPC, SPD increased the IBER. The negative and significant value of ECT_{t-1} elucidated that today's disequilibrium in IBER will adjust on the next day with a speed of 0.82 units. The coefficient of *R*-square stated that 72% of variations in IBER are owing to COVID-19.

Table 8 displayed the fallouts of the FTSE MIB stock market. The condition of COVID-19 on Italy's stock markets exposed

TABLE 5 | Asymmetric parameters of SPR.

Variables	Short-term coefficients	Std. Error	*t*-stat	Prob.
D(USC_NEG)	−0.047867***	0.003539	−13.52394	0
D(USC_NEG(-1))	−0.061323***	0.003402	−18.02596	0
D(USC_NEG(-2))	−0.108895***	0.005569	−19.55339	0
D(USC_NEG(-3))	−0.072915***	0.003619	−20.14618	0
D(USD_POS)	0.713848***	0.036514	19.55011	0
D(USD_POS(-1))	0.23431***	0.014268	16.42276	0
D(USD_POS(-2))	0.194744***	0.01369	14.22562	0
D(USD_POS(-3))	0.334891***	0.029691	11.27907	0
D(USD_NEG)	−0.377433***	0.055371	−6.816426	0
D(USD_NEG(-1))	1.65514***	0.097958	16.89641	0
D(USD_NEG(-2))	−0.074692***	0.02737	−2.728986	0
D(USD_NEG(-3))	3.650475***	0.235321	15.51275	0
ECT_{t-1}	−1.369525***	0.066813	−20.49782	0
R-Squared	0.912909			
Adjusted *R*-squared	0.892007			
Durbin-Watson stat	2.006439			
Variables	**Long-term Coefficients.**	**Std. Error**	***t*-stat**	**Prob.**
USC_POS	−0.004491***	0.001667	−2.694157	0.0099
USC_NEG	−0.054381***	0.014406	3.774912	0.0005
USD_POS	0.064436**	0.029631	2.174626	0.035
USD_NEG	−0.290139	0.338048	−0.858278	0.3953
C	0.181416	0.264851	0.684971	0.4969

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

TABLE 6 | Asymmetric parameters of NSR.

Variables	Short-term coefficients	Std. Error	*t*-stat	Prob.
D(USD_NEG)	0.039324**	0.019503	2.016267	0.0487
D(USC_POS)	−0.002147***	0.000382	−5.622014	0
D(USC_NEG)	0.002319***	0.00069	3.360414	0.0014
D(USC_NEG(-1))	−0.008198***	0.001064	−7.703282	0
ECT_{t-1}	−1.501702***	0.093855	−16.00026	0
R-Squared	0.812596			
Adjusted *R*-squared	0.800102			
Durbin-Watson stat	2.130245			
Variables	**Long-term coefficients**	**Std. Error**	***t*-stat**	**Prob.**
USD_POS	−0.013042***	0.004465	−2.920922	0.0051
USD_NEG	−0.026413	0.030567	−0.864107	0.3913
USC_POS	0.001013***	0.00034	2.977381	0.0043
USC_NEG	0.004258**	0.001923	2.214416	0.031
C	−0.525513*	0.274541	−1.914153	0.0608

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

that rise (reduction) in ITLD diminished (amplified) the FTMR, inferring that heath crisis imperatively contributes to Italy's financial instability for the long term period. In addition, growth in ITLC enlarged the FTMR imperatively. The sort-run condition in Italy denoted that first, second, and third lag values of FTMR harmed its own returns. Also, growth in ITLC has a negative impression on FTMR. Nonetheless, a negative shock in the second lag value of ITLC indicated an encouraging effect on FTMR. The consequences of ITLD symbolized that proliferation in ITLD possess negative sway on FTMER, but the first and second lag value have definite sway on it. Furthermore, a decline in ITLD has a direct influence on FTMR. The negative and significant figure of ECT_{t-1} itemized that FTMR will readjust the equilibrium with a speed of 0.95 units each day. The *R*-squared parameter denoted that 85% uncertainty generated in FTMR caused by COVID-19.

TABLE 7 | Asymmetric parameters of IBER.

Variables	Short-term coefficients	Std. Error	*t*-stat	Prob.
D(IBER(-1))	−0.368944***	0.09522	−3.875	0.0003
D(SPD_POS)	0.018471*	0.009268	1.993	0.0512
D(SPD_NEG)	−0.026216**	0.010675	−2.456	0.0172
D(SPC_POS)	0.001511	0.000911	1.6591	0.1028
D(SPC_NEG)	−0.001832*	0.000966	−1.897	0.0631
D(SPC_NEG(-1))	0.00301***	0.000996	3.0316	0.0037
D(SPC_NEG(-2))	0.006948***	0.00129	5.3867	0
ECT_{t-1}	−0.824331***	0.137511	−5.995	0
R-Squared	0.726141			
Adjusted *R*-squared	0.694191			
Durbin-Watson stat	2.154368			
Variables	**Long-term coefficients**	**Std. Error**	***t*-stat**	**Prob.**
SPD_POS	0.053991***	0.01765	3.0589	0.0034
SPD_NEG	0.023488	0.018017	1.3037	0.1978
SPC_POS	−0.006341***	0.001968	−3.222	0.0021
SPC_NEG	−0.005173**	0.001945	−2.659	0.0102
C	−0.636028	0.428132	−1.486	0.1431

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

TABLE 8 | Asymmetric parameters of FTMR.

Variables	Short-term coefficients	Std. Error	*t*-stat	Prob.
D(FTMR(-1))	−0.27947**	0.138377	−2.019624	0.0493
D(FTMR(-2))	−0.154875	0.136743	−1.132605	0.2632
D(FTMR(-3))	−0.295127**	0.113398	−2.602569	0.0124
D(ITLC_POS)	−0.008711***	0.001397	−6.235569	0
D(ITLC_POS(-1))	−0.015154***	0.003264	−4.642728	0
D(ITLC_POS(-2))	−0.0047	0.002589	−1.573306	0.1225
D(ITLC_NEG)	−0.001115	0.001937	−0.575378	0.5678
D(ITLC_NEG(-1))	0.006885***	0.00198	3.477965	0.0011
D(ITLC_NEG(-2))	−0.003758**	0.001782	−2.109409	0.0404
D(ITLD_POS)	−0.06983***	0.014714	−4.745672	0
D(ITLD_POS(-1))	0.023801*	0.011962	1.989722	0.0526
D(ITLD_POS(-2))	0.029575***	0.010511	2.813763	0.0072
D(ITLD_NEG)	0.002565	0.012862	0.199404	0.8428
D(ITLD_NEG(-1))	0.038093**	0.015194	2.507186	0.0158
D(ITLD_NEG(-2))	0.04502***	0.013664	3.294772	0.0019
ECT_{t-1}	−0.959373***	0.163657	−5.862111	0
R-Squared	0.851016			
Adjusted *R*-squared	0.807197			
Durbin-Watson stat	1.763297			
Variables	**Long-term coefficients**	**Std. Error**	***t*-stat**	**Prob.**
ITLC_POS	0.013317**	0.005649	2.357295	0.0227
ITLC_NEG	0.001321	0.002682	0.492464	0.6247
ITLD_POS	−0.109433**	0.053273	−2.054209	0.0457
ITLD_NEG	−0.048345**	0.020559	−2.351573	0.023
C	−0.500777	0.455916	−1.098396	0.2777

, **, and * denote 10%, 5% and 1% level of significance, respectively. Source: Author's calculation.*

The parameters of DAX 30 (**Table 9**) directed, in the long run, an upsurge (diminution) in GERD compacted (enlarge) the DAXR. Moreover, the decline in GERC also improves DAXR. These findings revealed that both lockdown and health crises are harmful to the stock markets of Germany. The short-term findings described that second,

TABLE 9 | Asymmetric parameters of DAXR.

Variables	Short-term coefficients	Std. Error	*t*-stat	Prob.
D(GERC_POS)	0.015476***	0.001209	12.80122	0
D(GERC_POS(-1))	0.012439***	0.001923	6.467043	0
D(GERC_POS(-2))	−0.088025***	0.005402	−16.29596	0
D(GERC_POS(-3))	−0.057992***	0.003854	−15.04828	0
D(GERC_POS(-4))	−0.097***	0.00647	−14.99249	0
D(GERC_NEG)	0.05202***	0.004721	11.11903	0
D(GERC_NEG(-1))	−0.067796***	0.004325	−15.67443	0
D(GERC_NEG(-2))	0.044564***	0.003649	12.21376	0
D(GERC_NEG(-3))	0.01327***	0.004158	3.191441	0.0041
D(GERC_NEG(-4))	0.183056***	0.01145	15.98705	0
D(GERD_POS)	−5.101477***	0.313432	−16.27619	0
D(GERD_POS(-1))	5.265597***	0.35462	14.84858	0
D(GERD_POS(-2))	−0.054459	0.100825	−0.540134	0.5943
D(GERD_POS(-3))	6.261756***	0.386781	16.18939	0
D(GERD_NEG)	−3.913296***	0.288936	−13.54383	0
D(GERD_NEG(-1))	30.64757***	1.850055	16.56576	0
D(GERD_NEG(-2))	23.76795***	1.466544	16.20677	0
D(GERD_NEG(-3))	19.4969***	1.21192	16.08761	0
ECT_{t-1}	−0.497359***	0.029762	−16.71134	0
R-Squared	0.945788			
Adjusted *R*-squared	0.910937			
Durbin-Watson stat	1.667758			
Variables	Long-term Coefficients.	Std. Error	t-stat	Prob.
GERC_POS	0.016748	0.035958	0.465776	0.6458
GERC_NEG	−0.255912**	0.1228	−2.083972	0.0485
GERD_POS	−19.28734***	7.569148	−2.548151	0.018
GERD_NEG	−65.49979**	25.3728	−2.581496	0.0167
C	−2.440744**	0.93232	−2.617925	0.0154

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

TABLE 10 | Asymmetric parameters of LSER.

Variables	Short-term coefficients	Std. Error	*t*-stat	Prob.
D(UKC_POS)	−0.00127	0.001661	−0.764723	0.4475
D(UKC_POS(-1))	0.022345***	0.003248	6.878603	0
D(UKC_NEG)	0.009267***	0.002137	4.337228	0.0001
D(UKD_POS)	−0.03503***	0.00746	−4.695883	0
D(UKD_POS(-1))	−0.090212***	0.014812	−6.090388	0
ECT_{t-1}	−1.100754***	0.115104	−9.563147	0
R-Squared	0.651816			
Adjusted *R*-squared	0.624182			
Durbin-Watson stat	1.867108			
Variables	**Long-term coefficients**	**Std. Error**	***t*-stat**	**Prob.**
UKC_POS	−0.003609*	0.00191	−1.889866	0.0638
UKC_NEG	−0.003213	0.002112	−1.521044	0.1337
UKD_POS	0.075038**	0.02864	2.620078	0.0112
UKD_NEG	0.086022**	0.035056	2.453823	0.0172
C	−0.319529	0.353596	−0.903654	0.3699

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

third, and fourth lag of positive shocks in GERC has a lessening impact on DAXR. However, a negative shock in GERC and other lag values except the first lag indicated an indirect association with DAXR. Additionally, positive shocks in GERD quantified mixed impact on DAXR, while a short term decline in GERD has negative, but first

lag, second lag, and third lag values point out positive linkage with DAXR. These effects are because of instability generated due to COVID-19. The *R*-squared coefficient diagnosed that the 94.5% instability in DAXR is because of COVID-19.

Table 10 represents the results of the London Stock exchange. The concluding coefficients of the UK explored that augmentation in UKD improved the LSER, while diminution in UKD reduces the LSER in the long term period, although the growth of UKC brought a significant decrease in LSER. The short term period outlined that positive shocks in UKC reduced the LSER, but the first lag value of positive shock in UKD showed an alternate impression. Additionally, an upturn in UKD possesses a diminishing impact on LSER. These outcomes designated that lockdown and health crises generated due to COVID-19 negatively impact the financial markets of the UK for the short term period. The value of ECTt-1 showed that fluxes occurred today in LSER will get equilibrium with the speed of 1.1 units on the next day. The *R*-square value reported a 65% variation in LSER due to COVID-19. **Figure 3** depicts the adjustment of asymmetric effect in the existing long-run equilibrium, once moved to a new long-run equilibrium as a result of positive and adverse shocks. The asymmetric plots denote the alliance of dynamic multipliers owing to positive and adverse shocks in S&P 500, DAX 30, FTSE MIB, Nasdaq Composite index, IBEX 35, and LSE markets. The outcomes revealed that these markets tremendously respond to the positive and negative shocks befallen due to COVID-19.

Diagnostic Parameters Evaluation

The examination employed the Breusch and Pagan (2006) test to diagnose the Serial Correlation and Heteroskedasticity in each model's residuals, Ramsey RESET technique, to ascertain functional misspecification, CUSUM, and CUSUMSQ (Ploberger and Kramer, 2006) test to define the reliability of parameters. The conclusions of these tests given in **Table 11**, nominated that there was no serial correlation and Heteroskedasticity in the residuals of each model. Besides, the plots of CUSUM and CUSUMSQ presented in **Figure 4** remain within the 5% critical boundaries, inferring that coefficients of the NARDL model are stable.

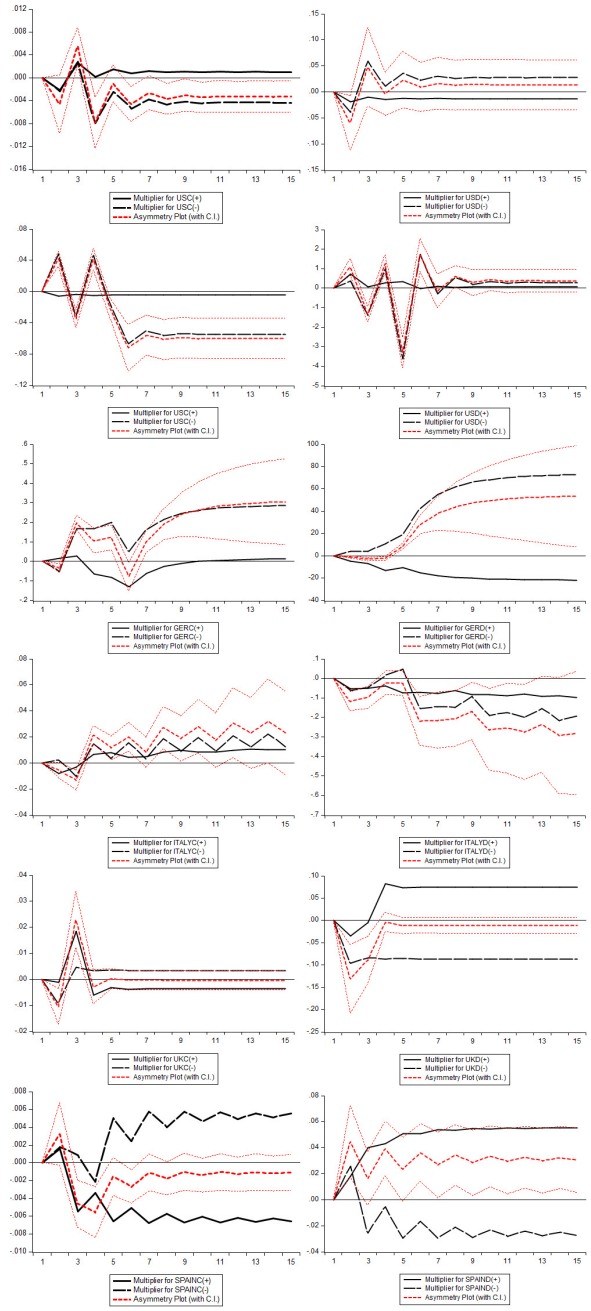

FIGURE 3 | The dynamic multiplier plots.

CONCLUSION

COVID-19 has imperatively shaken the economic indicators, primarily the financial markets of the globe. The number of patients and deaths as a result of COVID-19 are increasing day by day, and economic conditions have become entirely uncertain. Moreover, the financial markets of the world fronted a sudden crash in their market values. This investigation utilized the Non-linear Autoregressive Distributed Lag (NARDL) approach to estimate the non-linear impact of economic crisis and health crisis generated as a result of the COVID-19 pandemic on the behavior of financial markets of the most infected territories of Europe and the US. The analysis stated that the returns of the S&P 500 index are greatly affected by the economic crisis generated because of COVID-19 in the US. However, an accession in the health crisis, because of COVID-19, significantly decreased the Nasdaq Composite Index returns. These results confirmed that economic instability and the health management system have an imperative control over the financial markets' behavior. The verdicts elaborated that the economic crisis produced as a result of lockdown circumstances in Spain has more impact on IBEX 35 as compared to the

TABLE 11 | Diagnostic test results.

Heteroskedasticity	Value	Serial correlation	Value	Heteroskedasticity	Value	Serial correlation	Value
SR				FTMR			
F-statistic	1.321	*F*-statistic	0.5464	*F*-statistic	1.527	*F*-statistic	2.3644
Ramsey RESET		*F*-statistic	2.3623	Ramsey RESET		*F*-statistic	1.7672
NSR				DAXR			
Heteroskedasticity		Serial Correlation		Heteroskedasticity		Serial Correlation	
F-statistic	0.210	*F*-statistic	0.6362	*F*-statistic	0.264	*F*-statistic	0.8397
Ramsey RESET		*F*-statistic	0.1927	Ramsey RESET		*F*-statistic	0.2731
IBER				LSER			
Heteroskedasticity		Serial Correlation		Heteroskedasticity		Serial correlation	
F-statistic	0.929	*F*-statistic	1.4019	*F*-statistic	0.479	*F*-statistic	1.9939
Ramsey RESET		*F*-statistic	0.4698	Ramsey RESET		*F*-statistic	1.3502

, **, and * denote 10, 5, and 1% level of significance, respectively. Source: Author's calculation.*

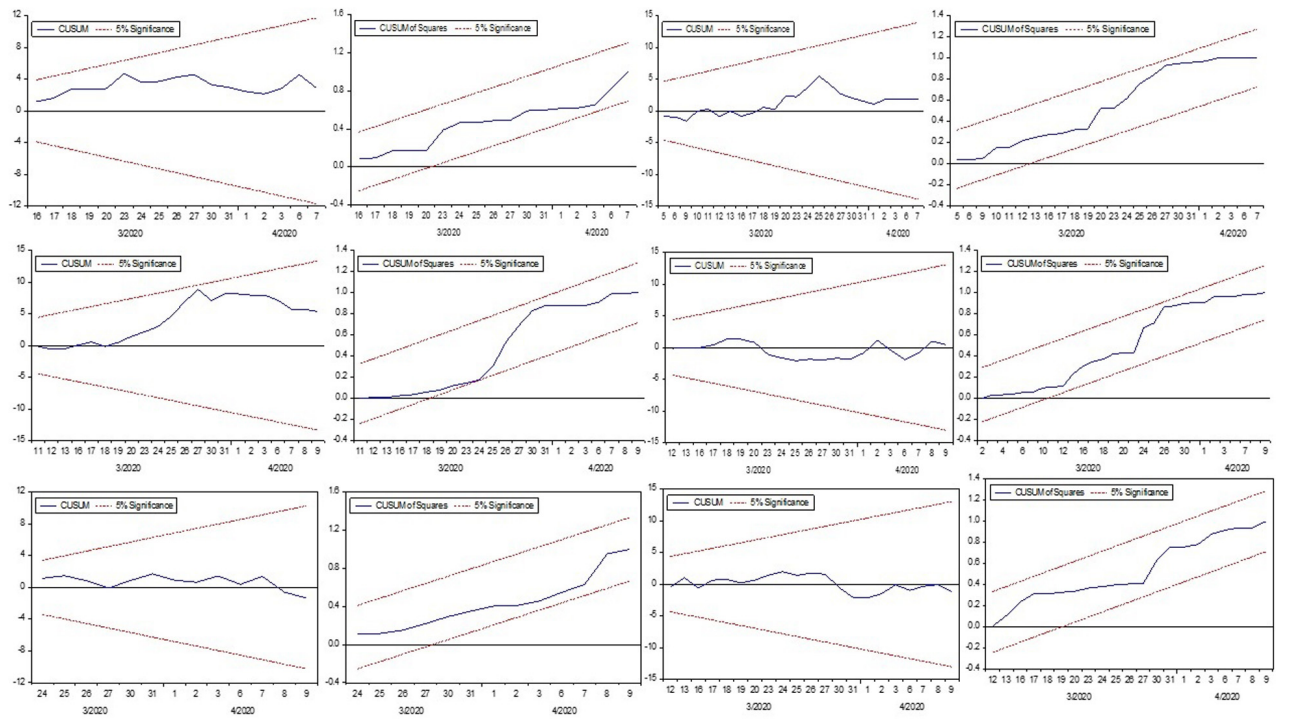

FIGURE 4 | The CUSUM and CUSUMSQ graph.

health crisis that resulted in Spain. In the long-run, Italy's stock markets are more affected by the health crisis than the economic crisis, while, in the short-run, economic uncertainty also lowered the stock returns of FTSE MIB. Nevertheless, the health crisis in Germany pointing to a significant upsurge in the economic crisis intimated an unimportant impression on the FTSE 100 index. The stock markets of the UK recorded that, in the short-run, an upsurge in the health crisis imperatively damages the stock returns of the LSE index, but in the long run, this influence was left to reverse. Therefore, this research authenticated that the health crisis begun with COVID-19 has devised another global financial crisis, and almost every nation is fighting with these crises today. Moreover, the study disclosed that economic uncertainty generated by COVID-19 is highest in the German stock markets, while the S&P 500 index is on the second-ranking, and Italian stock markets are on the third-ranking. The study concluded that the health crisis and economic crisis ominously affected the stock markets of the globe. Consequently, a significant amount should be allocated in the budget to explore and prevent these pandemics in the future. Further, a complete lockdown strategy does not prove to be an excellent remedy as it harms the financial markets, so other strategies should be developed, i.e., smart/partial lockdown. These suggestions are essential for policymakers, Government officials, researchers, and the general public.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: https://www.ecdc.europa.eu/en.

AUTHOR CONTRIBUTIONS

KS: conceptualization, analysis, and methodology. LX: supervision. MI: introduction. MA: results and discussion, and conclusion. KR: revising work, proofreading, and visualization. All authors contributed to the article and approved the submitted version.

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Impact of COVID-19 on Economic Well-Being and Quality of Life of the Vietnamese During the National Social Distancing

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Starting from April 1st, 2020, the nationwide partial lockdown in Vietnam has shown the effectiveness in stopping the community transmission of COVID-19, however, it also produced adverse impacts on the economy and inhabitants' life. A cross-sectional study using a web-based approach was conducted in the second week of April 2020 to examine the influence of the national social distancing on the quality of life and economic well-being of Vietnamese citizens under COVID-19 pandemic. The data included socio-economic characteristics, impact of COVID-19 on household income, health status, and health-related quality of life (HRQOL). Ordered logistic regression and multivariable Tobit regression model were employed to examine factors correlated to income change and HRQOL. Results showed that among 341 participants, 66.9% reported household income loss due to the impact of COVID-19. People holding undergraduate degrees, working in other sectors rather than healthcare, and having definite-term contract had a higher likelihood of income reduction. The mean score of EQ-5D-5L and EQ-VAS was 0.95 (± 0.07) and 88.2 (± 11.0), respectively. The domain of Anxiety/Depression had the highest proportion of reporting any problems among 5 dimensions of EQ-5D-5L (38.7%). Being female, having chronic conditions and living in the family with 3–5 members were associated with lower HRQOL scores. A comprehensive assessment of the influence of COVID-19 along with public health interventions, especially mental health programs, should be implemented to mitigate the negative effects of this pandemic on the economic status and quality of life of citizens.

Keywords: social distancing, economic well-being, household income, quality of life, HRQOL, COVID-19

INTRODUCTION

Emerging from December 2019 in Wuhan, China, coronavirus disease 2019 (COVID-19) has posed one of the greatest challenge to humankind within 75 years since World War Two (UNDP, 2020). As of July 10, 2020, there have been more than 12 million confirmed cases and 550,000 people lost their lives because of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Johns Hopkins University, 2020). While a specific treatment for this disease is still lacking (Harvard Medical School, 2020), the World Health Organization recommended that every nation plan and take comprehensive public health actions to suppress the spread of COVID-19 (WHO, 2020). In addition to medical-related measures such as testing and treating for patients, most countries are implementing temporary mobility restriction, social distancing, and large-scale gathering cancelation. These strategies have shown their effectiveness in slowing the transmission speed of SARS-CoV-2, however, they also have side effects on many aspects of citizen's lives (UNDP, 2014). The International Labor Organization estimates that 195 million jobs could be lost in the second quarter of 2020 as a result of COVID-19 (International Labour Organization, 2020). More than 1.5 billion students have been affected by the closure of educational institutions, reported by the United Nations Educational Scientific and Cultural Organization (UNESCO, 2020). People living in poverty, the elderly, youth, and indigenous persons are among the most vulnerable population in terms of suffering detrimental effects from the SARS-CoV-2 virus (UNDESA, 2020). It is imperative for every government to implement impact mitigation programs, not only interventions for healthcare or business but also consider improving both socioeconomic status and quality of life (QOL) of the general population, especially the vulnerable groups.

A pandemic can cause economic disruption in different ways. Human behavioral changes, such as fear-induced aversion to places of work and public gatherings, are a major cause of economic damage, besides the impact of mitigation measures (Madhav et al., 2017). Previous literature has documented the negative effects of different pandemics on the family income of residents. Wuqi Qui et al. conducted a case comparison study in China and concluded that the 2003 Severe acute respiratory syndrome (SARS) epidemic caused the average annual revenue of households to fall to US$ 175.44, 22.36% below what was anticipated, whereas the H7N9 pandemic had a less severe impact on the economy in comparison with SARS (Qiu et al., 2018). The Ebola epidemic, which mostly occurred in Africa, was reported to cause massive income deficits in numerous countries of this continent. Within just 6 months, this disease had resulted in a significant amount of household income loss in Liberia (35.13%) and Sierra Leone (29.67%) (UNDP, 2014) with the rates of reporting a decline in family income of 66% (Mercy Corps, 2019) and 55.5% (Michael et al., 2017). In terms of COVID-19 impact on household income, a recent survey in late March 2020 with 7,005 respondents from G7 countries has indicated that 31% of participants reported that "Coronavirus has already impacted my household income" and 39% thought that "Coronavirus has not yet impacted my household income, but I expect it to in the future" (Duffin, 2020). While in India, the proportion of people reporting a decline in income escalated from 9% in late February to 45.6% in mid-April 2020 (Keelery, 2020). However, the magnitude of the economic loss for each household due to SARS-CoV-2 has not been fully understood; therefore, more studies are needed to fill this gap.

In addition to causing severe consequences on the economy, COVID-19 also produced negative effects on the quality of life of residents, yet there are few studies on this topic and they only focus on a specific subject, not the general public. A study in Italy using a questionnaire to measure Health-Related Quality of Life (HRQOL) of Adults with Common Variable Immune Deficiency (CVID_QOL) has illustrated that COVID-19 disease generated negative effects on health-related quality of life and the risk of anxiety/depression among Primary Antibody Deficiencies patients (Pulvirenti et al., 2020). Utilizing 36-Item Short Form Survey (SF-36) to determine the influence of COVID-19 on health-related quality of life among people with suspected COVID-19 symptoms (S-COVID-19-S) from 5 provinces of Vietnam, Hoang et al. concluded that participants with S-COVID-19-S had a lower HRQOL-score (B, −7.92; $p < 0.001$) than those without S-COVID-19-S (Nguyen et al., 2020). To date, there is a lack of study using the standardized toolkit for measuring the impact of SARS-CoV-2 on QOL of the general population.

Vietnam is among the most vulnerable countries to COVID-19 on both economic and health aspects. The Vietnamese economy heavily relies on China as China is currently the second largest export market of this country and production in Vietnam always depends on imported raw materials, primarily from China (VietnamCredit, 2019). On health perspective, because of sharing a long border with China and limited healthcare resources, Vietnam had a higher likelihood of having COVID-19 imported cases as well as high risk of large-scale community transmission (VietnamCredit, 2019; Ebbighausen, 2020; Fleming, 2020). Although having a small number of confirmed cases and zero deaths related to COVID-19, the Vietnamese government decided to impose the nationwide partial lockdown at the early stage, starting from April 1st, 2020. This strategy has shown the effectiveness in stopping the spread of COVID-19 (Vu and Tran, 2020), however, it is freezing the economy and producing adverse impacts on inhabitants' life. This study targets to provide empirical evidence about the influence of this national social distancing on quality of life and household income of Vietnamese citizens avid COVID-19, with the ultimate goal to inform the policymakers to take appropriate and timely actions for controlling the disease while ensuring both health and socioeconomic wellbeing of the general population.

MATERIALS AND METHODS

Study Settings and Participants

A cross-sectional study using a web-based approach on qualified, well-known SurveyMonkey platform was conducted from April 6–12, 2020, 1 week after the first national partial lockdown was imposed by the government of Vietnam. During this

time interval, all Vietnamese people were told to stay indoors and could only go out for essential services, such as buying food, medicine, and other emergency case. The citizens were required to maintain a two-meter distance between individuals; gathering in groups of more than two people in public places were prohibited; and all non-essential business were shut down (VOV, 2020). This maximum social distancing strategy was implemented in the second stage of fighting COVID-19 in this country with most of the cases imported from overseas and community transmission emerged (Le, 2020; Manh and Dinh, 2020). The inclusion criteria of respondents in our study including (1) Agreeing to participate in the study by approving the online consent form; (2) Having the ability to access the online questionnaire; (3) Having full capacity to answer the questions.

Sample and Sampling

Participants were recruited by snowball sampling technique. Initially, a core group of 15 members including lecturers, students, and staff from Hanoi Medical University was set up. These persons had a higher probability of knowing other individuals from other medical universities and health facilities in Vietnam. This group was selected to reflect the diversity of research subjects, for example age, gender, educational level, and occupation throughout the country. Core-group members accessed the survey link via their computers, tablets, or smartphones and shared research invitation to their relatives and friends through email or social media. After people completed the questionnaire, they were encouraged to spread the link of the online survey to invite others residing in all regions of Vietnam to join. A total of 341 respondents involved in our study after 1 week of collecting data.

Measure and Instruments

A structured questionnaire was developed based on the validated tools and piloted on lecturers and students of Hanoi Medical University prior to the data collection throughout Vietnam. The information collected from this survey included:

Socio-Economic Characteristics

Socio-economic data included age, gender, living area, marital status, living area, religion, family size, educational level, occupation, employment status, and having health insurance.

Impact of COVID-19 on Household Income

The impact of COVID-19 on household income was examined by two questions: (1) "How has your family's monthly income changed due to the impact of COVID-19?" with three answer options (a) Decreased; (b) Increased; (c) Unchanged; (2) "Please estimate the percentage of your family income's change compared with the month before COVID-19 started to occur in Vietnam?" with six choices of answering: (a) 0%; (b) < 20%; (c) 20–40%; (d) 40–60%; (e) 60–80%; and (f) 80–100%. People were classified in "changed income" if they reported their income as "decreased" or "increased." Respondents were classified "no income change" if they replied their income "unchanged" under the impact of COVID-19.

Influence of COVID-19 on Participant's Job

Respondents also reported the influence of this pandemic on their jobs, which is classified in 4 options including (1) Fired; (2) Reduce working hours/shifts; (3) Have to work overtime; and (4) No effect.

Health Status and Service Utilization

The health condition of participants was investigated based on 4 criteria: Having outpatient examinations in the last 14 days; Having COVID-19 test in the last 14 days; Being isolated in the last 14 days; Having chronic conditions.

Health-Related Quality of Life

In this study, we chose the EuroQoL 5 Dimensions 5 Levels (EQ-5D-5L), which is a short, simple, validated questionnaire, and widely used in Vietnam for measuring the HRQOL of the general population. This tool comprises of five domains including Mobility, Self-care, Usual Activities, Pain/Discomfort, and Anxiety/Depression, which are assessed under 5 levels of answer from no problems (code 1) to extreme problems (code 5). The responses of each dimension were incorporated to determine the health state of participants with 11111 representing the best health and 55555 meaning the worst health. Each health state interpreted in one single "utility" score, which can be converted by using the interim scoring for the EQ-5D-5L (EuroQol Research Foundation, 2019). In the present study, we utilized the Vietnamese value set with the score ranging from -0.5115 to 1 (Mai et al., 2020). In addition, another element of EQ-5D-5L is Euroqol Visual Analogue Scale (EQ-VAS), was also used for participants to self-rate their health with the value ranging from 0 (worst imaginable health) to 100 (best imaginable health) (EuroQol Research Foundation, 2019). The recall period for both EQ-5D-5L and EQ-VAS was "today" – the day that respondents answered the online questionnaire.

Statistical Analysis

The extracted data from the online survey were analyzed by STATA 15.0 software. We described data characteristics that covered frequency, percent, mean, and standard deviation. To compare differences between people having household income change due to the impact of COVID-19 and people who were not affected, we used *t*-test or Mann Whitney test for ordinal variables and Fisher-exact test or Chi-square test for nominal variables. Ordered logistic regression was employed to examine factors correlated with the impact of COVID-19 on respondents' family income. A multivariable Tobit regression model was applied to identify factors associated with HRQOL score. A forward stepwise strategy was applied to obtain the final regression model with a threshold of the p-value is less than 0.2. A p-value of less than 0.05 was considered as statistical significance.

TABLE 1 | Socio-economics characteristics of respondents.

Characteristics	Income changes due to the impact of COVID-19				Total		*p*-value
	Yes		No				
	n	%	*n*	%	*n*	%	
Total	229	67.2	112	32.8	341	100.0	
Gender							
Male	72	31.4	45	40.2	117	34.3	0.11
Female	157	68.6	67	59.8	224	65.7	
Region							
Northern	173	75.6	89	79.5	262	76.8	0.06
Central	32	14.0	8	7.1	40	11.7	
Southern	19	8.3	15	13.4	34	10.0	
Foreign	5	2.2	0	0.0	5	1.5	
Age group							
Under 25	58	25.3	27	24.1	85	24.9	0.99
25–34	68	29.7	34	30.4	102	29.9	
35–44	62	27.1	32	28.6	94	27.6	
Above 44	41	17.9	19	17.0	60	17.6	
Religion							
Yes	36	15.7	15	13.4	51	15.0	0.57
No	193	84.3	97	86.6	290	85.0	
Marital status							
Single	82	35.8	45	40.2	127	37.2	0.38
Living with spouse	140	61.1	66	58.9	206	60.4	
Others	7	3.1	1	0.9	8	2.4	
Family size							
1–2 people	41	17.9	23	20.5	64	18.8	0.36
3–5 people	167	72.9	74	66.1	241	70.7	
Above 5 people	21	9.2	15	13.4	36	10.6	
Educational level							
High school and below	44	19.2	31	27.7	75	22.0	0.11
Undergraduate	132	57.6	52	46.4	184	54.0	
Postgraduate	53	23.1	29	25.9	82	24.1	
Occupation							
Health workers	47	20.5	19	17.0	66	19.4	0.15
Professional educators	33	14.4	23	20.5	56	16.4	
White-collar workers	44	19.2	27	24.1	71	20.8	
Students	55	24.0	29	25.9	84	24.6	
Others	50	21.8	14	12.5	64	18.8	
Employment status							
Government officials	74	32.3	40	35.7	114	33.4	0.76
Indefinite-term contract	43	18.8	23	20.5	66	19.4	
Definite-term contract	24	10.5	10	8.9	34	10.0	
Farmers / Students / Homemakers / Unemployed / Retired	70	30.6	34	30.4	104	30.5	
Others	18	7.9	5	4.5	23	6.7	
Having health insurance							
Yes	217	94.8	111	99.1	328	96.2	0.05
No	12	5.2	1	0.9	13	3.8	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***	***p-value***
Age	33.4	10.3	34.2	11.9	33.7	10.8	0.88

Ethical Consideration

The Institutional Review Board of Institute for Preventive Medicine and Public Health, Hanoi Medical University, approved the protocol of this study (Code. QD 75/QD-YHDP&YHDP dated 27 March 2020). The research' objectives and informed consent were provided on the online survey at the first page before the respondents make a decision to participate or not. No incentives were provided to participants and they could withdraw from the survey at any time. The respondents' information was kept confidentially and was only for research purposes.

RESULTS

Of 341 participants with a mean age of 33.7, the majority of them were female (65.7%), living in Northern Vietnam (76.8%) with a family size of 3–5 people (70.7%), no religion (85%), holding undergraduate degrees (54%), having full-time jobs (62.8%) and having health insurance (96.2%). In terms of occupation, students registered the highest proportion (24.6%), followed by white-collar workers (20.8%) and health professionals (19.4%) (**Table 1**).

Table 2 shows that most of the respondents reported a decline in household income (66.9%), and only one person replied that there was an increase in family income because of COVID-19. Among those having a decreased income, the change level at under 20% accounted for the highest proportion (25.2%), and the lowest went to 80–100% (6.2%). More than half of people (52.5%) answered that COVID-19 had no impact on their occupational status, while 30.2% had a reduction in working hours/shifts, and 8.5% lost their jobs as a result of SARS-CoV-2.

It can be seen from **Table 3** that in the last 14 days, only 4.4% of participants reported outpatient examinations, 2.4% SARS-CoV-2 testing, and 7% being separated from the other people. There were 14.9% of respondents living with chronic diseases, including hypertension (3.0%), diabetes (1.5%), and others. The mean score of EQ-5D and EQ-VAS was 0.95 (± 0.07) and 88.2 (± 11.0), respectively. Participants with family income changed due to COVID-19 had a significantly lower score of EQ-5D (0.94 ± 0.07) than the remaining group (0.96 ± 0.6) ($p = 0.04$). Among 5 dimensions of the EQ-5D-5L scale, the aspect with the highest proportion of having any problems was Anxiety/Depression (38.7%), followed by Pain/Discomfort (10.0%), Usual activities (8.5%), while the lowest percentage went to Self-care (0.3%). A significant difference was found in the rate of having any problems in Anxiety/Depression between people with household income changed because of COVID-19 (43.7%) and those with no income change (28.6%) ($p < 0.05$).

Table 4 indicated some associated factors with the change of household income and quality of life among participants due to COVID-19. The family income of people having health insurance (OR = 0.23; 95% CI = 0.08; 0.66) and being 25 years and above were less likely to be affected, whereas persons with undergraduate degree (OR = 2.31; 95% CI = 1.17; 4.54), working in other sectors rather than healthcare (OR = 2.23; 95% CI = 1.31; 3.79), and having definite-term contract (OR = 2.13; 95% CI = 1.08; 4.19) had a higher likelihood of income reduction. Participants having chronic diseases were significantly associated with lower quality of life in both EQ-5D index (Coefficient = −0.07; 95% CI = −0.11; −0.03) and EQ-VAS (Coefficient = −6.94; 95% CI = −10.84; −3.04). Respondents being female (Coefficient = −3.36; 95% CI = −6.08; −0.04) and living with family of 3–5 people (Coefficient = −3.06; 95% CI = -6.08; −0.04) had a lower QOL likelihood in terms of EQ-VAS scale.

TABLE 2 | Impact of COVID-19 on economic status of respondents.

Impact of COVID-19 on economic status	*n*	%
Magnitude of household income change		
Decreased 80–100%	21	6.2
Decreased 60–80%	23	6.7
Decreased 40–60%	52	15.3
Decreased 20–40%	46	13.5
Decreased < 20%	86	25.2
Decreased 80–100%	21	6.2
Unchanged	112	32.8
Increased	1	0.3
COVID-19 impact on jobs		
Fired	29	8.5
Reduced working hours/shifts	103	30.2
Have to work overtime	30	8.8
No effect	179	52.5

DISCUSSION

Our study featured a high rate of household income loss as well as impairment on some quality of life domains among the general population in Vietnam due to the impact of the COVID-19 pandemic. We also found some potential factors associated with the change in family earnings and QOL of Vietnamese citizens, implying for future interventions and programs to enhance the socioeconomic status and well-being of the residents suffering from the epidemic in resource-constrained settings.

The findings of this research showed that more than two-thirds (66.9%) of Vietnamese participants reporting a reduction in their family income as a result of COVID-19. This figure is higher than those in India (45.6%) (Keelery, 2020) and G7 countries (31%) (Duffin, 2020). The disparity could be attributable to the difference in economic structures and major markets between countries. The economy of Vietnam heavily relied on exports, whereas China is the second largest export destination and the main consumer of agriculture products of this country (B&Company, 2020; The Observatory of Economic Complexity, 2020). The magnitude of income deficit due to COVID-19 is the new contribution of our study to enrich the evidence related to the influence of SARS-CoV-2 on the economic status of the general public. Based on the assessment of household revenue damage stated by all respondents, we understand that this disease caused disparate

TABLE 3 | Health status and quality of life among respondents.

Characteristics	Household income changes due to the impact of COVID-19				Total		*p*-value
	Yes		No				
	n	%	*n*	%	*n*	%	
Having outpatient examination in the last 14 days	9	3.9	6	5.4	15	4.4	0.58
Having COVID-19 test in the last 14 days	7	3.1	1	0.9	8	2.4	0.28
Being isolated in the last 14 days	18	7.9	6	5.4	24	7.0	0.40
Having chronic diseases	40	17.7	10	9.2	50	14.9	0.04
Hypertension	7	3.1	3	2.8	10	3.0	0.99
Cardiovascular	0	0.0	1	0.9	1	0.3	0.33
Diabetes	3	1.3	2	1.8	5	1.5	0.66
Asthma	2	0.9	1	0.9	3	0.9	0.99
Others	29	12.8	4	3.7	33	9.9	0.01
Mobility							
Having problems	13	5.7	12	10.8	25	7.4	0.12
No problems	216	94.3	100	89.3	316	92.7	
Self-care							
Having problems	1	0.4	0	0	1	0.3	0.99
No problems	228	99.6	112	100	340	99.7	
Usual activities							
Having problems	23	10.1	6	5.4	29	8.6	0.21
No problems	206	90	106	94.6	312	91.5	
Pain/discomfort							
Having problems	26	11.3	8	7.1	34	10	0.25
No problems	203	88.7	104	92.9	307	90	
Anxiety/depression							
Having problems	100	43.6	32	28.6	132	38.7	< 0.01
No problems	129	56.3	80	71.4	209	61.3	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***	***p*-value**
EQ-5D index	0.94	0.07	0.96	0.06	0.95	0.07	0.04
EQ-VAS	88.3	10.1	88.0	12.6	88.2	11.0	0.64

impacts on income, calling for specific strategies to recover the economic status of targeted groups. The previous literature only mentioned the effect of pandemics under the perspective of average income loss proportion among all participants, such as the 2003 SARS epidemic in China with the average annual income of households to fall 22.36%) (Qiu et al., 2018), the Ebola in African countries caused the deficit in 6-month household income in Liberia and Sierra Leone of 35.13 and 29.67%, respectively (UNDP, 2014). Hence, our study suggested a new direction for future research, which is discovering the influence magnitude of pandemics on the economic well-being of the general population.

In the current study, the family income of people holding undergraduate degrees, working in other sectors rather than healthcare, and having definite-term contracts had a higher likelihood of being changed as a result of COVID-19. This may be due to the downsizing or closure of businesses following the requirement of strict social distancing in Vietnam. According to the estimation by the General Statistics Office of Vietnam, as of mid-April 2020, nearly 5 million people have lost their jobs because of this epidemic (Nguyen, 2020). The most affected sectors are tourism, services, aviation, transportation, leather, and footwear (Trong Quynh, 2020). To mitigate the economic impact of this pandemic, on April 10th, 2020, the Prime Minister of Vietnam has approved the relief packet of US $2.6 billion, targeting about 4.135 million victims who are hardest hit by COVID-19 (Minh, 2020; Vietnam News, 2020). However, the main beneficiaries of this policy are mostly the poor and near-poor, people with records of meritorious services to the country, household businesses, employers, freelance labors and blue-collar workers, and the list of recipients only based on the reports from local authorities (Prime Minister, 2020), while employees with higher educational degrees seemed to be neglected. Scientific evidence is still lacking to advise this policy and our research was one of the first studies to contribute important information for decision-makers to consider their actions. As our finding had pointed out, the income of employees having advanced education even more affected than those only have high school diplomas or lower, therefore, the policymakers should develop appropriate strategies to reduce the inequality in accessing financial support during the time of COVID-19.

TABLE 4 | Associated factors with household income change and quality of life of respondents.

Characteristics	Change of household income because of COVID-19		EQ-5D index		EQ-VAS	
	OR	95% CI	Coef.	95% CI	Coef.	95% CI
Gender (Female vs. male)					−3.36**	−6.30; −0.42
Region (Central vs. Northern)					−3.09	−7.42; 1.23
Age group (vs. Under 25)						
25–34	0.33***	0.16; 0.66				
35–44	0.38***	0.18; 0.79				
Above 44	0.35***	0.16; 0.76			3.05	−0.70; 6.80
Religion (Yes vs. no)			0.04	−0.01; 0.08		
Having health insurance (Yes vs. no)	0.23***	0.08; 0.66	0.05	−0.02; 0.13		
Having chronic diseases (Yes vs. no)			−0.07***	−0.11; −0.03	−6.94***	−10.84; −3.04
Family size (vs. 1–2 people)						
3–5 people					−3.06**	−6.08; −0.04
Above 5 people			0.04	−0.02; 0.09		
Education level (High school and below)						
Undergraduate	2.31**	1.17; 4.54				
Postgraduate	1.85	0.84; 4.08				
Occupation (Others vs. health workers)	2.23***	1.31; 3.79				
Occupation status (vs. Government officials)						
Definite-term contract	2.13**	1.08; 4.19	−0.05**	−0.10; −0.00	−4.46	−8.99; 0.08
Others					4.43	−1.07; 9.92

$^{***}p < 0.01$, $^{**}p < 0.05$.

Regarding the quality of life aspect, the average score of EQ-5D index (0.9) and EQ-VAS (88.2) calculated from our study were consistent with previous research among the general population of Vietnam in the context without the influence of pandemic (0.91 and 87.4, respectively), however, the rate of having Anxiety/Depression in this study (38.7%) was much higher than that in the compared research (15.2%) (Nguyen et al., 2017). Banned outdoor recreation, fear of being infected SARS-COV-2, and concerns of impact of this disease might be the reasons leading to a higher proportion of anxiety/depression in our study. Other studies in China also emphasized the high prevalence of mental health disorders among the general public under the influence of COVID-19 (Huang and Zhao, 2020; Ni et al., 2020; Wang C. et al., 2020; Wang Y. et al., 2020b). This high rate calls for the implementation of mental health strategies to minimize the negative impact of this disease on the mental health of residents (Ho et al., 2020). On the other hand, our analysis reveals that those being women and having chronic conditions were found to have lower HRQOL scores, which was in line with previous studies (Ha et al., 2014; Nguyen et al., 2017, 2019; Pham et al., 2018). The participants living in a family with 3–5 members had a higher risk of impaired QOL than those in households with a smaller size. The possible explanation is that during the nationwide partial lockdown, people were forced to stay at home and had no income to pay for living expenses; thus, the more people in the family, the higher the financial burden.

Several implications can be derived from our study. First, as our study provided preliminary findings at the early stage of national partial lockdown in Vietnam, it is critically necessary to have a comprehensive assessment on the effect of COVID-19 among different subjects in the next periods which can inform the government on policies for easing economic pain of the most affected populations. Second, public health interventions, especially mental health programs, should be implemented to address the psychological impacts of this pandemic on the quality of life of the general population. Finally, the evidence from our study can contribute to the development of more effective preparedness and response strategies to diminish the impact of future pandemics in Vietnam and other low- and middle-income countries.

The interpretations of the findings from our study should consider the following limitations. Since the authors did not collect the information on how many people the respondents have invited to participate in this survey, and it is possible that several individuals may invite the same person, we were not able to know exactly the number of people actually invited and the response rate in this online survey. The nature of the cross-sectional study restricts the ability to draw the causal relationship between the change in household income, quality of life, and their associated factors. The online survey could be seen as one of the best methods to collect data from a large sample size with low cost and time-saving, however, the disadvantages of this approach are possible bias of self-report and high homogeneity of data as no strict supervision is performed. Another consideration is the small sample size, which limits the generalizability for the other populations. Despite the above restraints, our research has some strengths that should be acknowledged. In the context of the national lockdown to be implemented for the first time

in Vietnam, this paper provided up-to-the-minute evidence for the Vietnamese government and other low-resource settings to develop timely strategies to minimize the impact of COVID-19 pandemic on socioeconomic status and well-being of their citizens. Moreover, utilizing standard tools (EQ-5D, EQ-VAS) to measure the quality of life of people has increased the validity of this study.

In conclusion, this study depicted a high rate of household income loss as well as impairment on some quality of life domains among the general population in Vietnam due to the impact of COVID-19. It is critically necessary to have a comprehensive assessment of the effect of COVID-19 among different subjects in the next periods, which can inform the government to impose suitable policies for easing economic pain of the most affected populations. Public health interventions, especially mental health programs, should be implemented to address the psychological impacts of this pandemic on the quality of life of citizens.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institutional Review Board of Institute for Preventive Medicine and Public Health, Hanoi Medical University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

BT, HN, HL, and RH: conceptualization. TN, QP, NT, and QN: data curation. HP, HN, and LV: formal analysis. BT, HN, CL, and CH: methodology. HL and XL: supervision. BT, CL, and RH: validation. BT, HN, HP, and LV: writing – original draft. HL, CL, XL, TN, QP, NT, QN, CH, and RH: writing – review and editing. All authors have read and approved the final version of the manuscript.

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Life or Livelihood? Mental Health Concerns for Quarantine Hotel Workers During the COVID-19 Pandemic

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INTRODUCTION

A novel coronavirus pneumonia, known as COVID-19 (coronavirus disease 2019), spread rapidly around the globe. The worldwide outbreak of pandemic had apprehended more than half of the population of the world that has caused immense damage to human health and economic and social life (Fareed et al., 2020; Shehzad et al., 2020). It paused the majority of global economic activities, causing major impacts on most industries, particularly the hospitality and leisure industry. As a result, hotels, viewed as a declining industry, have suffered a staggering drop in average occupancy (ATOMIZE, 2020). It is not only hotels in Western countries affected (Djeebet, 2020), the Chinese hotel industry has also been negatively impacted by the COVID-19 outbreak (Zhang et al., 2020). A major dilemma is the financial burden of keeping the hotel open vs. many people losing their jobs if it closes. With such severe impacts, the hospitality industry must learn to function in a new way.

With positive cases of COVID-19 escalating, hospitals face problems with overcrowding and insufficient isolation space (Feng and Cheng, 2020). In addition, there is increasing worry from frontline health care workers about contracting the virus and contaminating loved ones (Rosemberg, 2020). A quarantine hotel is one possible solution to address both these issues. In addition, as the COVID-19 pandemic continues, more countries require both citizens and foreign visitors arriving from abroad to enter a mandatory 14-day quarantine period within centralized observation centers or at home. Because of the shortage of quarantine infrastructure, some hotels have been commandeered by governments to be quarantine hotels.

Providing quarantine space is a smart business move for the hospitality industry. Quarantine packages will not only assist individuals (e.g., health care workers) but will also provide some economic relief for the hospitality industry (Rosemberg, 2020). Many hotels are now considering offering quarantine packages, and some have already been put in place in Austria, China, Malaysia, New Zealand, Taiwan, and the United States.

During the COVID-19 pandemic, the hospitality industry and those who make a living within it will face unprecedented changes. The resulting economic stress, isolation, and uncertainty can quickly take a toll on their physical and mental health. When a hotel transforms into the quarantine hotel, employees must decide whether to continue to earn a living while risking their lives or to walk away. It is a very difficult choice for quarantine hotel employees.

There have been numerous articles written in recent months regarding mental health care from a medical perspective (e.g., health care workers) during the COVID-19 pandemic (e.g., Kang et al., 2020; Walton et al., 2020). However, to date, it is difficult to find relevant literature or empirical studies exploring quarantine hotel employees' mental health and coping strategies. This article

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is more concerned about the new working situation, conditions, and mental health considerations for quarantine hotel staff during the COVID-19 pandemic. The aims of this research are 2-fold: first, to demonstrate the specific changes to roles and workload for the quarantine hotel employees; and second, to protect the quarantine hotel employees' mental health and provide recommendations for hoteliers in order to support their staff.

PHYSICAL CHANGES OF THE QUARANTINE HOTELS

The quarantine hotel must provide the basic amenities for centralized observation during the period of mandatory quarantine, good living conditions, and independent rooms. As a quarantine hotel in China, the workload now includes following an operation guide, complying with antiepidemic and disinfection standards, and implementing quarantine services, as follows:

Antiepidemic Check-In and Check-Out Guide

(1) Receptionists are required to wear personal protective equipment (PPE), including surgical masks, latex gloves, disposable gowns, caps, and eye protection.
(2) Check-in and check-out counters should be in different areas of the hotel to minimize the risk of infection.
(3) Temperatures of new guests must be taken before they enter the lobby.
(4) A receptionist distributes masks, gloves, and thermometers at a different counter. They also need to provide and explain an information sheet about COVID-19.

Disinfection and Cleaning Guide

(1) Cleaners must wear PPE.
(2) All potentially contaminated surfaces, including elevators, rooms, passages, lobbies, reception desks, public toilets, hotel entrances and exits, door handles, and any other public facilities, should be disinfected using household bleach at least three times a day and recorded.
(3) Wet disinfecting foot pads should be installed at lobby and elevator entrances.
(4) Emphasis should be on strict cleaning and disinfection of air conditioning or fresh air systems, water supply, and drainage equipment.

Implementing Quarantine Services

(1) Check and record the quarantine guests' body temperatures daily.
(2) Three meals a day are provided using disposable lunch boxes on a trolley outside guest rooms to avoid contact with quarantine guests.
(3) Guest rooms must be fully cleaned and disinfected prior to quarantine guests' check-in or after check-out.
(4) Guest rooms and public areas should have classified bins for collection of wet and dry garbage. The cleaners disinfect, collect, sort, and record the garbage outside the rooms every day.

PSYCHOLOGICAL EXPERIENCES OF THE QUARANTINE HOTEL STAFF

Although quarantine hotels provide quarantine space for exposed individuals, providing beneficial assistance to the public during this crisis is also likely to yield some financial relief (Rosemberg, 2020). However, the challenge for quarantine hotel staff is not only the increasing workload created by the quarantine hotel operation but also high psychological stress associated with job insecurity, risk of exposure, and contagion for themselves, their friends, and families.

The quarantine hotel employee hosts those who need quarantine infrastructure, medical staff, first responders, and/or hospital patients not suffering from COVID-19 with new and frequently changing protocols and PPE. Communication with quarantine guests during check-in and check-out is made more complicated by PPE, which covers most of the face, while quarantine hotel cleaners' duties have increased by the necessary disinfection of rooms and hotel areas, also with PPE. As the main route of transmission is from respiratory droplets and direct contact with quarantine guests, quarantine hotel staff face a higher risk of infection. Thus, it is important to keep the health and safety of quarantine hotel employees, particularly the cleaners, at the center of operations. These changes may cause quarantine hotel staff to be distressed and/or feel vulnerable. Consequently, this can cause negative impacts to their mental health, which quarantine hoteliers need to aim to mitigate.

WHAT CAN QUARANTINE HOTELIERS DO FOR STAFF?

Employers have a duty to protect the health and safety of their workers. Although temporary quarantine hotels slightly relieve financial pressures caused by the COVID-19 outbreak and contribute to corporate social responsibility (CSR) worldwide, it is possible that quarantine hotel employees are at a greater risk of adverse mental health outcomes owing to physical fatigue, risk of infection, and shortages of PPE.

Because of the increased risk of adverse mental health of staff, the quarantine hoteliers need to support the employees' mental health needs during the quarantine hotel period of operation. In this setting, it is suggested that quarantine hoteliers should develop short- and long-term mental health assistance programs for employees based on the following recommendations.

Adequate Training

Proper training is essential during and after the COVID-19 pandemic and is viewed as a protective factor against mental health issues (Brooks et al., 2018). Training helps educate employees about necessary behaviors and their importance in preventing the spread of the virus (Hamouche, 2020), for example, training staff in various COVID-19 protective measures including causes, transmission types, symptoms, cleaning, and

disinfection safety procedures. It is therefore recommended that hoteliers implement co-development programs to train their employees in preparation for the impact of COVID-19 in the workplace.

Open Communication Pathway

During the COVID-19 pandemic, communication is crucial in order to reduce the quarantine hotel employees' uncertainty and stress levels (Hamouche, 2020). In this context, it is recommended that hoteliers develop a communication plan to provide employees with clear information about what will happen during the COVID-19 pandemic, for example, daily updates of pandemic information and the quarantine guests' status, what major actions will be taken to operate the hotel, and the potential impact of these actions on the employees' workloads. Furthermore, they should build a two-way communication platform that encourages staff to express their needs and concerns, as this is one of the most useful resources to promote resilience in quarantine hotel employees. Strategies to improve their mental health will inspire staff to believe they are part of a working family, and together they can overcome the challenges presented by the COVID-19 pandemic now and in the future.

Building a Resilience Model

In the stressful working atmosphere of COVID-19, arousing a positive working environment is compulsory. Quarantine hoteliers can build a resilience model by encouraging supportive interactions between workers via bulletin boards and online and highlight their sense of honor and pride for continuing to work in a high-risk situation. These are significant environmental protective factors of resilience, as they are strongly related to mental health and considered essential components of successful psychosocial adjustment (Shastri, 2013). The more employees who engage with and benefit from the resilience model, the more the working atmosphere will be improved.

Promoting Organizational Support

Some studies have suggested that inadequate psychological support from employers is a risk factor for their mental health (Brooks et al., 2018; Hamouche, 2020). Employees who have high perceptions of organizational support are less likely to experience long-term physical and psychological health problems, such as depression and anxiety (e.g., Liu et al., 2015; Lei and Chen, 2020). In order to mitigate the potential negative impact of quarantine, fear of infection, and uncertainty on employees, hoteliers need to create a supportive environment in the workplace, for example, using online surveys to assess the scope of mental health problems and to observe the staffs' psychological status. Once mental health symptoms are identified, rapid access to psychological assistance and contingency for time off work should be provided. In addition, employee assistance programs, such as developing online materials for mental health education and counseling, etc., can provide psychosocial support (Liu et al., 2020). The quarantine hotelier can also implement additional benefits and practical support strategies, such as reducing workloads or hours, as well as increasing remuneration.

DISCUSSION

During the COVID-19 pandemic, the hotel industry faces unprecedented changes. This article is concerned with the risks to quarantine hotel employees' mental health and aims to suggest that quarantine hoteliers develop coping strategies to minimize the negative impact of COVID-19 on their employees' mental health.

To echo the prior study of Qiu et al. (2020), we suggest quarantine hoteliers provide counseling services for psychological first aid through telemedicine for their staff. It also encourages offering the communication pathways for hotel employees of clear communication with a regular update about COVID-19. Further, parallel to the views of Hamouche (2020), to develop the urgent timely mental health care team to offer regular screening psychological anxiety and depression should be performed for patients, as well as quarantine hotel workers. Having the effective preventive mental health measures in the workplace will help to reduce staffs' level of stress. The quarantine hoteliers have the responsibility to protect their staff and to ensure a workplace free from hazards that may harm employees or cause their death.

Faced with this epidemiological catastrophe, the world is still fighting to control the pandemic. It is necessary to understand the influence of the antecedents from the perspective of the quarantine hotel workers' mental health, especially the need to be empirically explored further in future studies, for instance, whether the hotel employees' knowledge of the pandemic is adequate and what kind of effective strategies, such as providing a communication pathway and counseling service, can relieve their fear and perception of the severity of COVID-19. Through understanding the protective and risk factors of working in the quarantine hotel, policy makers and hoteliers will be able to build a holistic practical and theoretical model to support the hotel employees' mental health and behaviors during the global emergent public health crisis.

IMPLICATIONS

The basic of hotel service quality depends on the performance of the staff that provides enthusiasm and courtesy service to customers. The staff is a significant asset and treasure of the hotel industry. In fact, the hospitality industry is accepted to be highly stressful environments because of long working hours and night shifts and weekend shifts parameter. During the COVID-19 pandemic, the mental health concern of the quarantine staff who has faced unprecedented changes is undoubtedly necessary. As a significant role of the lodging industry, protecting the staff's mental health has become an urgent task for the hoteliers. To take care of the mental health of these quarantine staff is a critical part of the public health response and also a positive CSR way. While

this study drives the quarantine hoteliers' concern about the staffs' mental health in the short term, researchers need to explore and discover effective care strategies of staff mental health, which will bring beneficial CSR to their employees for long.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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REVIEW
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Getting Through COVID-19: The Pandemic's Impact on the Psychology of Sustainability, Quality of Life, and the Global Economy – A Systematic Review

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The COVID-19 pandemic may affect the world severely in terms of quality of life, political, environmental, and economic sustainable development, and the global economy. Its impact is attested to by the number of research studies on it. The main aim of this study is to evaluate the impact of COVID-19 on the psychology of sustainability (quality of life), on sustainable development, and on the global economy. A computerized literature search was performed, and journal articles from authentic sources were extracted, including MEDLINE (PubMed), Google Scholar, Science Direct, ProQuest, and Emerald Insight. The references in selected articles were screened to identify any relevant studies. The following inclusion criteria were followed: research articles based on the COVID-19 pandemic, and articles, research papers, journals, and news articles published 2010 to 2020. The exclusion criteria were as follow: psychology research, articles, and journals published before 2010 and research articles having no link with the current pandemic's impact on the psychology of sustainability, quality of life, and the global economy. Of the initial 350 articles identified, only 61 studies were found to be relevant and meet the inclusion criteria. Based on these articles, the review highlights that compared to developed countries, the developing nations and poor nations such as African countries with compromised health structures have been greatly affected. There are close associations between health, economic, environmental, and political issues globally. The pandemic can be managed if we follow new policies that implement economic and public health changes worldwide. A planned, coordinated approach between the public-private sector is required, designed according to each country's health system and economy. We can come out of this crisis if we work together and support both developed and developing nations.

Keywords: coronavirus disease, COVID-19, the psychology of sustainability, economic growth, sustainable development, quality of life, world economy

INTRODUCTION

There is a high rate of uncertainty related to COVID-19, whose pandemic impacts economic performance, sustainability criteria, and development processes. Haider et al. (2020) mention the effect of coronavirus on health and economic crises. Analysis of its growth in countries, clearly shows that its development leads to crises. Declining GDP rates damage health, education, and industrial progress globally. According to Herbert (2020), COVID-19 affects socio-economic circumstances because of declining global GDP, declining capital flows, fewer investment opportunities, and decreased trading. Not limited to economic loss, this pandemic impacts social parameters like the changes in sustainable psychological development. Globally, the rate of poverty is increasing. The International Monetary Fund (IMF) World Economic Update for June estimated considerable fluctuation in the final ratios (IMF, 2020).

More than 20 million people currently live in extreme poverty; however, Mukhtar (2020) reports that an increase of about 420 million is projected to be living in extreme poverty. Findings gathered by the United Nations Industrial Development Organization (UNIDO) reflect that COVID-19 has resulted in a severe decline in human development for the first time since 1990 (Zandifar and Badrfam, 2020). Their examination reveals that the current global picture lacks socio-economic development. These issues and challenges directly affect an individual's psychology and assure them of a loss of psychological sustainability and the addition of financial crises. Specifically, with many risks affecting the public, cases of mental crises are increasing (Kang et al., 2019). As a result of people being restricted to their homes and being asked to maintain self-isolation, there is a high chance of someone being severely affected psychologically, which is further impacted by the lack of accurate guidelines or treatment.

When no resources are provided to manage people's well-being, the situation, including pandemic prevention measures, is reframed and affects psychological health. Concerning the impact on sustainable psychology, Bai et al. (2020) discuss the importance of improved mental health because it affects individual growth and counters restricted personal activities. The authorities' actions and management criteria for regulating the pandemic are beyond people's control but adversely impact their exercising, eating habits, gardening, dancing, meditation, learning, and other activities. As a result, people perceive the negative impact on their minds, and the sustainability of their psychological health is damaged (Yao et al., 2020). In the view of Li et al. (2020), COVID-19 impacts the quality of life and mental health as it prejudices human living standards. The joint United Nations Program on HIV/AIDS (UNAIDS, 2020) notes that this pandemic increases the numbers of people suffering from stress and anxiety, conditions that are related to depression. Thus, it is essential to conduct a study to evaluate the impact of COVID-19 from the perspective of quality of life and economic, psychological, and environmental perspectives.

Several research studies have highlighted the severe impact of the COVID-19 pandemic. It is worth noting that the 2013 SARS outbreak experienced in Hong Kong damaged mental health (Fernandes, 2020), but, specific to COVID-19, there are diverse effects on mental health following the imposition of preventive measures. Social distancing, self-isolation, limited meetings, and lack of interaction directly decelerate the economy and mental health. Many countries face declining projected global trade and export volumes. In the view of Allcott et al. (2020), psychological sustainability involves the merger of political perspectives, human development, and economic aspects, and COVID-19 has had an impact on all three. Fetzer et al. (2020) discuss the pandemic's impact on the global economy as self-isolation results in loss of business revenue. Restrictions on consumers being able to purchase ultimately result in an economic downturn. Apart from this, stresses are being constantly imposed on people worldwide that negatively affect their minds and decrease economic activity (Iacus et al., 2020). COVID-19's considerable impact has emotionally traumatized individuals; the handling of the situation has reduced their level of comfort, socially, economically, and environmentally, according to Cartwright et al. (2020). The amalgamation of these factors triggers a high level of stress in people's minds, which, meanwhile, affects economic development, as it ruins efforts for developmental projects (Pirouz et al., 2020).

We have faced several epidemics in the past. Asian nations were impacted by the Middle East Respiratory Syndrome (MERS outbreak), and West Africa was under the attack by the Ebola virus. They also influenced the socio-economic equilibrium, affected public health, and caused numerous deaths similar to what we are facing with COVID-19 (Marin, 2018; Lawanson and Evans, 2019). The pandemic has affected all types of businesses. There are shortages of medical equipment such as masks and Personal Protection Equipment (PPE), etc. It has made us realize how fragile our systems are and that no country can face this crisis on its own. A targeted and collaborative approach is required.

The main aim of this current research is to evaluate the impact of the COVID-19 pandemic on the sustainability of the quality of life, i.e., how people are tending toward stress, anxiety, depression, and other health/mental issues. Not limited to this alone, the study discusses the pandemic's impact on sustainable development psychologically and economically. Given that changes in psychological sustainability link with people's living style, and how they deal with their life situations, there is a need to conduct a study in this direction. Currently, there are reports and research articles that separately discuss the impact of COVID-19's rapid spread on the health system, mental health, sustainability, and the global economy (Allcott et al., 2020; Banerjee, 2020; Pirouz et al., 2020). Research related to the pandemic's simultaneous effects on the psychological, economic, and environmental paradigms is required. That is why this study explores information about and human experiences that influence their quality of life psychologically, economically, and environmentally.

Due to the pandemic, trade has also been largely affected. The impact of this chaos will have a long-term effect on globalization. All private and public sectors are under its influence (Donald, 2020). Previously, all large companies had goals focused only on financial gain. However, now the level of interconnected trade has lost its meaning. There has been an unequal distribution of the benefits associated with globalization (Roome, 2011).

The more powerful governments and those who own major conglomerations should realize that unless we work together, the overall quality of life will be compromised globally. Working culture and environment and the worker's s policies should be looked into to obtain a flexible, innovative, and empathetic workplace for everyone to deal with this crisis.

Therefore, the aim of this research report is to:

- Analyze the impact of the COVID-19 pandemic on the sustainability of quality of life
- Determine the effect of the COVID-19 on the economic, social, and political factors relating to the sustainable development environment
- Evaluate the impact of the COVID-19 pandemic on the global economy
- Examine the organizational changes and solutions for dealing with the COVID-19 pandemic, and
- Highlight the effect of support of the world trade environmental infrastructure in tackling the condition of COVID-19.

METHODOLOGY

Study Design

All the guidelines and principles were followed while preparing the methodology for this research. A thorough literature search was conducted, and after proper evaluation and analysis, relevant literature was identified and included for the present review.

To accomplish the desired objectives, all the studies related to the topic published from Jan 2010 to June 2020 were selected. It was assumed that including some publications of the previous decade would be helpful in reflecting upon the practices and strategies that were implemented in situations previously like the global economic recession A computerized literature search was performed and journal articles from authentic sources were extracted, including MEDLINE (PubMed), Google Scholar, Science Direct, ProQuest, and Emerald Insight. The References in the selected articles were screened to identify any relevant studies. The literature search was performed by including the following keywords: "Coronavirus" OR "pandemic" OR "SARS-CoV-2" OR "COVID-19" OR "sustainability" OR "quality of life" OR "Global economy" OR "psychology and Organizational changes and COVID-19."

Inclusion and Exclusion Criteria

The inclusion criteria were: research articles based on the COVID-19 pandemic and articles, research papers, journals, and news articles published from 2010 to 2020; articles on sustainability management related to virus pandemic. The exclusion criteria were: psychology research, articles, and journals published before 2010; research articles having no link with the current pandemic's impact on the psychology of sustainability, quality of life, and the global economy and additionally, articles that were in languages other than English. The process of retrieving and screening the studies according to these criteria in this systematic review is shown in **Figure 1**. After an initial search, a total of 265 articles were identified in MEDLINE (PubMed), and 85 through other databases. After removing the duplicate records, 272 titles and abstracts were screened. Finally, only 61 studies were found to be relevant and meet the inclusion criteria.

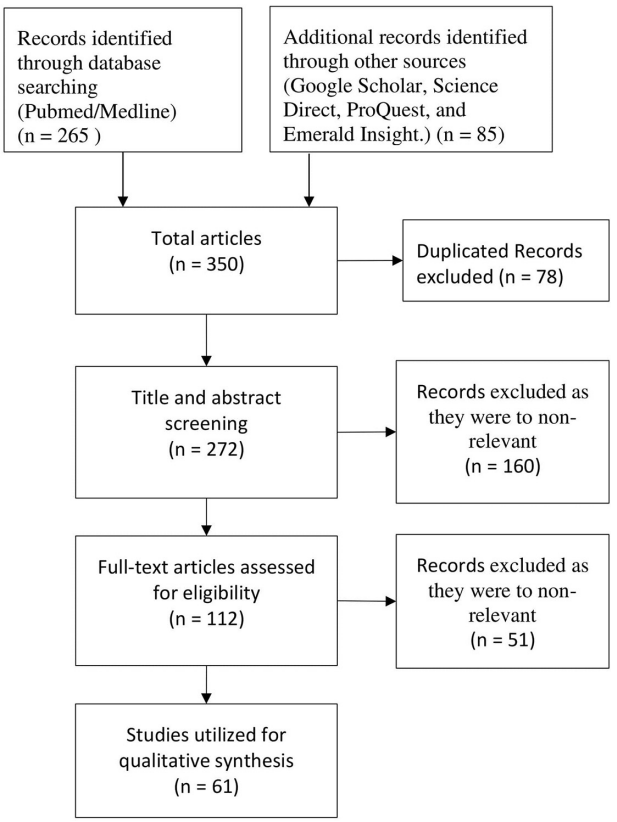

FIGURE 1 | Flow diagram illustrating the literature search and selection criteria (according to PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analysis; Moher et al., 2009).

LITERATURE REVIEW

Psychology of Sustainability

According to Chandler (2020), the psychology of sustainability and the criteria for relative development are associated with socio-economic progress, leading to improved living standards. The study by Srivastava et al. (2020) proposed that the management of sustainability relates to ecology, equity, and economy. Meanwhile, Cartwright et al. (2020) observed that COVID-19 affects the quality of life as overall economic, ecological, and equity conditions have changed. According to Bastola et al. (2020), psychological and sustainability factors contribute to well-being and allow psychological development. Recycling, dismantling, and demolishing factors are affected by sustainability. The psychology of sustainability also relates to deconstruction, recoverability, and oxygenation (Iacus et al., 2020). Using the micro-dimension of awareness creates an

opportunity to increase awareness that ultimately enables involvement in self-centered development criteria.

Impact of Coronavirus Disease on the Psychology of Sustainability and Quality of Life

Political, environmental, and economic aspects collectively determine sustainable development psychologically (Bowen et al., 2017). These aspects also determine how humans should spend their current lives so that the same quality of life can be transferred to and enjoyed by future generations. According to Garfin et al. (2020), minimal changes in human life slowly alter the future, but future generations will not perceive their lives as the outcome of change; they will think that people before them have led their lives in similar ways. World Wars and pandemics have impacted our present lives. Moreover, the COVID-19 pandemic has dramatically impacted the political, environmental, and economic aspects of human life on which psychological development and sustainability are dependent. This ultimately affects the quality of life by disturbing people's living standards. The outbreak of COVID-19 in early 2020 has agitated social problems and threatened the economies of the world (Nicola et al., 2020). According to Arden and Chilcot (2020), growth and development in different countries have stopped. The financial stability of both developed and undeveloped countries has been shattered as the pandemic has targeted many lives. Human beings are highly dependent on socialization. Because social distancing and lockdown are necessary precautions for avoiding COVID-19, the resultant increased stress and depression directly lessens the quality of life (Balasubramanian, 2020). Most people around the globe are losing their jobs, i.e., their income. Profit margins and revenue generated by various organizations have dropped. To save the economy and their citizens' psychological health from the pandemic, many countries have developed strategies, but years of struggle will be required to regain economic stability.

Moreover, the COVID-19 pandemic and the associated crises have traumatized people's psychological well-being, especially employees who have lost their jobs. The well-being of employees working from home is compromised as the gap between their professional and personal lives has reduced (Pratt and Frost, 2020). The situation has stressed employees and has led to an uncomfortable and aggressive relationship with the organization, which has directly, or indirectly ruined their psychological sustainability on a macro level. According to Mahase (2020), the world before and after this pandemic will never be the same as people have isolated themselves, millions of lives have already gone, and the global economy has slowed exponentially. COVID-19 has imposed the harsh realities of unemployment, illness, and bereavement on people, and long-lasting hardships and struggles are required to mitigate the situation's negative impact. Coronavirus has substantially impacted people's psychology and has created an extensive psychological experiment on human beings, which will eventually change the overall lifestyle of current and future generations.

Knowing that the condition of the current pandemic has diverse effects on psychological sustainability, disturbs the quality of life, and restricts people to having to deal with preventive measures. However, according to Di Fabio (2017), the management of the psychology of sustainability helps to foster well-being and enhance working conditions within society. There are changes in behavior in which most people are suffering from stress, anxiety, and fatigue (Wang et al., 2020). The full lockdown restriction of staying in the home negatively impacts on human living standards. Professional examination reveals that increasing cases related to post-traumatic stress, nutritional deficiencies, and psychological issues have been reported. Oher psychological impacts of COVID-19 include a growing fear of leaving home.

Impact of Coronavirus Disease on Sustainable Development

Impact of Coronavirus Disease on Economic Conditions

The interdependency of overall prosperity and integrity of health emphasizes human dependence on the state of the economy. Econometric analysis of the world's economic growth rate shows that the current pandemic has led to widespread health crises and economic damage. According to Haider et al. (2020), the economic situation depends on the GDP rate helping to affect economic recovery measures. Global economic crises due to COVID-19 reveal economic decline. Moreover, the report by Allcott et al. (2020) highlights the declining economy related to fluctuations in GDP rates. In the current scenario, the GDP rate has shrunk by approximately 4.2%, the first time for a pandemic (Fetzer et al., 2020). Another report estimated that a difference of 7% is projected in the coming period if the same conditions continue (IMF Blog, 2020). Additionally, there will be a considerable number of further crises if the IMF faces losses. The overall rates of advanced economies like those of Europe and America have declined the same as emerging economies (Kang et al., 2019).

COVID-19 impacts global trade and investment. In Fernandes' view (2020), changing global trading volumes can be observed, and all industries are eventually affected by the pandemic. The World Trade Organization (WTO) supports this view (WTO.org, 2020). Its graphs represent the changes in the average value of trade, which includes a contribution by the IMF to change the economic outlook, which, in turn, relates to growing global poverty and declining living standards (Bastola et al., 2020). GDP growth projections make it apparent that living standards are heading to extreme poverty at an increased rate. Subsequently, this negatively affects the economy, as it leads to economic crises.

Chandler (2020) reports that COVID-19 has impacted labor by 68% in just 2 weeks, which signifies the loss of many jobs and directly increases stress levels. The highest unemployment rates are in Asia, Europe, and America. In Asia and the Pacific regions, unemployment rates have headed toward a decrease of 4.5%. In America, Europe, and Central Asia, it is 10.5%. Apart from this, fluctuations in trading sectors have led to a decline in manufacturing, textile, cosmetics, and many more industries. According to Iacus et al. (2020), COVID-19 has enormously impacted the income ratios in developed and developing

countries. A shift in fiscal policy packages has been assessed across 162 countries. It was distributed as Austria (∼17.80% of GDP), France (∼15.30% of GDP), Qatar (∼13.00% of GDP), United States (∼10.50% of GDP), and Australia (∼9.70% of GDP). Monetary stimulus packages across these 162 countries were distributed as Bahrain (26% of GDP), China (14.14% of GDP), Germany (12.49% of GDP), and the United Kingdom 9.09% of GDP; Sarkodie and Owusu, 2020).

Impact of Coronavirus Disease on Environmental Issues

Along with the impact of COVID-19 on economic conditions, there is an environmental impact, which Cartwright et al. (2020) discuss. The COVID-19 situation impacts global emissions, especially in relation to the release of emissions into the atmosphere. The lessening of CO_2 emissions relates to the effect of COVID-19 on human development, which in the view of Bastola et al. (2020), led to the 2020 financial crisis. The restrictions on human development and declining rates of change evolved along with the loss of environmental degradation. It was observed that in Asian and European countries, the extent of the ambient particulate matter has declined significantly (Gautam and Trivedi, 2020; Kasha, 2020). Urban and industrial areas have less carbon monoxide and aerosol in the present situation (Gautam and Trivedi, 2020; Holthaus, 2020). These environmental gains mirror the losses in the fields of health, education, income, and trade (Bai et al., 2020).

Impact of Coronavirus Disease on Political Issues

The coronavirus's impact can be observed politically when lockdown and self-isolation result in reduced export and import rates. In the current situation, it is difficult to carry out activities designed to run the economic wheel (Haider et al., 2020). Furthermore, there has been a considerable shift in the policies and strategies related to economic policies. On the industrial level, there has been a decline in line with industrial restriction. Even though support is being provided for business opportunities to deal with the COVID-19 pandemic, there are still restrictions on mobilizing current development. According to Bastola et al. (2020), political parties have provided funds and highlighted financial support to ensure people's survival during COVID-19. Moreover, the impact of lockdown, isolation, and rescheduling, as well as the spread and fear of the virus, have resulted in new political perceptions.

Impact of Coronavirus Disease on the Global Economy

According to Moti and Ter Goon (2020), global economic integration is required to deal with the implications of the coronavirus pandemic. A balanced partnership between the public-private sector, which takes into account the contextual economy and health system, and is specific to each country's situation, will help national as well as international health and economic recovery. The world's total GDP depends on the economies of separate countries; China's economy is the largest contributing economy, and the United States's, the second largest. Due to COVID-19, most factories are moving toward closure and stopping the production of goods. This lack of production of goods and services has a great impact on the consumers, and no significant purchasing practices have been recorded since the spread of COVID-19. In the same context, declining sales are forcing the international market to face the situation. Brands like Apple, Toyota, Jaguar, Land Rover, and many more are facing the loss of investors and consumers (Ahmad et al., 2020). According to Qiu et al. (2020), Hyundai has shut down its business services and supply operations due to a lack of consumer purchases. Starbucks has shut outlets as consumers cannot purchase. A reduction in the import rate of oil by China resulted in a decline in international oil prices. Multiple uncertainties have been observed in the consumption of smartphones as both demand and supplies are worsening. The car production company, S&P, has faced declining purchases (Ahmad et al., 2020). The aftermath of COVID-19 will thus impact the global economy. According to an IMF report (IMF, 2020), the issues related to the current pandemic will restrict the global economy. Overall sustainable development criteria are expected to collapse. The distribution of economic policy globally in response to COVID-19 was conducted across 166 countries. It demonstrated that the United States is at the top, followed by Sweden. There are few countries with no economic policy such as Kazakhstan, Ukraine, Yemen, Liberia, and Denmark (Sarkodie and Owusu, 2020).

Organizational Survival Envisioned by Human Resources During the Pandemic

During the outbreak of the coronavirus, management styles need to be changed to tackle operations and reduce the chances of a crisis, according to Ågerfalk et al. (2020). This includes consideration of online management, as online networks can help organizations survive. In Donald's view (2020), there are two major types of organizational arrangements: traditional and a new post-pandemic system. The traditional structure (pre-pandemic model) has existed during the past five or six decades. However, its demerits were clearly evident during this pandemic. It lacks clarity when defining roles and responsibilities. There is a disparity in outcome attainment, and system working-conditions are less efficient. Although power allocation is part of the matrix structure, in a crisis, it can lead to instability and loss of control (Roome, 2011), resulting in an inadequate organizational structure. The new-age model (post-pandemic) focuses on the innovation, knowledge, and better required skillsets (Guan and Huang, 2014). Organizations that are quickly adaptive build creativity and possess a sharing attitude will be in a better situation to manage its employees post-pandemic. The old models based on power and control need to shift to a more open, flexible, and modernized culture.

In the current situation, typical hierarchical organizations will not result in better outcomes as the approach to allocate power and authority to a specific group will restrict working conditions. Human resources (HR) has envisioned a new model, using distributed leadership, innovation, and continuous training to adapt to the changing times (Hu, 2014) to obtain effective results. According to McConnell's (2020) study, organizations

with networked, hierarchical, distributed leadership styles, cross-training practices, and flexible guidelines using survival techniques to tackle COVID-19 conditions.

Support of World Trade Environmental Infrastructure to Tackle COVID-19

The impact of COVID-19 is not limited to sustainable development, as there are challenges associated with global trade management. According to the United Nations Environment Program (United Nations Environment Programme [UNEP], 2020), trade is essential for saving livelihoods and increasing economic cooperation. Whether it is related to COVID-19 or typical situations, trade infrastructure boosts the confidence level of operations and allows improvement of the transparency of environmental trade infrastructure (Deshmukh and Haleem, 2020). Other than this, multiple actions and procedures need to be followed for the management of the COVID-19 situation (Hishan et al., 2020). With support from world trade's environment infrastructure, there is an opportunity to supply food and health products. This may help organizations to avoid unnecessary export and import practices. Development in world trade's environmental infrastructure helps ensure public interest and government support to effectively analyze the development choices. Gilbert et al. (2020) confirm the importance of world trade environmental infrastructure to boost the confidence level and increase the transparency of economies. Deshmukh and Haleem (2020) consider that the transparency of shared strong data or collections of information contributes to supporting the managed infrastructure required for COVID-19.

When West Africa suffered from a massive outbreak of the Ebola virus, it led to a high death rate and affected the country at numerous levels (Smith et al., 2019). Socio-economic disparity, slow growth rates, shortage of food, and loss of businesses and jobs resulted. We are facing a similar situation presently, which demands that the health, economic, and environmental policies should be modified so we can recover from this crisis and collaborate in the future efficiently (Smith et al., 2019).

RESEARCH FINDINGS

The analysis helped to evaluate the impact of COVID-19 on the psychology of sustainability, quality of life, and the global economy. In the initial search, we found 350 articles, including 78 duplicate articles. After title and abstract screening, we were left with 272 articles. Of these, 112 were assessed for eligibility, and only 61 met the inclusion criteria. After extraction, the relevant articles were categorized into the following subheadings to provide a clear description: the author and year of the published article; the assessment of the key findings due to COVID-19; the present implications caused by the pandemic, and future perspective that will help in the recovery from this crisis situation. See **Table 1**. The focus of this work is to review the research work published specifically in response to COVID-19. It is interesting to observe that the majority of the studies were from 2019 to 2020. This is justified as the pandemic occurred in very recent times. Hence the research mainly highlighted its current impact globally and the lessons learned from current scenarios. Among these, the majority are review articles, and only a few of them were randomized and controlled clinical trials, which assessed the economic, environmental, health, and sustainability impacts.

COVID-19 caused greater chaos than previous pandemics. It is represented in all the studies: the global spread, its implications, and how it has ruined all sectors, small and large. Even though the assessment of various factors has been done in the studies, clear, conclusive steps to be followed are not included in many of them. The research has shown that developing countries are in a far worse situation in managing their health systems and economy than developed countries. Additionally, people of the rural areas, the elderly, women, and children are undergoing major stresses and life changes due to the pandemic. Even though air pollution has decreased tremendously in all countries, post-pandemic there will be piles of medical waste, which will impact the entire environment. These research projects show that the management and leadership systems based on power and control are not a sustainable option in the future. Long use of a lack of creativity, technological usage, and strict policies cannot be continued now.

Table 1 clearly shows that the pandemic has disrupted the balance among all the nations. Though the impact is mainly seen in the health sector and the economy, on a deeper level, everything is affected. There is the struggle of SMEs, social distancing norms, working from home, the new era of online teaching, the suffering of daily-wage workers, a crisis situation for the restaurants, hotels, and aviation department, changes in fiscal and monetary policies, the psychological impact on health professionals and health workers, and the extra workload on the sanitation department. In terms of analyzing the research findings of the included studies, it is very clear that the impact of the pandemic has been assessed by one or more of the factors (health, economy, environment, sustainability, or management). However, it is clear that a conclusive result based on the psychology of sustainability, overall well-being, and global economic implications is lacking. Thus, this has contributed to the goal of the present study: how can we learn from these challenges faced by humans globally?

DISCUSSION

Analysis of the impact of COVID-19 on the global economy highlights that various elements affect economic conditions. The study by Pirouz et al. (2020) observes that the current pandemic hurts GDP as it directly weakens a region's overall economy. This is supported by the view that the loss of consumer consumption affects the economy of regional economies, too (Fetzer et al., 2020). In other words, multiple socio-economic factors lessen the economic rate and decelerate the global economy.

The collected data also discusses the impact of COVID-19 on psychological sustainability. The information gathered revealed that humans experience an increasing rate of uncertainty when stress, anxiety, and depression are continually increasing (UNAIDS, 2020). According to Zandifar and Badrfam (2020), there are various ways by which COVID-19 can affect sustainable development psychologically. Evaluation of elements related to

TABLE 1 | Impact of COVID-19 and future perspective to improve health, economy, sustainability, and quality of life.

Author/Year	Assessment	Implications	Future perspective
Moti and Ter Goon, 2020	Impact on the health and the economy	As compared to the developed countries, the developing nations and poor nations such as African countries with a compromised health structure have been greatly affected.	New policies should be implemented that focus on economic recovery as there has been inflation for essential goods and services. Government should strategically execute revised norms to combat the pandemic. It should implement a mitigation policy and a post-pandemic policy. The mitigation policy should target the nation's health sector. It will include various new changes to deal with the pandemic such as defined containment measures, protection of health workers with additional benefits. Increased supply of the sanitizers and other Personal Protection Equipment (PPE). Regional opening of testing centers. Online education aimed at improving the awareness regarding the risks associated with COVID-19 and how to successfully manage them. The post-pandemic recovery policy will ensure that individual follow social distancing properly and also abide by the lockdown rules. For people to sustain they can be allowed to work for specific hours at offices, avoiding gatherings, etc. so that the businesses as well as the citizens are not at a loss.
Sarkodie and Owusu, 2020	Assessed impact on the environment, health and economy.	Air pollution has declined, however, the amount of medical waste has dramatically increased. Several fiscal measures, changes in the monetary policies and economy recovery have been shared by private sectors across numerous countries. Of 143 countries, United Kingdom ranks with the highest level of uncertainty in the assessment of pandemic uncertainty. Among 162 countries, United States has implemented the greatest policy cuts.	Due to the crisis, many developing and developed countries will face recession as they have introduced several new policies such as fiscal, and monetary measures, and additional welfare costs with health policies. This has impacted developing and weaker nations badly. To deal with the economic slowdown, these countries will adapt to a scaled effect. Priority will be given to resource depletion over the sustainable utilization Governments across all the nations should aim to achieve an outcome ensuring that health, economy and sustainable development are not compromised once we recover from the pandemic.
Berchin and de Andrade Guerra, 2020	Impact on sustainable development of all the sectors	COVID-19 has led to an increased demand of healthier and organic food making the various food systems susceptible. The impact of the pandemic is largely observed among women, children, elderly, wage workers, and small and medium enterprises (SMEs).	Several measures should be taken to achieve a balance among all sectors: Regional mobilization: Policies to ensure trade is continued and involves private firms to help small and medium enterprises. Global support to combat the risk associated with the cross-border transactions. Enhanced accessibility of technology: With the changing world and innovation occurring at a faster pace, technology should be provided in all the rural areas so people can access all kinds of information post-pandemic. Revised Policy: Policies to strengthen the overall system and not only focus solely on financial growth. Education: Encourage use of technologies and distance learning irrespective of the region or nationality.

(Continued)

TABLE 1 | Continued

Author/Year	Assessment	Implications	Future perspective
Donald, 2020	Impact on management and leaders; business and the decision models	The design models of many organizations were based on the lack of creativity and flexibility, which were favorable 30 to 40 years ago. The importance of decision making, risk management, and involvement of stakeholders that worked previously needs modification in the present situation.	New organizational structures are required, based on innovation, confidence, risk taking attitude, and flexibility. In the newly-designed organizations there should be no restricted roles, responsibilities, or structure. Training should be conducted so everyone is adaptive and can modify their needs as per requirements.
Kottika et al., 2020	Impact on SMEs involving business and consumer markets	There has been economic breakdown in the growth of United States GDP as it decreased by 4.8% in the first quarter of 2020. In European nations, GDP shrunk by 3.8% in the same period	It is important to develop entrepreneurial personality traits as it is clearly shown that their attitude plays a significant role in the orientation of SMEs. A high quality of service should be provided to consumers following specific protocols that are open to change depending on the market situation.
Etemad, 2020	Impact on the quality of life, economy, as well as the organization of various institutions.	There has been a slowdown in the functioning of all sectors whether in a large or a small city, rural area or urban place. However, SMEs are the ones that have been impacted the most due to the pandemic.	The situation prior to the crisis should be assessed closely, and processes followed regarding entrepreneurial and internationalization perspectives. A review and reevaluation of sectors should be done to maximize financial support to those who cannot recover on their own.

sustainability reveals that associations of social, environmental, and economic factors lead to psychological sustainability practices. The collected data reveals the impact of COVID-19 on the psychology of sustainability. The current situation has a consistent impact on people's mind-sets. As a result, there is a need to adapt services to tackle mental health issues to allow people to survive with an improved quality of life (Li et al., 2020). With the declining economy, the contribution of COVID-19 can be observed in the global emission system. Labor can expect to decline in the future, and there is a high chance of an individual facing job loss. This overall situation leads to stress and restricts people in developing the economy sustainably (Chandler, 2020). These employment issues are also linked with psychological factors as they are the leading cause of stress and depression, and ultimately hurt the quality of life (Banerjee, 2020).

The collected data shows that HR departments are now changing working criteria and focusing on alternative working solutions for organizations. Allcott et al. (2020) observe that COVID-19 forces HR to shift management from close-ended to open-ended leadership styles. A dispersed workforce and its interdependency on loose criteria are considered necessary for organizational survival in the pandemic. Apart from this, HR prefers to adopt flexible guidelines and cross-training practices to provide practices and services to manage the pandemic's result. These sorts of instructions and guidelines help HR ensure the survival of an organization and save corporations from the calamities experienced by COVID-19 (Fernandes, 2020).

Similarly, most organizations are reacting in a managed manner to increase their productive outcomes. It has been clear that a declining projection rate is observed globally, and no improvement for the projected rates is expected (Pratt and Frost, 2020). According to a report published by WHO (WTO.org, 2020), a loss of capital flows and a decline in annual charges is decelerating economic conditions. Furthermore, there are also considerable COVID-19 effects in the form of losses faced by global trade and investment practices. Analysis of the impact of COVID-19 on the economy reveals that the world's economy is expected to face further decreases in volumes and global trade projections because the current situation is worsening day by day.

Along with this, there is an impact of COVID-19 politically, which results in reduced exports and imports. Politically, a high level of funds is required to support a country's regulation (Bowen et al., 2017). The spread of the virus endangers the overall sustainability of development. The situation during COVID-19 has been managed by the support of trade's environmental infrastructure as various macro-level elements help to ensure sustainable development. With the help of improved access to advanced technologies, it is anticipated that production processes can make development more efficient (Haider et al., 2020). There is a shortage in the supply of drugs and medicine for mental health issues. This, according to pharmacists, is a significant issue. It hinders the development of health services and makes it difficult for practitioners to improve their patients' quality of life (UNAIDS, 2020). There is an opportunity for support of world trade environmental infrastructure as this allows corporations to work with advanced

infrastructures and increased interest levels. Moreover, world trade support systems may enhance the efficient supply of food and medicines. With this, there is a clear avoidance of import and export practices without advanced infrastructures (Herbert, 2020). With infrastructure support, there is a high chance of transparency in the management of economies when these companies support the developed infrastructure (Arden and Chilcot, 2020). World trade environmental infrastructure support includes a focus on planting trees and promoting sustainable practices to provide useful opportunities to increase healthy regional recovery.

The impact of COVID-19 on psychological sustainability can be examined by observing the changes in people's behavior. Di Fabio (2017) shared the thoughts of people quitting the workplace because of the pandemic, as this also affected educational institutions. Along with this, a lack of healthcare-related facilities contributed to the negative psychological impact on sustainability. Balkhi et al. (2020) found that various psychological factors affect people's behavior, ultimately changing global lifestyles. More than 80% of people worldwide show more concern about safety as they prefer to reduce physical contact with others (Wang et al., 2020). Around 23% of people face extremely anxious conditions due to mental well-being (UNAIDS, 2020). Other than this, the peoples' behavioral changes include increasing exhaustion and fatigue that directly restrict them from working toward development.

There is a link between the psychology of sustainability, sustainable development, and economic crises because all these depend on the quality of life and related improvement (Rothan and Byrareddy, 2020). Zenker and Kock (2020) mention that the COVID-19 pandemic changes people's lifestyles globally by affecting their social, economic, and environmental contexts. Multiple reasons drag the psychology of sustainability toward losses in profit margins and revenue generated. Kang et al. (2019) highlighted the crisis rate of COVID-19 by reflecting on job crises, consumption rates by consumers, and increasing unemployment rates. One COVID-19 impact on individual well-being is that compromised work policies make it difficult for employees to survive peacefully. In the same context, multiple changes are observed in the situation experienced globally as the condition of self-isolation makes people less interested in harming the economy. Some of the destructive realities associated with coronavirus disease include illness, unemployment, bereavement, long-lasting hardship, and struggle in handling the situation (Fetzer et al., 2020). Other than this, there are diverse effects of COVID-19 economically, socially, and environmentally. Rothan and Byrareddy (2020) used a survey to explore the psychological impact of the ongoing pandemic and found that people suffer from a lack of confidence and from the infection itself. There is less concern about the maintenance of health, as most people do not have access to infection control measures. Along with this, there is no realization of the situation's gravity. People can only understand it in terms of their situations.

Multiple uncertainties result from the outbreak of COVID-19, as this affects the individual and humanity at large. COVID-19 has an impact on the psychology of sustainability, the nature of thought, and the attitudes expressed. Within this context, continual stresses are imposed on people from restrictions that negatively affect their minds. Along with this, COVID-19 stresses employees and others and creates an uncomfortable relationship with a peaceful life, directly and indirectly affecting psychological sustainability.

People's psychologies have changed, as they are dependent on the global situation, currently negatively affected by COVID-19. The result is that the COVID-19 pandemic and associated crises have traumatized people's psychological well-being by disturbing their social, economic, and environmental peace. The lack of work policies leads to stress, as criteria for managing the situation are, as yet, undeveloped. The data involving regional GDP rates, economic efficiencies, sales rates, and trade rates reveal an economic impact of COVID-19. All these aspects are directly and indirectly associated with the pandemic. A fall of 7.2% in GDP has been observed in economies.

However, we can learn from past crises to survive the present global economic loss. In the Greek financial breakdown, 700,000 jobs were lost between 2008 and 2014 (KEPE, 2015). More than 35% of medium-sized businesses were largely impacted as compared to small businesses. Entrepreneurs managed to come out of the crisis by providing us some key findings that can help us to better deal with COVID-19. They ensured that their products met all their consumers' needs, lowered their prices (Bourletidis and Triantafyllopoulos, 2014), utilized advanced tools and technologies to provide something meaningful (Giannacourou et al., 2015). Additionally, entrepreneurial or managerial personality traits played a significant role in defining company successes (Elenurm et al., 2014; Espíritu-Olmos and Sastre-Castillo, 2015).

The various findings reveal that fluctuations regarding trading system volumes when this relates to losses or improvements in industries worldwide. They also reveal an increased proportion of living standards worldwide is heading toward extreme poverty. Crises are facing energy production as there are lower CO_2 emissions, which mirrors the fact that human development and progress are declining. Changes in management styles are required to deal with how society operates and reduce the chance of further crises. However, the adoption of a networked, hierarchical, distributed leadership style, cross-training practices, and flexible guidelines will benefit corporations in tackling the COVID-19 crises. Finally, the impact of COVID-19 can be tackled by the support of the world trade environmental infrastructure, which is known to boost the confidence levels of corporations in operations and improve the transparency of global trade.

IMPLICATIONS AND FUTURE PERSPECTIVES

Humans have witnessed several previous crises in different regions and countries, and humanity emerged from them. We should think about creating a global change to prevent further suffering caused by the COVID crisis. It is highly probable that a

recurrence of the present crisis will strike the global population more severely. It is therefore desirable that:

1. Government be proactive and implement planned precautions now before the situation worsens.
2. Management, institutions, and organizations develop their skill sets demonstrate sustainability, resilience, and innovation as COVID-19 has compromised traditional business management and systems.
3. Globally, nations plan and sanction policies for the collective good instead of their own self-interests.
4. All educational institutions provide necessary guidance and professional help to deepen understanding of crisis management. This will help individuals to become aware, protect themselves, and avoid any risks or harm caused by their negligence.
5. All the important health organizations, health professionals, scientists, and researchers be provided a targeted fund that provides sufficient training and understanding regarding the pandemic's impact on public health, so the next crisis is dealt with more effectively.
6. Humanity take a collective approach to avoid unnecessary harm to the environment. The earth can be saved if each one of us becomes more responsible, provides support, and care for one another.

We can learn a lot from this pandemic and become more capable of dealing with any future crisis.

CONCLUSION

This pandemic has taught us that the entire world is connected. If we do not work together and cooperate, humanity will suffer drastically. We need to implement a few changes so that we not only emerge from this crisis but are also able to continue with our lives in a healthy and sustainable way. Firstly, it is important that marketing processes are modified. Instead of blindly following brands and getting attracted to the logos, etc., companies should try to meet their customers' requirements. There should be a shift in business approaches from financial targets to what is best for customers. Unnecessary use of plastic products should be strictly prohibited. Secondly, any health-related issue should be handled at a global level. If we limit ourselves to our own specific race, ethnicity, culture, nationality, and background, humanity will not be able to sustain this pandemic. A broader view and understanding of public health need to be the key drivers for all political parties. Thirdly, globally oriented with specific goals, WHO should be the decision-maker for our health and well-being. Guaranteed budgets should be allocated, and policies prioritizing health in different regions and cultures should be planned. Fourthly, people from all cultures and interests, such as health professionals, scientists, environmentalists, researchers, politicians, sociologists, and ethicists should cooperate and work to improve the current situation. Additionally, all the policies related to the functioning of society, taxation, fiscal policy, environmental issues, economy, and health should be changed so humans can survive on planet Earth harmoniously.

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All authors have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Determinants of the Financial Contribution to the NHS: The Case of the COVID-19 Emergency in Italy

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The COVID-19 pandemic has quickly become an unprecedented challenge for many countries at a global level, requiring a significant amount of financial resources to support the National Healthcare System (NHS). In Italy, most of these resources came from the general public through tax payments and monetary donations. The present work aims to investigate the antecedents of citizens' willingness to financially support the NHS in a situation of public emergency such as the one related to the COVID-19 outbreak. It also aims to distinguish between the willingness to support the system through two different forms of financial contribution, tax payment and charitable giving. An empirical study was performed in the midst of the Italian public health emergency, while the country was reaching its contagion peak. Results showed that participants were more willing to give a financial contribution when it was framed as a one-off donation rather than as a one-off tax payment. Moreover, it was found that trust in money management was the most important factor in predicting the intention to make a financial contribution to the NHS, either through a tax payment or through charitable giving. The perceived risks with regard to the pandemic, in contrast, had no impact.

Keywords: COVID-19, tax behavior, charitable giving, sustainable development, framing effect, common good, financial contribution

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INTRODUCTION

In late December 2019, an outbreak of the novel coronavirus disease (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) began in Wuhan, China, and quickly reached the other countries of the world (Xu et al., 2020). On January 30th, 2020, the World Health Organization (WHO) declared the coronavirus outbreak a public health emergency of international concern, as such influenza pandemics can lead to significant mortality and widespread socio-economic disruption (Bootsma and Ferguson, 2007; Smith et al., 2009). Significant financial resources are critical to respond efficiently to such an emergency, and, historically, most of these resources came from the general public through tax payment and monetary donations. Paying taxes and giving money to charitable institutions, indeed, can be considered two complementary ways of creating public value and increase social welfare (Sugden, 1984; Slavov, 2014). In many countries, tax money provides essential services, including healthcare, whereas charitable giving can alleviate those problems related to the crisis of the welfare state (Selle, 1993). In recent years, issues such as the global financial crisis, growing social inequalities, and the coronavirus outbreak have placed economic sustainable development in the spotlight and increased tension between providing for the common good and focusing on one's own self-interest. Arguably, for the well-being of our societies, it is crucial to find mechanisms to promote prosocial choices over egoistic

ones, including tax compliance and charitable giving. Promoting this kind of prosocial behavior is of paramount importance to meet the UN Sustainable Development Goals (United Nations, 2018). Among different approaches that can shed light on understanding how to reach such sustainable development goals, opening the black box of psychological processes is one of the newest and most promising frontiers (Di Fabio and Rosen, 2018).

Based on these premises, the present work aims to adopt a psychological framework to investigate the antecedents of citizens' willingness to financially support the national healthcare system in a situation of public emergency such as the one related to the new coronavirus outbreak. It also aims to distinguish the willingness to support the system through two different forms of financial contribution, tax payment and charitable giving. To do so, an empirical study was performed in Italy – one of the first and most affected countries – while it was reaching its contagion peak. The article will be structured as follows: first, an overview of the Italian context (COVID-19 health emergency and financial situation) will be provided; next, a theoretical background to test a model will be presented by adopting the theory of planned behavior (Ajzen, 1991); and finally, the adopted methodology will be described and the main results will be presented. The attitudinal component, normative component, and perceived behavioral control will be examined in relation to the intention to make a financial contribution to the National Healthcare System (NHS) to support the COVID-19 health emergency. Besides the interest at the theoretical level, understanding the antecedents of such financial contribution is of paramount importance to orient public policies and social campaigns.

COVID-19 Emergency in Italy

On February 21st, 2020, the Italian region of Lombardy became the center of Italy's coronavirus outbreak when the first locally transmitted case was confirmed. Beginning March 8th, 2020, the Italian government adopted very urgent and restrictive measures to lessen the spread of the virus and its potential impact on the population. Among the more far-reaching measures, any movement of physical persons (both within and entering/exiting the national territory) has been forbidden, except for proven work needs, situations of necessity or health reasons. Schools and universities have been closed, and there are have also been restrictions on the exercise of public activities (sports, restaurants, entertainment, etc.) and any form of gathering of people in public places. In parallel, measures were taken to strengthen the National Health System, with particular reference to intensive care.

Despite such measures, healthcare providers in Italy (and elsewhere) have been called to work in very critical conditions. It was not expected that the infection would spread so rapidly throughout the population and that there would have been such a significant number of serious cases that would require intensive treatment. As a result, the need for beds in intensive care units (ICUs) rapidly exceeded the number of available beds (Nicoli and Gasparetto, 2020). At the time of this writing, more than 240,000 people in Italy have tested positive for the virus and more than 35,000 people have died[1]. It did not take long before the Italian government realized that extraordinary financial measures were needed to support the National Healthcare System and face the pandemic.

Like some other countries, the Italian healthcare system provides universal coverage to citizens and residents, with public healthcare largely free of charge. From an organizational point of view, the system is regionally based, with local authorities responsible for the organization and delivery of health services, leaving the Italian Government with a weak strategic leadership. Over the period of 2010–2019, the National Healthcare System suffered financial cuts of more than €37 billion and a progressive privatization of health-care services. Public health expenditure as a proportion of gross domestic product was 6.6% for the years 2018–2020 and is forecast to fall to 6.4% in 2022 (Cartabellotta et al., 2019). The on-going coronavirus pandemic, together with the already fragile Italian financial situation and the public healthcare expenditure cuts over the years, poses additional challenges in relation to citizens' health-related rights. For this reason, understanding how to promote and sustain citizens' financial contributions for the common good–either through tax payments or charitable giving–is of paramount importance.

Italian Financial Situation

The Italian economy was already in serious difficulty before the coronavirus outbreak, and Italy's fragile public finances make the issue of financial provision for the common good even more relevant. According to Eurostat[2], in 2019 the Italian government debt equaled 134.8% of the country's economic output. In the European Union, where the average for 27 countries is 77.8%, Italy has the second highest ratio of government debt to GDP.

In addition, Italy is a low-tax-compliance country. Although estimates of the level of tax evasion are, inevitably, uncertain, the publicly available data and research carried out over time agree that the phenomenon is significant. According to recent estimates (Schneider, 2015), Italy's shadow economy is higher (20.6% of GDP) than the average of 31 other European countries (18.0%), and tax evasion is estimated to be much higher than in other highly developed countries (Giovannini, 2011). According to the latest report of the Italian Ministry of Economy and Finance (MEF), the difference between the amount of tax and social contribution that is due and what is actually paid was €109 billion per year, on average, during the period of 2012–2016 (i.e., 6.4% of GDP). Tax evasion is often considered the root of many problems within the Italian economy, such as revenue loss, equity concerns, and other inefficiencies (Santoro, 2010).

In terms of charitable giving, Italy ranked 33rd out of 128 countries on a 10-year World Giving Index, with 38% of the population donating money (CAF Charities Aid Foundation, 2019). According to a survey on a representative sample of Italian people conducted by BVA Doxa[3] between March 20th–24th,

[1]Data retrieved from the official Ministero della Salute website, http://www.salute.gov.it/, on July 16th, 2020.

[2]https://ec.europa.eu/eurostat/tgm/table.do?tab=tableandinit=1andlanguage=enandpcode=teina225andplugin=1

[3]https://www.bva-doxa.com/en/feelings-habits-and-attitudes-italians-in-covid-19-times/

2020, 24% of the population – almost 10/12 million Italians – claimed to have already made a donation to support the healthcare and hospital sector since the start of the coronavirus emergency. In addition, 35% said they wanted to donate in the upcoming weeks. Compared to the annual data published by BVA Doxa's annual research on Italians' solidarity, these figures represent an increase of about 30% compared to the number of Italians who donate every year to scientific, health and equivalent research purposes, which totaled to 8.3 million in 2019. The fact that many people say they have supported charitable causes related to the virus or are willing to do so is very positive. Nonetheless, the Italian healthcare system cannot face the coronavirus pandemic solely by relying on voluntary monetary donations from private citizens.

Several reasons can be found to explain Italians' apparent different attitudes toward tax payments and charitable giving. The first and most obvious reason is the distaste for the coercive nature of taxes (as compared to voluntary private giving) and the desire of donors to control or target their donation (Li et al., 2011). In the case of charitable contributions, people can make their own decisions regarding which social programs or causes to support, whereas in the case of taxes, taxpayers seldom have the opportunity to earmark their tax payments for specific causes. Another reason could be the perceived inefficiency of government expenditures on general welfare. Nonetheless, Jones (2017) found that when subjects could voluntarily donate to both government agencies and charitable institutions (thus removing the coercive nature of taxes), they gave significantly less to the government than to charity, even after accounting for the relative effectiveness of the two types of institutional expenditures. This leads to another explanation, that of a deep-rooted "tax aversion" bias, a phenomenon by which people may perceive an additional burden associated with tax payments compared to economically equivalent payments that are labeled differently (Fennell and Fennell, 2003; McCaffery and Baron, 2006). The origin of this aversion can be historically identified (see Ferrari and Randisi, 2011).

Based on such premises, the present study aims to investigate whether labeling financial support to the National Healthcare System as a one-off tax or as a one-off donation can affect the willingness to make such a contribution. Because of the "tax aversion" bias, the following hypothesis is formulated:

> H1: People will show greater intentions to give a financial contribution to the NHS if such a contribution is labeled/framed as a donation rather than a one-off tax.

Antecedents of Financial Contributions to the NHS

As mentioned above, the present study aims to test a model to investigate the antecedents of financial contributions to the NHS during a public emergency. Several antecedents have been identified by adopting the theory of planned behavior (Ajzen, 1991).

First, we took into account people's attitudes toward the pandemic emergency. In fact, people's risk perception related to the pandemic has been identified as one of the factors contributing to an increase in public participation in adopting preventive measures (Brug et al., 2009; Poletti et al., 2011). Perceived risk and anxiety about catching the virus can lead people to adopt some protective behaviors such as wearing a mask, isolation (Lau et al., 2007; Barr et al., 2008), and increased hand washing (Lau et al., 2007; Rubin et al., 2009). Perceived severity, perceived risk, and anxiety about catching the virus have also been associated with a reduced use of public transport, avoidance of public places and taking leave of absence from work (Sadique et al., 2007; Goodwin et al., 2009; Rubin et al., 2009). No evidence, however, can be found on the relationship between perceived risk and anxiety about catching the virus and the willingness to financially support the healthcare system. Given the existing literature supporting the relation between perceived risk and adoption of preventive measures, we propose the following hypothesis:

> H2: People with negative pandemic attitudes (i.e. high perceived risk) will show greater intentions to give a financial contribution to the NHS.

Second, we considered the role played by subjective norms and values. COVID-19 is challenging our position in the world, because on the one side we realize our connectedness to those around us regardless of how distant they appear to be (e.g., geographic distance), yet on the other side we are becoming deeply aware of our individuality because the illness is a threat to our personal wellbeing (Ahmad et al., 2020). Given the global nature of this pandemic, and the fact that supporting the healthcare system can help not only one's own family and friends but also distant strangers, we decided to consider people's orientation toward the common good. The common good entails feelings of responsibility for one's community and compliance with social rules and order. People's sense of responsibility for the common good has been identified as one of the core dimensions of the construct called "social cohesion" (Schiefer and van der Noll, 2017). Social cohesion requires a minimum degree of commitment to the community as well as the willingness to subordinate personal (and private) needs to the collective (and public) needs of the social environment. The specific motivation to provide for everybody's needs and make sure that the common good is accessible to anyone has also been shown to be an antecedent of tax compliance and charitable giving (Castiglioni et al., 2019a). We also decided to take into account the dimension of collectivism. Collectivism emphasizes interdependence, prioritizes collective goals over personal goals, and places more importance on social norms than attitudes (Triandis and Gelfand, 1998). Thus, the following hypotheses has been formulated:

> H3: People with high levels of collectivism and common good orientation will show greater intentions to make a financial contribution to the NHS.

Finally, we considered perceived behavioral control. Both tax payments and monetary donations involve money, which is fungible. The effectiveness of one's financial contribution to the HNS is therefore subsidiary to the actual use and management

of that money, which is under the control of a third party (e.g., the government or other institutions/nongovernmental organizations); thus, this evokes trust-related issues (Castiglioni et al., 2018). Understandably, one may be less likely to donate if he or she is concerned that the donation will not reach the impacted people (i.e., low perceived control). Donors want to be assured that their financial contributions will be used for the stated purpose (Oosterhof et al., 2009). Similarly, tax compliance increases when taxpayers are aware of a direct link between their tax payments and the provision of a desirable public good (Alm et al., 1992). Thus, we expect that the level of trust in money management – which is also connected to the general trust people have toward NHS and public institutions–has an influence on the intention to make a financial contribution to the NHS.

> H4: People with high levels of trust in money management will show greater intentions to make a financial contribution to the NHS.

In sum, we propose a model of antecedents of financial contributions to the NHS to support the emergency situation that includes attitudinal factors (i.e., pandemic attitudes and perceived risk), subjective norm factors (i.e., orientation toward the common good and collectivism), and perceived control (i.e., trust in money management, public institutions, and NHS). The model is represented graphically in **Figure 1**. Understanding the relative importance of each factor in determining the financial contribution to the NHS can become a key factor for policy-makers to decide how to develop social marketing campaigns (i.e., in terms of rhetoric to use and key messages to deliver) aimed at increasing financial resources for NHS.

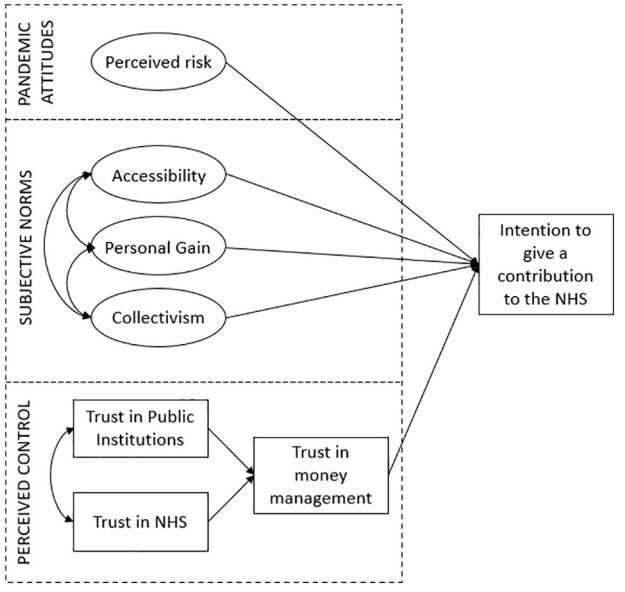

FIGURE 1 | Model of antecedents of the intention to make a financial contribution to the NHS.

MATERIALS AND METHODS

Sample and Procedure

A between-subjects experimental design was developed through the online survey platform Qualtrics. The questionnaire was preceded by an electronic consent form which contained an adequate disclosure regarding the objectives of the study. Moreover, anonymity was assured to all participants, who were also informed about the possibility to withdraw from the study at any time with no consequences. No incentives were offered for participation. After providing informed consent, participants were automatically randomly assigned to one of the two different conditions (tax group vs. donation group) and read a message in which the financial contribution to the NHS was framed as either a one-off tax or a one-off donation. After reading the message, participants answered a question about their intentions to either pay a one-off tax to support the NHS (tax group) or give money to a charity supporting the NHS (donation group). Further individual difference measures and demographics were collected as detailed below.

The questionnaire was made accessible from March 21st, 2020, to April 8th, 2020. A combination of convenience and targeted sampling was adopted, which included emails to personal contacts and invitations to take part in the study through social media websites (Facebook, LinkedIn, and Instagram).

Measures

Dependent Measures

According to the experimental condition, participants indicated either their intentions to pay an one-off tax to support the NHS (behavioral intentions on a scale from 0 = not at all likely to 10 = extremely likely: "Imagine that in the next few weeks the government decided to place an one-off tax on private citizens to support the National Healthcare System. How inclined would you be to give money to support it?") or their intentions to make a one-off donation to a charity supporting the NHS (behavioral intentions on a scale from 0 = not at all likely to 10 = extremely likely: "In the last few days, several charities have been collecting money to support the National Healthcare System. How inclined would you be to give money to support it?").

Pandemic Attitudes and Perceived Risk

Five elements related to pandemic risk attitudes were measured: (a) risk susceptibility (i.e., perceived likelihood of contracting COVID-19: participants were asked to rate from 1 (very low) to 5 (very high) their perceived risk of being infected by the COVID-19 virus); (b) risk severity [i.e., perceived potential severity of COVID-19 infection for their own health: participants answered a question regarding how dangerous the effects of COVID-19 could be to their own health, ranging from 1 (not dangerous) to 5 (very dangerous)]; (c) general concern [i.e., personal concerns regarding the COVID-19 emergency at large, ranging from 0 (not at all concerned) to 10 (extremely concerned)]; (d) concerns for their own health and safety [ranging from 0 (not at all concerned) to 10 (extremely concerned)]; and (e) concerns for the health and safety of their loved ones [ranging from 0 (not at all concerned)

to 10 (extremely concerned)]. These five elements showed very good scale reliability (α = 0.80).

Values and Subjective Norms

Collectivism was assessed using CVSCALE (Yoo et al., 2011), which consisted of six items (e.g., "Group welfare is more important than individual rewards") evaluated using 5-point Likert-type scales anchored by 1 = "strongly disagree" and 5 = "strongly agree." The scale showed very good reliability (α = 0.79). Personal orientation toward the common good was assessed using the Common Good Provision scale (CGP, Castiglioni et al., 2019a), which comprises two main dimensions: (a) Accessibility (four items, such as "If I provide for the common good, I do so to provide for everybody's needs", α = 0.88); and (b) Personal Gain (three items, such as "If I provide for the common good, I do so to get a personal return," α = 0.83). Both dimensions were assessed using 9-point Likert-type scales anchored by 1 = "strongly disagree" and 9 = "strongly agree."

Trust and Perceived Control

Participants were asked to express their level of trust toward the National Healthcare System (NHS) and toward public institutions using 5-point Likert-type scales. They were also asked to express their trust in money management; that is, the extent to which they believed the money contributed to supporting the NHS – either through tax payments or donations – would actually be used for that purpose (from 0 = extremely unlikely, to 10 = extremely likely).

Sociodemographic Variables

Socio-demographic data were also collected, including age, sex, education, employment situation, region of residency and level of income, in order to characterize our sample.

Analysis

Descriptive statistics were computed for each item (asymmetry, kurtosis, mean, median, and standard deviation), and normality of distribution was checked. Cronbach's alphas were calculated to assess reliability of item scales. The effects of different frames (taxes vs. donations) on the intention to give a financial contribution to the healthcare system was assessed using one-way analysis of variance (ANOVA). Structural Equation Modeling (SEM) was used to examine the model fit. We specified antecedents as exogenous predictor variables and intention to financially provide for the NHS as outcome variable. For greater clarity, neither the regression errors nor the corresponding observable variables are shown in **Figures 2**, **3**. Absolute and relative fit indices are reported in order to determine the fit of the proposed model.

RESULTS

Sample Characteristics

We collected 600 valid questionnaires. Participants were Italians (66.5% female) aged between 18 and 75 years (M = 33.3, SD = 13.8). The majority (57.5%) of participants held a university degree (either bachelor's or master's). A high percentage (55.3%) were workers, whereas 35.3% were students and the remaining 10.4% included unemployed people, homemakers, and retired people. The vast majority of respondents came from Lombardy (72%), the region most affected by coronavirus. Regarding their income, 18.8% reported a monthly net household income lower than €1,500, 50.5% reported between €1,500 and €3,500, and 30.7% reported € 3,500 or more.

With regard to the different experimental conditions, 298 (49.7%) comprised the tax payment group and 302 (50.3%) comprised the donation group. Chi-square tests were conducted to test the homogeneity of two different groups for socio-demographic characteristics, and a one-way ANOVA was performed to compare age. No significant differences were found between the tax payment group and the donation group, thus suggesting that random assignment was valid ex post.

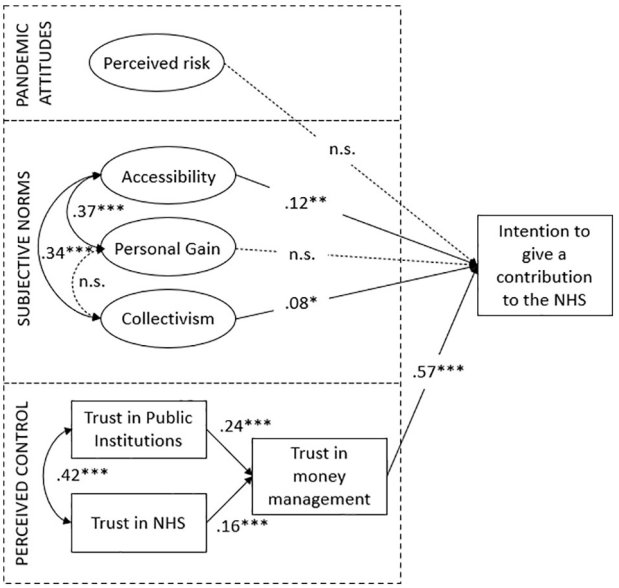

FIGURE 2 | Final model of relationships between antecedents and intention to make a financial contribution to the NHS (N = 600). Standardized parameter estimates for the final model. ***p < 0.001; **p < 0.01; *p < 0.05.

Diagnostics for Normality

Before performing other statistical analysis, descriptive statistics were computed for both dependent and independent variables (asymmetry, kurtosis, mean, median, and standard deviation), and normality of distribution was checked for both groups (tax-group and donation-group). **Table 1** shows results of descriptive statistics for each subgroup. All values appear to be in the acceptable range for normal distribution.

Demographic Effects on Intention to Make a Financial Contribution to the NHS

Analysis of variance (ANOVA) was performed to determine the effects of socio-demographic characteristics on the intention to

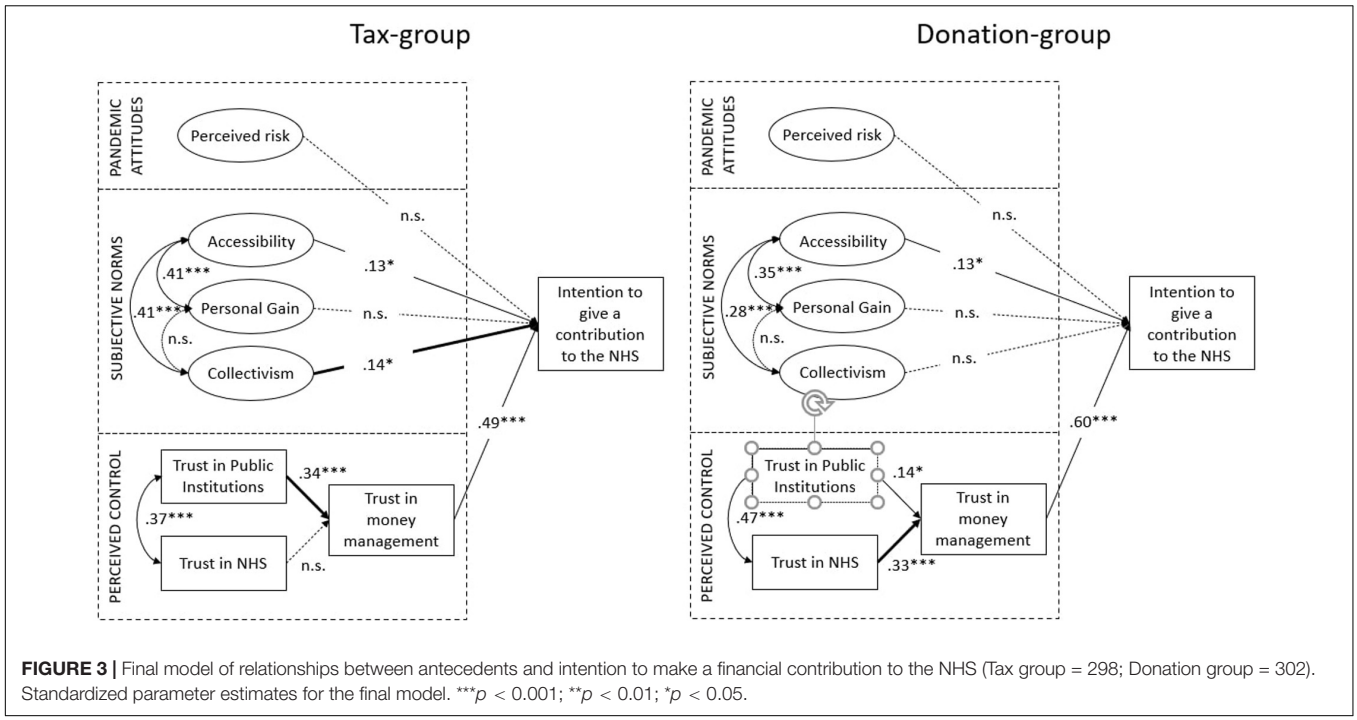

FIGURE 3 | Final model of relationships between antecedents and intention to make a financial contribution to the NHS (Tax group = 298; Donation group = 302). Standardized parameter estimates for the final model. ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

TABLE 1 | Descriptive statistics for dependent and independent variables.

Variable	Group	M	SD	Md	A	K
Intention to make a financial contribution to the NHS	Tax group	5.6	3.1	6	−0.4	−0.9
	Donation group	7.3	2.6	8	−1.0	0.4
Pandemic attitude	Tax group	5.8	1.3	5.8	−0.8	0.7
	Donation group	5.7	1.2	6	−0.6	0.3
Accessibility	Tax group	7.7	1.3	8	−1.3	1.9
	Donation group	7.6	1.5	8	−1.5	1.6
Personal Gain	Tax group	6.7	1.7	7	−0.8	0.4
	Donation group	6.3	2.0	6.7	−0.7	−0.3
Collectivism	Tax group	3.8	0.6	3.8	−0.3	0.7
	Donation group	3.8	0.6	3.8	−0.2	0.3
Trust toward the National Healthcare System (NHS)	Tax group	4.0	0.8	4	−1.1	1.5
	Donation group	3.9	0.7	4	−1.0	1.2
Trust toward public institutions	Tax group	3.1	0.9	3	−0.3	−0.7
	Donation group	3.0	0.9	3	−0.3	−0.5
Trust in money management	Tax group	5.7	2.8	6	−1.2	0.6
	Donation group	7.0	2.6	7	−1.0	−0.7

make a financial contribution to the NHS. No significant effects were found for age, sex, education, employment situation, or region of residency. A significant effect was only found for household income [$F(2,478) = 7.779$, $p < 0.01$, $\eta^2_p = 0.04$]; thus, income was included as a random factor in the following analysis to determine the presence of framing effects.

Framing Effects on Intention to Make a Financial Contribution to the NHS

The effects of different frames (taxes vs. donations) on the intention to give a financial contribution to the healthcare system was assessed with one-way analysis of variance (ANOVA). Framing condition was included in the model as a fixed factor, whereas household income was included as a random factor given its association with the dependent variable. Results showed the existence of a statistically significant difference between tax group and donation group [$F(1,473) = 43.932$, $p < 0.01$, $\eta^2_p = 0.95$]. Respondents in the tax-framed situation reported a much lower level of intention to make such a contribution (M = 5.6, SD = 2.6) compared to respondents in the donation-framed situation (M = 7.3, SD = 3.1). No significant interaction effect between framing condition and household income was found.

Based on the above evidence, we reject the null hypothesis in favor of the alternative hypothesis suggesting that people show greater intentions to make a financial contribution to the NHS if such contribution is labeled/framed as a one-off donation rather than a one-off tax.

Structural Equation Model

We tested the model shown in **Figure 1** with Structural Equation Modeling (SEM), using the maximum likelihood procedure and the matrix of original data as input with AMOS (Arbuckle, 2003). To test the fit of the model, several indexes are recommended, such as χ^2 and its level of probability, however, due to its sensitivity to sample size, other fit indexes are proposed, such as the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). The model (**Figure 2**) showed a very good fit to the data: CMIN/DF = 2.030, CFI = 0.94, RMSEA = 0.029 (LO90 = 0.027, HI90 = 0.032). Among the antecedents to the intention to make a financial contribution to the NHS, trust in money management predicted the greatest portion of variance (β = 0.57). As for subjective norms, both the "Collectivism" (β = 0.08) and "Accessibility" (β = 0.12) dimensions had a significant – albeit weaker – positive relation with the dependent variable. For pandemic attitudes and perceived risk, no significant effect was found. Based on this evidence, both H3 and H4 are confirmed. People with high levels of collectivism and common good orientation (in particular, the dimension of "Accessibility" rather than "Personal Gain") show greater intentions to make a financial contribution to the NHS. Most relevant, the higher is people's level of trust in money management (which is also determined by the general level of trust toward the NHS and public institutions), the more willing they are to make a contribution to the NHS. No effect was found in relation to perceived risk; thus, H2 is rejected.

After testing the model on the whole sample, we compared the two groups (tax group and donation group) across the same measurement instrument, to see whether path coefficients in the model were equal or different. **Figure 3** shows the two structural models, both based on the general model previously tested. Different pathways in the tax and donation framing conditions were found that similarly, explain the intention to make a financial contribution to the NHS.

The first difference in the structural paths between the two groups lies in the antecedent of trust in money management. In the tax-frame condition, trust toward public institutions is the main determinant of trust in money management (β = 0.34) whereas trust in the NHS has no significant impact. This is in line with the fact that, in the tax frame condition, the Italian government is the public institution in charge of money management and administration; therefore, the more people trust the government, the more willing they are to pay a one-off tax. In the donation-frame condition, on the other hand, trust in NHS is the main determinant of trust in money management (β = 0.34), whereas trust in public institution has a weaker – although significant – relation (β = 0.14). This is in line with the fact that, in the case of monetary donations, people are free to choose the body that will receive the money, including NHS directly, which would become the third party in charge of handling money. Thus, the more people trust the NHS, the more willing they are to make a monetary donation.

Another divergence was found in the relationship between collectivism and the dependent variable. In fact, this relationship is positive and significant in the tax-framed condition (β = 0.14), whereas it is non-significant in the donation-framed condition. Having collectivistic values seems to play a role only in tax payment situations, not in charitable giving.

DISCUSSION

This study provides novel insights into behavioral responses to pandemics by assessing people's willingness to financially provide to the NHS during a public health emergency. Instead of using a fictitious situation or simulation experimental design, the present study was able to assess people's willingness to give such contributions in the midst of the novel coronavirus (COVID-19) emergency situation in Italy.

The aim of this work was twofold. On the one hand, it aimed to investigate the antecedents of citizens' willingness to financially support the national healthcare system in a situation of public emergency. On the other hand, it aimed to investigate the framing effect of labeling such a financial contribution either as a one-off tax or as a one-off monetary donation.

Results showed that people were more willing to make a financial contribution if it was labeled as a one-off donation rather than as a one-off tax. At a theoretical level, this supports the existence of a "tax aversion" bias, a phenomenon by which people may perceive an additional burden associated with tax payments compared to economically equivalent payments labeled differently (Fennell and Fennell, 2003; McCaffery and Baron, 2006). A further explanation is the distaste for the coercive nature of taxes (as compared with voluntary private giving) and the desire of donors to control or target their donation (Li et al., 2011). Although tax payments and charitable donations are arguably two sides of the same coin – as both are ways to financially provide for the common good – at the affective and psychological levels they are perceived to be very different (Castiglioni et al., 2019b). At the pragmatic level, such evidence can help policymakers and administrators to understand what kind of consensus different policies can achieve among the population during an emergency.

With regard to the antecedents of citizens' willingness to financially support the national healthcare system, perceived control in terms of trust toward money management appeared to be the most relevant factor. This demonstrates the importance of reassuring people that their financial contributions will be used for the stated purpose (Oosterhof et al., 2009). Although this result equally applied to the tax group and the donation group, different antecedents were found in relation to trust in money management. With regard to tax payment, both general trust in public institutions and general trust in NHS have an impact on trust in money management. Trust in public institutions, however, is more relevant. The

importance of trust in the tax compliance domain is not a novelty, as also suggested by the "slippery slope framework" (Kirchler et al., 2008; Gangl et al., 2015). According to the "slippery slope framework," when tax authorities are trusted, people are more willing to be voluntary tax compliant. In addition, tax compliance increases when taxpayers are aware of a direct link between their tax payments and the provision of a desirable public good (Alm et al., 1992). The present study underlines the impact and the importance of the proper management of tax money, not only in a situation of ordinary administration but also in a situation of emergency. In addition, it expands the role and importance of trust not only toward tax authorities but also toward public institutions at large.

In the charitable giving condition, on the other hand, only general trust in NHS appears to be an antecedent of trust in money management. This can be explained by the fact that, in the case of monetary donations, people can directly donate to the NHS, with no mediation of other public institutions. Therefore, trusting that the NHS will properly handle their money is the main determinant.

According to the model we tested, perceived trust was even more important than subjective norms, which appeared to be significant but to a lesser extent. In particular, the "accessibility" component of orientation toward the common good, but not "personal gain," predicted behavioral intention. In the midst of a public health emergency, making sure that all the citizens can have access to adequate health assistance appears to be more relevant in predicting the intention to give a financial contribution than pursuing personal interests. Collectivism appeared to be a significant antecedent as well. However, when distinguishing between the tax group and the donation group, it appeared to be significant only in the tax-framed condition. Donation literature on the "warm glow" feeling can explain the lack of impact of collectivism in the donation-framed condition. According to the "warm glow" theory, donors gain utility not only from increasing public goods but also from the act of giving itself (impure altruism; Andreoni, 1990). That is, people may have pleasurable psychological experiences upon donating money, and such feelings may be more important to the donors than actually increasing the collective welfare (Butera and Horn, 2020).

Finally, an unexpected result was the lack of a significant effect of pandemic attitudes and perceived risk on the intention to make a financial contribution. A possible explanation for the lack of a significant effect may be related to the specificity of the dependent variable in this study (i.e., intention to give a financial contribution to the NHS). Although people's risk perception of the pandemic is one of the key factors contributing to an increase in public participation in adopting preventive measures (Rogers, 1975; Prati et al., 2011) and vaccination acceptance (Van der Weerd et al., 2011), this might not apply to making a financial contribution to the common good. A possible explanation for the lack of significant effects of perceived risk on the intention to make a financial contribution to the NHS is related to the specific timing with which we collected the data. As mentioned above, data were gathered during the peak of the coronavirus outbreak in Italy, and most respondents lived in Lombardy, the most affected region in Italy. Given the "objectivity" of the seriousness and severity of the pandemic emergency at the time people took part in the study, the role played by their "subjective" perception may have been mitigated. Further research on the topic may help gain a better understanding of such results.

To summarize, at a pragmatic level, results suggest that a social communication aimed at collecting financial support to face a health emergency situation should emphasize how money will be handled and managed, rather than focusing on the potential health risks associated with the pandemic spread. Moreover, social marketing campaigns aimed at increasing tax compliance need to reassure people regarding how public institutions will use the money, as well as foster important social values related to the accessibility of public goods and collectivism. Meanwhile, in social marketing campaigns aimed at collecting money from private donations, it is important to support trust toward the NHS and emphasize the accessibility dimension of the common good.

Our study had several limitations that should be noted. First, results were self-reported. Measurement errors and social desirability bias may exist despite the fact that the questionnaire was anonymous. A further limitation of this study is that we assessed behavioral intentions rather than objectively measured behavior. Although being very important and well-validated proxy for behavior, it is known that behavioral intentions can only predict a moderate amount (30–42%) of the variance in actual behavior across a wide range of contexts (Armitage and Conner, 2000; Webb and Sheeran, 2006; Cooke and French, 2008). Finally, results cannot be generalized in a probabilistic way to the whole Italian population, as a non-probabilistic sampling technique was adopted. However, the present study did not aim to perform a probabilistic generalization, but rather an analytic generalization, which relies on the design of the research to make casual claims in relation to a model/theory. In that regard, the present study needs to be considered as a first exploration on the topic. Further studies taking into account other sources of variability, such as different Italian regions, different times, different countries (e.g., high-tax compliance countries vs. low-tax compliance countries), and with different kinds of emergencies (i.e., not health-related) may provide further insights.

The study has several strengths too. First, it was conducted during the threat of an actual new influenza pandemic, during its contagion peak. It therefore provides important insights into the reactions of the public, in addition to the number of laboratory and hypothetical studies on people's reactions to pandemics. Second, our model proved a very good fit to the data and gave important insights into understanding the antecedents of the financial provision for the common good. It also stressed differences and specificities of two different domains: tax payment and charitable giving. Third, in addition to the theoretical results, it also offers operational suggestions for policy-makers and administrators in facing a health-related emergency.

CONCLUSION

Ensuring fiscal sustainability has become a priority challenge for many countries, including Italy. If this is true in times of normal economic growth, it becomes even more relevant in times of crisis. The public health emergency related to the novel coronavirus (COVID-19) has further weakened many countries' public finances, thus making it of paramount importance to understand how to promote citizens' contribution to the common good. From a financial point of view, this includes paying taxes and giving money to charities. This specific sustainability goal fits into the larger picture of the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs), as it was established at the 70th Session of the UN General Assembly in 2015.

This study's outcomes are important for governmental crisis communication. It is suggested that, rather than focusing on potential risks and fear-arousal messages, social communication aimed at collecting financial resources to support the NHS should provide information on how the money will be handled, in order to increase trust in money management and increase a sense of perceived control.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Both authors contributed to the conception and design of the study, contributed to manuscript revision, read and approved the submitted version. CC analyzed the data and wrote the first draft of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The Effect of Stress, Anxiety and Burnout Levels of Healthcare Professionals Caring for COVID-19 Patients on Their Quality of Life

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Background: The healthcare system is among the institutions operating under the most challenging conditions during the period of outbreaks like pandemic which affects the whole world and leads to deaths. During pandemics that affect the society in terms of socioeconomic and mental aspects, the mental health of healthcare teams, who undertake a heavy social and work load, is affected by this situation.

Aim: This research was conducted with the aim of determining the effect of stress, anxiety, and burnout levels of healthcare professionals (doctors, nurses, healthcare assistants) caring for COVID-19 patients on their quality of life.

Method: The sample of the study consisted of a total of 240 healthcare professionals, determined by random sampling method among the healthcare professionals working in pandemic hospitals in Tokat city center, Turkey. Perceived Stress Scale, Spielberger State-Trait Anxiety Inventory, Maslach Burnout Inventory and Quality of Life Scale were used in the study conducted in the relational screening model.

Findings: While the stress, trait anxiety, and quality of life mean scores of healthcare professionals who were female, married and had children were higher than the other groups, high, moderate, negative, and positive correlations were found among all variables.

Conclusion: The research concluded that the stress, anxiety, and burnout of healthcare workers caring for COVID-19 patients affected their quality of life.

Keywords: stress, anxiety, burnout, quality of life, healthcare professionals

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INTRODUCTION

COVID-19, which was declared to be a pandemic by the World Health Organization (WHO) after emerging in Wuhan, China, has had an impact on many countries other than the point where it started to spread and mostly affected the healthcare professionals. Healthcare professionals are at risk of exposure to infectious diseases, including the novel coronavirus (COVID-19) that emerged in China. Working face-to-face with people who are quarantined and carrying the virus can raise serious concerns such as fear of death among healthcare professionals, feelings of loneliness and anger may develop, and these emotions may lead to stress in the professionals

(Xiang et al., 2020; Zhang et al., 2020). In a study conducted by Cai et al. (2020) with 534 doctors, nurses and primary care providers in Hubei state, healthcare professionals' stress levels were found to be extremely high during the COVID-19 outbreak. As a result of a study conducted in Turkey, it was determined that 38% of nurses working in the emergency department experienced stress. According to the same research, it was revealed that nurses experiencing stress regretted their choice of profession and thought to quit or leave their jobs (Yasal and Partlak, 2019). The study conducted by Jiang et al. (2020) with 310 people in order to examine the psychological symptoms of healthcare professionals in Wuhan during the COVID-19 outbreak showed that healthcare professionals were under moderate to severe stress, and that many of them reported high anxiety and depression. Emergencies such as the COVID-19 outbreak can prove riskier for healthcare professionals who work under various difficulties and risks even in the provision of ordinary health services. These situations can cause them to be exposed to severe stress reactions and experience stress, which increases the risk of developing secondary trauma.

Although stress, fatigue, and increased workload can have various consequences such as musculoskeletal disorders, one of the most likely negative consequences of these conditions is increased burnout in healthcare. It is known that the risk of getting the virus, which spreads gradually during the epidemic, increases the anxiety of getting sick both for themselves and their relatives and can lead to burnout in carrying out tasks that require endurance. During epidemic periods such as COVID-19, the most important causes of burnout are prolonged working hours, the anxiety of getting sick with increasing virus load, and most importantly, all kinds of discourses and approaches that devalue the labor of healthcare professionals who risk their own health. Burnout is mostly seen in those who work in professions such as "health," which directly serve people and where human relations are important. In studies conducted outside the epidemic period, high levels of burnout have been reported among healthcare professionals both in our country and in the world (Erol et al., 2012; Kansoun et al., 2019). In the study of Matsuo et al. (2020), where they investigated the prevalence of burnout in healthcare professionals during the COVID-19 outbreak in Japan with the participation of 488 healthcare professionals, the overall burnout prevalence was found to be 31.4% (98 out of 312). 59 (46.8%) of 126 nurses, 8 (36.4%) of 22 radiology technologists, and 7 (36.8%) of 19 pharmacists were experiencing burnout.

A study conducted on healthcare professionals showed a significant positive relationship between stress and burnout (Morgantini et al., 2020). Another study investigating the relationship between burnout, anxiety, and stress disorders during the COVID-19 epidemic reported that doctors and nurses experienced high levels of mental health problems, including burnout (Sung et al., 2020).

The stress and anxiety and burnout of physicians, nurses and assistant healthcare personnel who are in direct contact with patients can affect both their job performance and health conditions and reduce their quality of life. In healthcare professionals, the anxiety that occurs during or as a result of crisis intervention may impair their mental reasoning and abstract thinking skills and cause a lack of attention and coordination. Various emotions such as fear and anxiety can affect their problem-solving performance. The decrease in problem-solving ability may lead to a decrease in the efficiency of the services provided to protect the health of individuals and public health and to facilitate living conditions.

In this study, it was aimed to determine the effect of stress, anxiety, and burnout levels of healthcare professionals who work actively in hospitals during the COVID-19 pandemic on their quality of life. In line with this aim, answers to the following questions were sought:

1. Is there a relationship between the stress, anxiety, and burnout levels of healthcare professionals and their quality of life?
2. Do stress, anxiety, and burnout levels of healthcare professionals have an impact on their quality of life?

MATERIALS AND METHODS

The research was conducted in the relational screening model in order to determine the effect of stress, anxiety, and burnout levels of healthcare professionals on their quality of life. This cross-sectional study was conducted between 20 May 2020 and 10 June 2020 by applying an anonymous online survey to HCWs who were actively working during the COVID-19 pandemic. All subjects provided informed consent electronically before registration. Only subjects who agreed to participate voluntarily were included in this study, and subjects could quit the process at any time. Only one response per person to the questionnaire was permitted. Incomplete surveys were not included in this study. The target population of the study consists of healthcare professionals working in pandemic hospitals in the city center of Tokat. While determining the sampling method, the simple random sampling technique, which is the sampling type in which all the elements in the study population have an equal chance to be selected, was used. For the sample size, the "disproportionate element sampling" technique was used. A total of 240 healthcare workers, 170 women (70%), and 70 men (30%) participated in the study.

The desired number of the population could not be reached as a result of healthcare professionals having to work hard due to the pandemic, being on leave, or being excused for reasons such as illness or birth. Variable types used in the analysis are limited by the reliability of the applied survey. The fact that some hospital staff did not participate in the survey made the sample smaller.

Measurement Tools

Perceived Stress Scale

The scale, developed by Cohen et al. (1983) (Cronbach's alpha = 0.78) and adapted to Turkish by Eskin et al. (2013) (Cronbach's alpha = 0.84), consists of 14 items. The scale was developed in order to measure the degree to which situations in one's life are appraised as stressful (Eskin et al., 2013). Participants are asked to rate the items on a 5-point Likert-type scale (Never = 0; Very often = 4). The scores of 7 items with positive

statements are reversed. The total score ranges from 0 to 56, and a high score indicates the person's excessive perceived stress.

Spielberger State-Trait Anxiety Inventory

The scale was developed by Spielberger et al. in 1964 in order to determine the trait anxiety levels of individuals. The Turkish reliability and validity studies of the scale were conducted by Öner and Le Compte (1983). Trait anxiety scale measures anxiety in adolescents over the age of 14 and adults. This scale, which is a kind of self-assessment scale, includes 20 items consisting of short expressions. All items are scored between 1 and 4 by reversing the scores in the reverse items included in the scale, and the increasing score indicates high level of anxiety. The total score obtained from the scale can vary between 20 and 80. A high score indicates high level of anxiety, while a low score indicates low level of anxiety.

Maslach Burnout Scale

Maslach Burnout Scale was developed by Maslach and Jackson (1981) in order to determine the level of burnout. It is a scale consisting of three sub-dimensions as emotional exhaustion, depersonalization, and personal accomplishment and 22 items that have defining characteristics of these dimensions. The Cronbach's α coefficients of the sub-dimensions of the scale, which was adapted into Turkish by Ergin (1992), were found as 0.86 for the emotional exhaustion sub-dimension, 0.71 for the depersonalization sub-dimension, and 0.76 for the personal accomplishment sub-dimension.

Quality of Life Scale

It was developed by Menekay and Çelmeçe (2017) in order to determine employees' attitudes toward their quality of life. The scale consists of 28 items and four dimensions: working life, social life, burnout, and satisfaction. The reliability coefficients of the sub-dimensions of the scale vary between 0.637 and 0.831. The reliability coefficient of the whole scale is 0.881 (Menekay and Çelmeçe, 2017).

Measurement Model

In the reliability and validity analysis, the first point to be considered about variables is internal consistency reliability. Internal consistency reliability is commonly measured with Cronbach's Alpha value. The second thing to look at with regard to variables is validity. The validity check is done in two stages as convergent validity and discriminant validity. Two values are considered for merger validity (Doğan, 2019). These are the outer loadings and the explained average variance extracted (AVE) values. There are three methods recommended for divergence validity (Doğan, 2019). The first of these is the Fornell and Larcker criterion (Hair et al., 2017), the second is cross loadings values, and the third is the HTMT (Heterotrait-Monotrait Ratio) criterion (Henseler et al., 2015). According to the Fornell and Larcker (1981) criterion, the square root of the AVE values of the structures included in the study should be higher than the correlations between the structures included in the study. **Table 1** shows the results of the analysis made according to the Fornell and Larcker (1981) criterion. According to the criterion of Henseler et al. (2015), HTMT (Heterotrait-Monotrait Ratio) expresses the ratio of the mean correlations of the expressions of all variables included in the study, to the geometric average of the correlations (the heterotrait-heteromethod correlations) of the expressions of the same variable. The authors stated that the HTMT value, 0.90, should be under 0.85 for concepts that are distant from each other in terms of content. HTMT values are given in **Table 2**.

TABLE 1 | Divergence validity results (Fornell and larckell criterion).

Stress	Trait anxiety	Burnout	Quality of life	
Stress	**(0.912)**			
Trait anxiety	0.669	**(0.925)**		
Burnout	0.627	0.610	**(0.907)**	
Quality of life	0.678	0.705	0.721	**(0.892)**

Significant values are written in bold.

TABLE 2 | Divergence validity results (HTMT criterion).

Stress	Trait anxiety	Burnout	Quality of life
Stress			
Trait anxiety	0.731		
Burnout	0.689	0.667	
Quality of life	0.747	0.766	0.790

The values in parentheses in the table are the square root values of AVE. When the values in the table are examined, it is seen that the explained mean the square root of the variance of each structure is higher than its correlation with other structures.

When the values in the table are examined, it is seen that the HTMT values are below the threshold value. Based on the findings in **Tables 1**, **2**, it can be stated that the divergence validity was provided.

FINDINGS

A total of 240 people, 170 (70%) females and 70 (30%) males, participated in the study. The sociodemographic characteristics of the healthcare professionals participating in the study are presented in **Table 3**.

It is seen among the healthcare professionals participating in the study that 70% of them were female, 30% were male, 54% were married, 46% were single, %30 were doctors, 50% were nurses, 20% were assistant personnel, 47% had children, and 53% did not have children.

The differences between the stress, trait anxiety, burnout, and quality of life mean scores of healthcare professionals are presented in **Table 4**.

In **Table 4**, relationships between stress, trait anxiety, burnout, and quality of life scores and socio-demographic and other characteristics of healthcare professionals are observed.

The mean scores of stress ($t = -2.392$, $p = 0.017$, $X = 67.5$), trait anxiety ($t = 3.214$, $p = 0.001$, $X = 48.12$), and quality of life ($t = 0.73$, $p = 0.011$, $X = 14.2$) of female healthcare professionals were found to be significantly higher than those of men.

TABLE 3 | Sociodemographic characteristics of the healthcare professionals participating in the study.

	N	%
Gender		
Female	170	70
Male	70	30
Marital status		
Married	130	54
Single	110	46
Professional status		
Doctor	70	30
Nurse	120	50
Assistant personnel	50	20
Having children		
Had children	114	47
Didn't have children	126	53

TABLE 5 | Correlation values of the relationship between stress, trait anxiety, burnout levels, and quality of life of healthcare professionals.

		1	2	3	4
1.	Stress	–			
2.	Trait anxiety	0.64**	–		
3.	Burnout	0.46**	0.59**	–	
4.	Quality of life	−0.61**	−0.64**	−0.70**	–

**$p < 0.01$

TABLE 6 | Regression values regarding the effect of stress, trait anxiety, burnout levels of healthcare professionals on their quality of life.

	β	*t*	*p*(sig)
Stress	−0.359	−3.887	0.000
Trait anxiety	−0.025	−0.292	0.000
Burnout	0.176	−1.837	0.000

The mean scores of stress ($t = -2.380$, $p = 0.015$, $X = 61.9$), trait anxiety ($t = 3.012$, $p = 0.001$, $X = 44.21$), and burnout ($t = 1.789$, $p = 0.002$, $X = 29.67$) of married healthcare professionals were found to be significantly higher than those of single employees.

Considering the occupational status, the mean scores of burnout of the nurses ($t = 2.564$, $p = 0.004$, $X = 8.91$) were found to be significantly higher than the mean scores of doctors ($X = 8.41$) and other assistant personnel ($X = 8.14$).

The mean scores of stress ($t = -1.876$, $p = 0.013$, $X = 67.78$), anxiety ($t = 3.356$, $p = 0.001$, $X = 9.97$) and quality of life ($t = 3.325$, $p = 0.001$, $X = 49.11$) of healthcare professionals who had children were found to be significantly higher than those of employees who did not have children.

Findings regarding the correlations between the stress, anxiety, and burnout levels of healthcare professionals and their quality of life are presented in **Table 5**.

As seen in **Table 5**, high moderate positive correlations were found between stress and trait anxiety ($r = 0.64$; $p < 0.001$), burnout ($r = 0.46$; $p < 0.001$), and high and negative correlation was found between stress and quality of life ($r = -0.61$; $p < 0.001$). A moderate and positive correlation was found between trait anxiety and burnout ($r = 0.59$; $p < 0.001$) and a high and negative correlation was found between trait anxiety and quality of life ($r = -0.64$; $p < 0.001$). Again, a high and negative correlation was found between burnout and quality of life ($r = -0.70$, $p < 0.001$).

Multiple regression analysis was performed in order to test the effect of stress, trait anxiety, and burnout on quality of life, and the performed analyses are presented in **Table 6**.

When **Table 6** is examined, it is possible to see that the *F*-value for stress is 11.470 at 0.00 significance value level and adjusted R^2 is 0.196. Through the information obtained from the regression analysis, it is seen that stress, trait anxiety, and burnout explain the quality of life correlation variable by 19%. In addition, considering the *t*-statistics and *p*-values, it can be

TABLE 4 | The differences between the stress, trait anxiety, burnout, and quality of life mean scores of healthcare professionals.

	Stress			Trait anxiety			Burnout			Quality of life		
	X	Ss		X	Ss		X	Ss		X	Ss	
Gender												
Female	67.5	13.3	*t* = −2.392	48.12	9.37	*t* = 3.214	30.1	9.24	*t* = 1.324	14.2	3.87	*t* = 0.731
Male	62.3	15.7	***p* = 0.017***	46.17	9.27	***p* = 0.001***	28.7	8.82	*p* = 0.122	13.8	3.14	***p* = 0.011***
Marital status												
Married	61.9	12.7	*t* = −2.380	44,21	9,54	*t* = 3.012	29.67	8.21	*t* = 1.789	22.61	4.41	*t* = 1.941
Single	56.4	13.8	***p* = 0.015***	40,31	9,21	***p* = 0.001***	28.22	6,98	***p* = 0.002***	19.87	4.23	*p* = 0.145
Professionals status												
Doctor	55	13.1	*t* = 1.301	45.98	9.56	*t* = 1.698	29.34	8.41	*t* = 2.564	14.29	3.65	*t* = 1.365
Nurse	62	14.7	*p* = 0.174	44.25	11.03	*p* = 0.081	26.98	8.91	***p* = 0.004***	13.62	3.56	*p* = 0.114
Assistant personnel	60	14.1		49.52	12.41		24.15	8.14		11.75	3.62	
Having children												
Had children	67.78	14.89	*t* = −1.876	47.23	9.97	*t* = 3.356	29.56	7.84	*t* = 1.623	49.11	8.44	*t* = 3.325
Didn't have children	62.17	14.97	***p* = 0.013***	42.15	9.00	***p* = 0.001***	29.22	7.99	*p* = 0.121	44.29	9.45	***p* = 0.001***

*Significant values are written in bold. *$p < 0.01$.*

seen that there is a negative correlation between the independent variables and the dependent variable. This situation indicates that stress, anxiety, and burnout have a negative effect on the quality of life.

DISCUSSION

The coronavirus pandemic, which has deeply affected the world, has caused the death of thousands of people, and with the onset of the pandemic, healthcare professionals have had to work at a very busy pace. In our study, the effect of stress, trait anxiety, and burnout levels of healthcare professionals working during the COVID-19 pandemic on their quality of life was investigated.

Correlations between scores of stress, trait anxiety, burnout, and quality of life and socio-demographic and other characteristics of healthcare professionals were examined, and the mean scores of stress, trait anxiety, and quality of life of female healthcare professionals were found to be significantly higher than those of males. In the study conducted by Zhu et al. (2020) with 5,062 healthcare professionals in Tongji hospital in Wuhan, China, the stress scores of female employees were found to be higher. In the study conducted by Lai et al. (2020), stress levels of women were found to be high, and in another study conducted with employees in COVID-19 services in China, it was observed that nurses developed more psychological symptoms than physicians, and women developed more psychological symptoms than men (Huang et al., 2020). These findings support our study. According to the research findings, it was found that women experienced more work-related stress. This situation can be interpreted as women's responsibilities related to social life and family outside of work cause them to be exposed to more stress. In the study conducted by Barello et al. (2020) with 376 healthcare professionals, the burnout levels of female healthcare workers were found to be higher than those of males.

The mean scores of stress, trait anxiety, and burnout of married healthcare professionals were found to be significantly higher than those of single employees. Working in a hospital where COVID-19 treatment is provided causes state anxiety levels. The increase in the weekly working hours of healthcare professionals increases the levels of anxiety and despair.

Considering the occupational status, the mean scores of burnout of the nurses were found to be significantly higher than the mean scores of doctors and other assistant personnel. In the study conducted by Hacimusalar et al. (2020), anxiety scores of nurses were found to be higher than other employees. This may be caused by the fact that nurses' working conditions involve more negative changes compared to other healthcare professionals during the pandemic period. The fact that nurses have more physical contact with patients than doctors in inpatient wards may be an important factor. In a study conducted by Li et al. (2016) with nurses and doctors, it was reported that negative life events were associated with depression and anxiety symptoms, doctors experienced more work-related negative events than nurses, but nurses displayed higher levels of anxiety and depression (Li et al., 2016). In the study conducted by Barello et al. (2020) with 376 healthcare professionals, burnout levels of nurses were found to be higher than other healthcare professionals.

The mean scores of stress, anxiety, and quality of life of healthcare professionals who had children were found to be significantly higher than those of employees who did not have children. In the study conducted by Hacimusalar et al. (2020), the anxiety levels of those who had children were found to be higher. These findings support our study. Schools have been evacuated during the pandemic and the children have had to stay home. This situation has caused many problems for working parents such as the care and education of their children. Parents who cannot get permission from work since they have to work have had difficulty finding someone to take care of their children, some of the babysitters have quit their jobs and the difficulties of working parents have increased. It is an expected result that such stressful life events cause an increase in the anxiety levels of individuals.

High, moderate, and positive correlation was found between stress, anxiety and burnout levels of healthcare professionals and their quality of life; high, moderate, and positive correlation was found between stress and trait anxiety, burnout; high and negative correlation was found between stress and quality of life. A moderate and positive correlation was found between trait anxiety and burnout, and a high and negative correlation was found between trait anxiety and quality of life. Again, a high and negative correlation was found between burnout and quality of life.

High, moderate, and positive correlation was found between stress and trait anxiety, burnout of healthcare workers, and a high and negative correlation was found between stress and quality of life. A moderate and positive correlation was found between trait anxiety and burnout, and a high and negative correlation was found between trait anxiety and quality of life. Again, a high and negative correlation was found between burnout and quality of life.

In the study conducted with 376 healthcare workers in Italy, one of the countries most affected by the COVID-19 outbreak, the burnout levels of employees were found to be very high (Barello et al., 2020).

In the study conducted with 1,422 healthcare workers during the COVID-19 epidemic in Spain, a total of 56.6% of their employees' post-traumatic stress disorder symptoms were observed, in 58.6% anxiety disorder, in 46% depressive disorder, and in 41.1% emotional burnout (Luceño-Moreno et al., 2020). These findings support our study.

LIMITATIONS

Furthermore, there is a high proportion of women compared to men. Other studies have shown the same limitation (Gallè et al., 2020; Zhong et al., 2020). In this case, one of the main reasons for this difference is that, in many positions, such as nurses and nursing assistants, the majority of the positions are occupied by women. Another limitation has to do with the cross-sectional design of the study: the pandemic has not yet finished and its influence on mental health cannot be reflected in this research,

so it would also be advisable to carry out a longitudinal study that evaluates the evolution over time of the symptoms assessed in this work. On the other hand, there has not been a previous situation in Turkey in which there has been a lockdown, and it is likely that after its ending, the levels of experienced symptomatology will be lower. However, during the SARS crisis, other authors have found that the symptoms of psychological problems after the quarantine period of the disease have lasted up to 3 years later. In the long term, the effects of post-traumatic stress disorder, anxiety and burnout will depend on the possible outbreaks of COVID-19. The measures currently being taken in order to adapt the work place to the new situation (such as providing protective equipment or increasing the number of healthcare professionals) are relevant for mitigating these symptoms. If the appropriate actions to protect health care providers are not taken, they may make medical errors in the future, present higher burnout levels associated with depressive symptoms, anxiety, suicidal ideation, have poorer interpersonal relationships or develop substance abuse. Therefore, a follow-up study along the next few months becomes necessary.

CONCLUSION AND SUGGESTIONS

At the end of the research, it was determined that the stress, anxiety, and burnout of healthcare professionals working during the COVID-19 pandemic had a negative effect on their quality of life.

The healthcare system is among the institutions operating under the most challenging conditions during the period of outbreaks like pandemic which affects the whole world and leads to deaths. During pandemics that affect the society in terms of socioeconomic and mental aspects, the mental health of healthcare teams, who undertake a heavy social and work load, is affected by this situation.

One of the issues that countries should be prepared for in possible future outbreaks such as COVID-19 is taking necessary protective and supportive mental-social measures to protect the mental health of healthcare teams working at the front line as well as their physical health so that they can provide a functional service. In line with this purpose, the following suggestions have been made:

- In order to reduce the mental damage of COVID-19 among healthcare workers, mental health intervention teams can be organized, brochures can be prepared, and a range of mental services including counseling and psychotherapy can be provided to employees and their families.
- Similarly, video interview programs, stress management programs, and group programs aiming at communicating, talking, sharing experiences, and expressing fears and hopes at the end of a working day can be created in order to provide individual mental support for employees in COVID-19 units.
- More healthcare professionals can be recruited in order to reduce the pressure and workload on healthcare professionals.
- One of the most troubling issues during the pandemic was the inconveniences in accessing appropriate protective equipment. Personal protective equipment can be provided for healthcare professionals.
- Working hours can be re-planned by planning the need for rest of the healthcare professionals and creating working and resting environments that will ensure that not only the risk of infection but also other risk factors arising from insomnia and fatigue are taken under control.
- Supportive administrative practices are suggested to be carried out in order to reduce the stress and anxiety levels of healthcare professionals.
- Regardless of whether future outbreaks are the result of natural or man-made events such as bioterrorist threats or not, it is important to recognize gaps in policies and practices and to develop comprehensive strategies and make investments in order to manage and alleviate infectious disease outbreaks.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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The Impact of the Economic Corridor on Economic Stability: A Double Mediating Role of Environmental Sustainability and Sustainable Development Under the Exceptional Circumstances of COVID-19

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This study discusses the impact of different economic indicators on economic stability, including honest leadership, improved infrastructure, revenue generation, and CPEC taking into account the double mediating role of environmental sustainability and sustainable development, while considering the latest COVID-19 situation. This study adopted primary data collection methods and obtained data from the employees of CPEC by using questionnaires and smart-PLS for analysis purposes. The results revealed that honest leadership, improved infrastructure, revenue generation, and CPEC have a positive nexus with economic stability. Despite the severe impact of COVID-19 on the country's economy, the economic corridor plays a vital role in stabilizing the state's economy and supports all those related to this phenomenal project either directly or indirectly.

Keywords: COVID-19, CPEC project, economic stability, environmental sustainability, sustainable development

INTRODUCTION

Corridors are important for managers and consumers and play a vital role in bringing economic and social development (Muro-Rodríguez et al., 2017). Considering this importance, China and Pakistan have started a new mega project named the China Pakistan Economic Corridor (CPEC). This project is considered a new hope for a secure future. This project makes trade and transportation of goods easy for Chinese people, and it provides a lot of benefits in terms of technology and infrastructure development. CPEC was declared as a new and innovative venture in the year 2003. This project is a part of China's One Belt One Road (OBOR) initiative and was started by the Chinese government in 2013. This project is focused on the connectivity of different continents like Europe, Africa, and Asia. CPEC is considered a small part of OBOR (Ibragimov et al., 2019).

It is still regarded as the most extensive project between two immediate neighbors, i.e., Pakistan and China (Haraguchi et al., 2019). CPEC is not a single project, but it is a nexus of a colossal

number of developmental projects. Pakistan is a developing country. This country faces many problems like lack of resources, increased taxes, foreign debts, political leader corruption, and economic crisis. These problems have incentivized government authorities. The government of Pakistan is trying to improve the current situation by utilizing native resources (Tarofder et al., 2019). Pakistan's economic condition was not stable previously, and that is why policymakers and technocrats have advised the government authorities to promote collaboration with different neighboring countries. Other countries with sound investment plans can be proven as the right investment partners for Pakistan (Daniëls et al., 2019).

Pakistan is blessed with many natural resources, while China has started exploring all of Pakistan's resources. The problems of illiteracy, and social and political pressures had created hurdles in the way of Pakistan's prosperity (Huang et al., 2017; Alvesson and Einola, 2019). Nowadays, Chinese and Pakistani professionals are trying to devise new ways to explore novel resources. Unskillful and illiterate labor also affects the progress of many projects. Technological advancement and different automated machines are an unknown to the inhabitants of these areas (Asif and Ling, 2019; Garfield et al., 2019). The literacy rate of the inhabitants of these hilly areas near Gwadar port and Gilgit is relatively low. The government should establish skill development institutions and IT firms to assist in the economic and social development of these areas. The unity and cooperation between the Chinese and Pakistani populations is evident in many areas. Chinese people are amicable, and they indulge themselves in developing CPEC and related projects in Pakistan. The new bonding experience between ordinary people of both countries increases daily (Yu, 2017; Hassan, 2020).

China Pakistan Economic Corridor consists of multi developmental projects that are foreseen as the prospects for Pakistan and China's success. The Chinese government has conceptualized CPEC as a dream of success, and Pakistan is materializing this dream as a bright future. The local Pakistani community is also delighted and excited about this project (Badawi et al., 2019). The educational reforms, infrastructure development, revenue generation, and technological advancements have improved the local community's lifestyle. The past few years were dreadful and fearful for the residents of Khyber Pakhtunkhwa and Balochistan, Pakistan. That is why some local people were against Chinese intervention and entrance into their local territory. Security-related issues were faced initially by the government of Pakistan. A proper education and awareness-related campaign was started in those areas to educate people about the benefits of the China/Pakistan friendship and CPEC. This education and awareness campaign has brought forth excellent outcomes. The developmental activities like educational institutions, skill development institutions, and modernized infrastructure have reshaped people's lifestyles (Hussain, 2019).

The economy's productive base includes its capital assets (produced, human, and natural capital stocks; knowledge) and its institutions (including its cultural coordinates). Together, they supply citizens with the infrastructure they create, use, and exchange. The productive foundation of a culture is the root of its wellbeing. It should be remembered that there is a broad range of resilient items, specific tangibles like buildings and equipment, land and wildlife, trees, and shrubs. While some intangible things like patentable ideas, legal system cultural coordinates, and human resources with shared aspirations need to be considered (Dasgupta, 2007; Awais et al., 2019).

Scope, complexity, and urgency differentiate environmental sustainability. Firstly, the sense of sustainability spans the fields of culture, society, and people to cover the natural environment: air, soil, water, etc. This broadened focus has many consequences, such as environmental performance convergence and the need for innovative testing methodologies and indicators. Second, phenomena of sustainability are dynamic and multi-layered, sometimes distinguished by unclear interdependencies and non-linearity. The dilemma includes alternate frames including logical ones (economic factors such as competitiveness and profitability), ecological ones (environmental protection, including management of natural resources, and climate mitigation), humanistic ones, i.e., personal fulfillment and societal interests such as equal trading policies and ideal rights (Wright, 2002; Martins et al., 2010).

China has a tremendous think tank, and its government has always supported Pakistan. This friendship is growing stronger day by day. The development of the economy of Pakistan is due to the honest efforts of China. In 2013, the Chinese president proposed the Silk Road Economic belt to connect the Baltic Sea with the Pacific Ocean. This project was the necessary foundation of CPEC and the economic stability of Pakistan. It gave them a thought to construct new infrastructure and buildings to provide a *trans*-Eurasian passage for trade. Pakistan is the center point of this passage. That is why China considers CPEC as a vital pathway of trading and economic stability for all Eurasia countries (Jia, 2017; Rahman, 2018; Saud, 2018).

The importance of CPEC and related projects have gained the focus of a lot of other countries like Saudi Arabia. The primary contribution of CPEC is that it enhanced the local public's assistance in developing the country's economy and infrastructure. The reforms regarding the revenue generation for the wellbeing of the nation's economy is enormous. Pakistan and China both have some common traditions and business interests. They both have the same strategic positions and face combined threats with great bravery and brotherhood. The recent technological advancements in the police force and army of both countries have also eliminated the security-related risks of the countries and their adjacent neighbors (Ahmed et al., 2018).

Forensic experts have devised many new techniques to resolve terrorist-related concerns of that area. The Pakistani government has provided many police resources and the forensic branch closely checks all activities related to militancy and terrorist activities in this region. They have ensured the security of all Chinese professionals in the country on an exceptional basis and have properly secured apartments in Pakistan. They have provided proper food and water resources for their foreign friends, and hence the economy and revenue-related departments are also blooming under CPEC and related projects.

While considering all the above, it is also imperative to consider natural disasters that could harm any project's

applicability. Either this project is executed on a significant scale or a minor scale. The same is the case with the current COVID-19 situation. Nobody could think that a single virus would be powerful enough to jeopardize the entire world's economy so disastrously. That is why this study bears significant importance in researchers' and other stakeholders' eyes that either this mega project sustains under this extreme pandemic situation and supports the economy of concerned and relevant countries or collapses on its foundations while fighting with this unexpected natural disaster.

LITERATURE REVIEW

A moderate amount of research is being conducted by Pakistani and Chinese researchers such as Abid and Ashfaq (2015) who discuss CPEC challenges and opportunities, Ali et al. (2018) who found an energy crises bottleneck and suggested solutions, Chen et al. (2018) who show concerns on heavy investments, Khuhro et al. (2019) who investigated the readiness for organizational change due to CPEC, and Sun et al. (2020) who talked about socio-cultural impacts of CPEC on community wellbeing. This social wellbeing is the result of honest and diligent Chinese leadership that has provided Pakistan with ample working resources and funding in terms of business, employment, and working opportunities. CPEC is a project that will benefit future generations. It will provide the Chinese and Pakistani public with the most effective platform for their countries' development and prosperity (Makhdoom et al., 2018). The proper regulatory measures are necessary to gauge the efficacy of all working and planning initiatives. A regulatory task force must be designed by combining the skilled personnel of both Chinese and Pakistani origins who will effectively audit all budgeting and fund-related matters. They have to give monthly, and yearly audit reports to the government so that both governments are well aware of the project's pace. The social media advertisement of CPEC and related projects is necessary to spread the knowledge to Chinese and Pakistani natives and the international audience so that budgeting and investment-related areas can flourish more effectively.

Hegemonic Stability Theory

In the previous period, the economy's position was reduced, and countries mostly worked on their military might. Ties with other countries relied on the army itself and their friends and allies on the military force. But the market has now become an essential instrument for developing a non-military formidable force. Countries with economic power may be using a carrot and stick method to exert leverage over trade, financing, aid, grants, and impacts on poorer nations. Rising economic interdependence triggered the critical factor of hard power in the economy (Ahmed, 2019; Hao et al., 2020; Hassan, 2020).

Following these national interest changes, this research work considers the Hegemonic stability theory that is based on international relations and is rooted in the field of economics. This theory argues that economic openness brings stability. Apart from criticism on Hegemonic theory, this theory is widely considered due to its two versions, the first one discusses stability due to a single dominant state, while, the second explains that by taking insights from game theory that logic of collective good brings economic stability (Webb and Krasner, 1989). CPEC is a win-win project between two allied countries that is beneficial for both countries. This research work considers the second Hegemonic stability approach and all hypothesis are build by considering this logic.

Honest Leadership and Economic Stability

Pakistan is currently facing leadership issues. The two previous ruling parties and their principal leaders were proven to be the most corrupt leaders of the world. They have looted the resources and financial budget of Pakistan. They destroyed the country's economic stability and devastated Pakistan's international reputation and its native business community. The foreign investment and stock exchange trends dropped drastically after the proclamation of their corruption in colossal money laundering scandals (Ali et al., 2018; Khan et al., 2020). Chinese leaders are quite diligent and honest in this regard. China is the second-largest economy globally, and it is all due to its leaders and the public's efforts. The social reforms and efficient justice procedure implementation are necessary for the betterment of all developmental projects.

China Pakistan Economic Corridor is making remarkable progress in this government's tenure as the regulatory authorities have been quite active in this period. Proper auditing and honest, enthusiastic leadership will surely enhance and support Pakistan and China's economic stability. Sincere and devoted leaders make the country stable and provide investment and funding opportunities from overseas (Ali et al., 2018). Honest leadership plays an essential role in economic stability. Real leadership will never use short cuts. Simultaneously, dishonest leadership will destroy any country economically because a fraudulent leader's purpose will be to earn money at any cost in any circumstances. Corruption is another factor that could be damaging to any economy (Khan et al., 2020).

Dishonorable leadership would negatively use their power (Hussain, 2019; Syed, 2020). For example, wrong or substandard proposals would be approved for personal gain that could harm the economy. At the same time, honest leadership would believe in gradual economic progress.

H1: There is a significant positive association between honest leadership and economic stability in the country.

Improved Infrastructure and Economic Stability

The economy will cover factors such as manufacturing ability and technologies for other entities. Thus, it eventually takes over the military as a significant factor in its control of other countries or states. No country can sustain its military power by investing a lot of capital, resulting from a stable economy. Even if the nation is geographically fine, there is a considerable reserve of natural resources and broad military forces; however, it cannot sustain without a healthy economy (Ahmed et al., 2018).

Infrastructure development is related to a modern, well-developed information technology structure while also considering modern marketing and developmental plans (Sadiq et al., 2020a). The current and well-established routes will provide efficient and advanced transportation facilities to the trading companies and business community (Rimovna and Gennadievna, 2019). The investors become happy when they do not suffer from any loss caused by product damage. The creation of modernized and digitalized police stations and other regulatory authority headquarters also prohibits illegal smuggling practices. These things provide considerable profits to the local business community and international investors (Shabbir and Zeb, 2019). The revolutionized infrastructure and related aspects have provided economic stability to Pakistan and China.

Infrastructure is important for economic stability. If roads are available in a country, things could be sent to market quickly, and the state will grow economically. Similarly, if public transport is easily accessed, then the economy will grow. The working environment is also essential for economic growth. If the working environment is right, then people will do a large amount of work in a short time. And if the working environment is not correct, people will do less work in the same time frame (Garfield et al., 2019; Sadiq et al., 2020b). Facilities also play a crucial role in economic stability. If the people are facilitated, then this will definitely be the cause of economic stability. Otherwise, it can create an economic depression. A competitive environment is also essential in financial stability. In a competitive environment, any country's economy will grow within a short time. Airports are also a necessary part of economic stability. Through an effective supply chain of transportation and planes, deliveries will be at their highest and will be sent from one destination to another within a short time. Transport is also critical in economic stability. Through transportation, items will be moved from one city to another easily within time. Fair and handsome wages are also significant for economic stability. If an employer pays attractive salaries to their employees, they will be interested in working, and business and the market will grow. Equal opportunities also play an essential role in economic stability. The workers will want to work in a competitive environment (Mehar, 2017; Rehman et al., 2018).

H2: There is a significant positive association between improved infrastructure and economic stability in the country.

Revenue Generation and Economic Stability

The increased number of tourist visits to northern and hilly areas of Pakistan has provided a lot of revenue to Pakistan, which boosts the economy into becoming more progressive and stable (Kokot et al., 2020). The modernized and digitalized system of tourist resorts and other recreational areas helped a lot in developing and portraying a positive image of Pakistan to the whole world (Šušić et al., 2019). In the previous year, Pakistan's economy and peace have been sabotaged by terrorism and other problems. The involvement of Chinese visitors and the government has changed this situation altogether. The improved revenue generation has made remarkable progressive outcomes to support Pakistan's economy (Hardy et al., 2019). China has advertised Pakistani tourist destinations and made them more attractive for foreigners to visit them without any security-related concerns.

H3: There is a significant positive association between revenue generation and economic stability in the country.

CPEC and Economic Stability

China Pakistan Economic Corridor acts as a nexus of hope and development for Pakistan's weak economy. Chinese support and efforts are remarkable in this regard. The involvement of Saudi Arabia helped improve Pakistan's economy (Beg et al., 2019). CPEC brings support for the economy and the trading, education, and IT-related areas of Pakistan. The bonding between the two countries has proven that CPEC has a strong bond to the world's economy and business communities (Shahzad and Javaid, 2020; Sharma et al., 2020). Many contributions have been enumerated through the development of CPEC; therefore, boosted economies have a broad impact over CPEC contributions. Developed economies significantly invest in projects to gather higher returns or attain various benefits that have essential aspects for boosted economies and people's living standards (Stanley and Zhang, 2020). Improved living standards have provided people with confidence in their country's government (Tipene-Leach and Abel, 2019). A significant boost is linked with Pakistan's economy while emphasizing the cordial ties of CPEC, contributing to Pakistan's development and economic growth (van Laar et al., 2019). Boosted economies of various developed countries significantly influence countries' projects with the eminent significance of elements (Khan et al., 2016). Where the economies have been boosted from the projects with international importance, the countries could positively spend all possible amenities that the government retains for its public (Kusdibyo et al., 2019).

Economic relations are mostly dependent on projects that significantly impact countries (Kakar and Khan, 2020). Therefore, countries with strong connections due to joint projects could quickly develop strong relations to counter international pressures. Relationships between countries due to similar projects or collective investments could develop into a friendly relationship and develop economic ties. Countries' interests are primary aims; therefore, in CPEC, national and economic interests are more dominated by the elaboration of various initiatives. At the same time, they emphasize the projects that have significant importance, and relations between countries and their native people (Saad et al., 2020). CPEC ventures include educational institutes, companies, housing, work openings, and how these ventures will improve their future and help the community (Cole et al., 2020). The results of this research study would show that policymakers and officials are receiving support from local citizens for the CPEC project and therefore create policies to take local citizen advantages into account in future projects. Therefore, based on literature and past research, we establish a model representing the resident's expectations and advantages of CPEC construction projects (Hao et al., 2020).

H4: There is a significant positive association between China Pakistan Economic Corridor (CPEC) and economic stability in the country.

Sustainable Development

Sustainable development is a combination of fiscal, environmental, and social aspects. Sustainable development is defined by the World Wildlife Fund-WWF for Nature in 1993 as "the enhancement of human quality of life in the capacity to sustain ecosystems" (Goodland, 1995; Awais et al., 2019). The World Environment and Development Commission (hereinafter WCED) says: "[we need] development which reacts to the requirements of the present era generation without sacrificing the future's capacity to fulfill its requirements." As a controlling norm for economic, social, and environmental development, the United Nations adopts sustainability as a way to satisfy requirements to meet its needs without giving potential cycles and to encourage "impartial redistribution of natural costs and financial changes within and across countries" (Zhang et al., 2017). According to WCED, sustainability includes the strengthening of environmental and natural infrastructure and the provision of current and prospective ancestors' economic and social welfare. Sustainability has been recognized as the critical regulatory criterion and standard for a modern society to have an expanded normative association between current and potential cohorts. Sustainability is a centralizing idea that represents ecological, environmental, and social aspects as three elementary aspects, meaning the pillars of sustainability need to contemplate human, economic, and natural resources (Kajikawa, 2008; Schoolman et al., 2012). This research seeks to examine the critical foundations of sustainability and address synergies for the essential purpose of sustainable growth. The three facets of sustainability undertaken may have both beneficial and detrimental consequences. In the course of community theses, synergies were revealed and researched and recognized for local economic income by economic tourism, such as scenic scenery, biodiversity, and a high environmental standard, from which neighborhoods would benefit (Gurung and Scholz, 2008).

H5: Sustainable development positively mediates the positive association between honest leadership and economic stability in the country.

H6: Sustainable development positively mediates the association between improved infrastructure and economic stability in the country.

H7: Sustainable development positively mediates the association between revenue generation and economic stability in the country.

H8: Sustainable development positively mediates the association between China Pakistan Economic Corridor (CPEC) and economic stability in the country.

Environmental Sustainability

The researchers certainly embodied the idea of economic sustainability (Ali, 2018). There is a need to preserve the environment/nature from uncontrolled expansion before it is too late, we must protect human wellbeing (Awais et al., 2019). The means of development in many areas of the world intensify why groundwater, fishing, tropical forests, top-soil, and biodiversity are collapsing and dispersing their once-existing patrimony. The rapid loss of vital resources, air quality, and land destruction confirm that human industrial activities are significantly disrupting global environmental support and that potential biophysical transport capacity is more likely to be reduced (Zhang et al., 2017). The foreign allocation of investments abroad promotes economic development and shifts its environmental threats to the host countries. For emerging technology that is less energy-intensive and for renewable resources, additional financial help, and sustainable development paths are needed (Ali, 2018; Awais et al., 2019). Northern Pakistan (NP) is host to three of the world's largest glaciers. There are 5218 square miles (approx. 15,040 km2) of glaciers and snow covers 2738 square miles. Unfortunately, these glaciers disappear day by day because of several global changes and anthropogenic actions (Gilany and Iqbal, 2016). Due to the CPEC project, nearly 7,000 trucks will travel through this region every day and emit more than 36.5 million tons of CO_2. This release would relentlessly minimize the glaciers and contribute to extreme water overflow (Laghari, 2013). Also, several businesses would be seriously impacted in some places due to the water crisis, including irrigation, food production for the rising population, hydropower generations, and water-based operational industries. A degraded natural climate, massive glacial scaling, and shifts in the patterns caused by massive CPEC travel will damage biodiversity (Nabi et al., 2017). Aquatic biodiversity on the coastline of the Gwadar Port, the Arab Sea, and Pakistan will be greatly influenced. The areas beside the CPEC routes are particularly vulnerable to climate change owing to the recent global warming patterns (Asmat et al., 2018).

H9: Environmental sustainability positively mediates the positive association between honest leadership and economic stability in the country.

H10: Environmental sustainability positively mediates the association between improved infrastructure and economic stability in the country.

H11: Environmental sustainability positively mediates the association between revenue generation and economic stability in the country.

H12: Environmental sustainability positively mediates the association between China Pakistan Economic Corridor (CPEC) and economic stability in the country.

RESEARCH METHODS

For the high rate of economic growth, stability in economic conditions is needed. CPEC plays a vital role in the economic stability in both China and Pakistan. This study highlights the double mediating role of environmental sustainability and sustainable development between honest leadership,

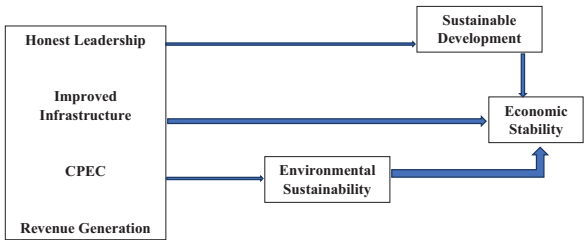

FIGURE 1 | Theoretical model.

improved infrastructure, revenue generation, CPEC, and economic stability.

This study uses a quantitative method to analyze the data acquired and examine the proposed hypotheses' accuracy. The data for our research have been obtained from the officials and employees involved in the CPEC project. Simple random sampling has been applied to collect relevant data and analyze the data, and for the validity of hypotheses, smart PLS has been adopted. The required data supporting our study have been acquired by distributing questionnaires among officials and employees involved in CPEC. For this study, 570 questionnaires were sent to the target employees and officials. Out of which, 354 were returned, meaning that 62.11% of the targets responded.

The study has four economic stability indicators: honest leadership, improved infrastructure, CPEC, and revenue generation with different questionnaire items. The honest leadership (HLS) section has four items (Abdullah et al., 2016) in relation to economic stability while improved infrastructure (IIFS) has six items (Chuang and Lin, 2013). Revenue generation (RG) also has six items (Rust et al., 2002) and CPEC is comprised of five items (Saad et al., 2019). Besides, the dependent variable in this study, which is the economic stability, has five items. The study has two mediators named as environmental sustainability (ES), which has six items (Green et al., 2019), and sustainable development (SD), which has four items (Kushwaha and Sharma, 2016). All these indicators are shown with the help of **Figure 1**.

The outcomes of the study show the assessment of structural and measurement model (**Figure 2**). Firstly, the measurement model's assessment has been executed, and convergent validity is part of the measurement model assessment. It has been checked first for the correlation between items. The results indicated that there was valid convergent validity and the extensive correlation between items because the values of Alpha along with CR were across the standard of 0.70; on the other hand, the values of loadings and CR were higher than 0.50. These figures are shown in **Table 1**.

Secondly, the measurement model assessment was executed with the help of discriminant validity for the correlation between variables. Fornell-Larcker and cross-loadings were used to check

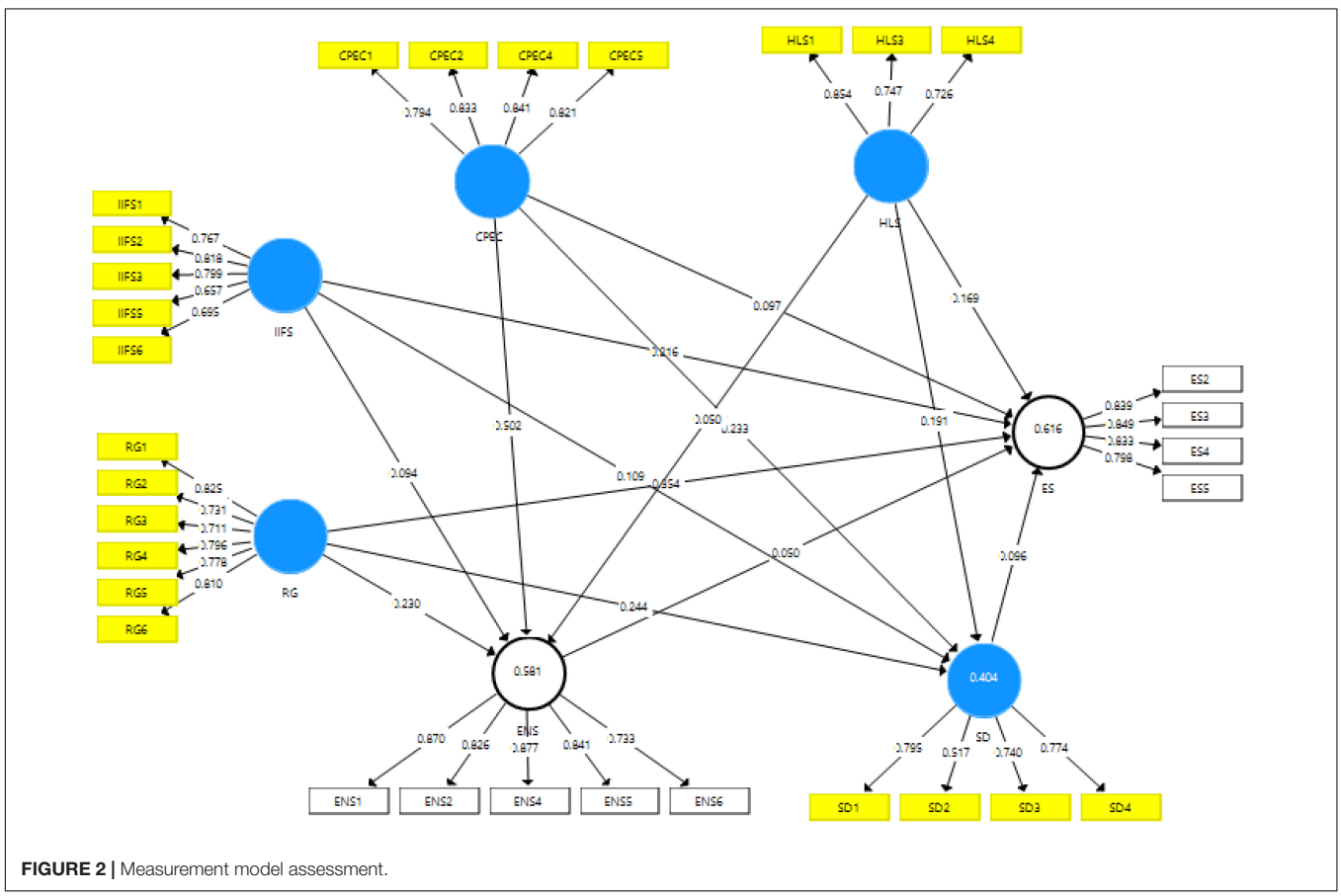

FIGURE 2 | Measurement model assessment.

the discriminant validity. The results indicated that there was valid discriminant validity and low correlation between variables because the values that show association with the construct itself were larger than the values exposed to the association with other constructs. These figures are highlighted in **Tables 2**, **3**.

Secondly, the Heterotrait-Monotrait (HTMT) ratio was used for checking the discriminant validity, and the results indicated that there was valid discriminant validity and low correlation between variables because the values were less than 0.90. These figures are highlighted in **Table 4**.

The structural model assessment was made using path analysis. The results revealed that honest leadership, improved infrastructure, revenue generation, and CPEC had a positive nexus with economic stability and accepted H1, H2, H3, and H4. The outcomes also revealed that sustainable development positively mediated among the nexus of honest leadership, improved infrastructure, revenue generation, CPEC, and economic stability and accepted H5, H6, H7, and H8. Finally, the outcomes also revealed that environmental sustainability positively mediated among the nexus of honest leadership, improved infrastructure, revenue generation, CPEC, and economic stability and accepted H9, H10, H11, and H12. These figures are shown in **Table 5**.

Figure 3 depicts the assessment of the structural model which has seven variables, and each variable has its items with regression weights. All variables and item regression weights are up to standard and follow statistical considerations.

TABLE 1 | Convergent validity.

Constructs	Items	Loadings	Alpha	CR	AVE
CPEC	CPEC1	0.794	0.840	0.893	0.676
	CPEC2	0.833			
	CPEC4	0.841			
	CPEC5	0.821			
Environmental sustainability	ENS1	0.870	0.887	0.918	0.691
	ENS2	0.826			
	ENS4	0.877			
	ENS5	0.841			
	ENS6	0.733			
Economic stability	ES2	0.839	0.849	0.898	0.689
	ES3	0.849			
	ES4	0.833			
	ES5	0.798			
Honest leadership	HLS1	0.854	0.775	0.820	0.605
	HLS3	0.747			
	HLS4	0.726			
Improved infrastructure	IIFS1	0.767	0.802	0.864	0.562
	IIFS2	0.818			
	IIFS3	0.799			
	IIFS5	0.657			
	IIFS6	0.695			
Revenue generation	RG1	0.825	0.869	0.901	0.602
	RG2	0.731			
	RG3	0.711			
	RG4	0.796			
	RG5	0.778			
	RG6	0.810			
Sustainable development	SD1	0.795	0.773	0.803	0.511
	SD2	0.517			
	SD3	0.740			
	SD4	0.774			

TABLE 2 | Fornell-Larcker.

	CPEC	ENS	ES	HLS	IIFS	RG	SD
CPEC	0.822						
ENS	0.726	0.831					
ES	0.622	0.586	0.830				
HLS	0.572	0.484	0.551	0.778			
IIFS	0.542	0.519	0.611	0.411	0.750		
RG	0.628	0.623	0.702	0.472	0.574	0.776	
SD	0.555	0.537	0.548	0.484	0.454	0.543	0.715

TABLE 3 | Cross-loadings.

	CPEC	ENS	ES	HLS	IIFS	RG	SD
CPEC1	**0.794**	0.571	0.522	0.332	0.427	0.505	0.451
CPEC2	**0.833**	0.589	0.553	0.365	0.441	0.555	0.441
CPEC4	**0.841**	0.634	0.486	0.563	0.468	0.491	0.477
CPEC5	**0.821**	0.593	0.487	0.622	0.447	0.515	0.455
ENS1	0.600	**0.870**	0.441	0.418	0.408	0.432	0.481
ENS2	0.593	**0.826**	0.563	0.342	0.462	0.585	0.414
ENS4	0.668	**0.877**	0.478	0.482	0.430	0.510	0.492
ENS5	0.673	**0.841**	0.473	0.447	0.466	0.472	0.502
ENS6	0.466	**0.733**	0.472	0.317	0.380	0.588	0.332
ES2	0.552	0.521	**0.839**	0.554	0.519	0.554	0.422
ES3	0.494	0.455	**0.849**	0.410	0.514	0.622	0.484
ES4	0.501	0.463	**0.833**	0.392	0.534	0.602	0.469
ES5	0.519	0.508	**0.798**	0.472	0.458	0.552	0.445
HLS1	0.564	0.451	0.505	**0.854**	0.386	0.441	0.471
HLS3	0.331	0.279	0.369	**0.747**	0.235	0.273	0.319
HLS4	0.403	0.377	0.393	**0.726**	0.317	0.364	0.314
IIFS1	0.391	0.327	0.432	0.297	**0.767**	0.452	0.343
IIFS2	0.416	0.361	0.486	0.290	**0.818**	0.514	0.377
IIFS3	0.379	0.320	0.515	0.310	**0.799**	0.473	0.353
IIFS5	0.383	0.437	0.396	0.316	**0.657**	0.337	0.281
IIFS6	0.452	0.488	0.448	0.322	**0.695**	0.367	0.339
RG1	0.506	0.489	0.668	0.395	0.482	**0.825**	0.547
RG2	0.576	0.594	0.630	0.409	0.520	**0.731**	0.413
RG3	0.368	0.428	0.557	0.400	0.347	**0.711**	0.442
RG4	0.493	0.470	0.448	0.331	0.454	**0.796**	0.354
RG5	0.483	0.445	0.416	0.340	0.414	**0.778**	0.348
RG6	0.473	0.438	0.468	0.293	0.426	**0.810**	0.374
SD1	0.418	0.385	0.417	0.389	0.404	0.400	**0.795**
SD2	0.309	0.242	0.273	0.264	0.229	0.279	**0.717**
SD3	0.482	0.486	0.486	0.365	0.342	0.476	**0.740**
SD4	0.346	0.377	0.351	0.350	0.297	0.362	**0.774**

The values are related to HTMT analysis which is used to analyze discriminant validity of items. The values in bold highlight that these values are greater than the values which appear after them, hence proving that these items fulfill the criteria of discriminant validity.

TABLE 4 | Heterotrait-Monotrait ratio.

	CPEC	ENS	ES	HLS	IIFS	RG	SD
CPEC							
ENS	0.838						
ES	0.737	0.675					
HLS	0.737	0.611	0.716				
IIFS	0.659	0.612	0.738	0.545			
RG	0.728	0.701	0.796	0.593	0.679		
SD	0.727	0.677	0.711	0.697	0.607	0.684	

TABLE 5 | Path analysis.

Relationships	Beta	S.D.	*t*-statistics	*p*-values	L.L.	UL.
CPEC - > ES	0.097	0.038	2.560	0.012	0.032	0.167
HLS - > ES	0.169	0.028	5.954	0.000	0.112	0.220
IIFS - > ES	0.216	0.032	6.851	0.000	0.156	0.276
RG - > ES	0.354	0.033	10.612	0.000	0.289	0.417
CPEC - > ENS - > ES	0.125	0.050	2.500	0.041	0.015	0.055
HLS - > ENS - > ES	0.102	0.043	2.372	0.039	0.001	0.028
IIFS - > ENS - > ES	0.105	0.044	2.386	0.044	0.002	0.041
RG - > ENS - > ES	0.111	0.049	2.265	0.038	0.007	0.026
CPEC - > SD - > ES	0.022	0.008	2.692	0.008	0.006	0.040
HLS - > SD - > ES	0.018	0.008	2.412	0.018	0.006	0.034
IIFS - > SD - > ES	0.010	0.005	2.036	0.044	0.004	0.023
RG - > SD - > ES	0.023	0.008	2.946	0.004	0.009	0.037

DISCUSSION AND IMPLICATION

The study results have revealed that honest leadership in business has a positive relationship with the economy's stability. These results are in line with the past studies of Puaschunder (2017). It has been proven that an honest leadership in business enterprises in an economy brings stability in the economic conditions and growth. The results have revealed that improved infrastructure has a positive effect on economic stability. These results match with those of other studies (Mohmand et al., 2017) according to which the application of higher quality infrastructure in economic activities brings stability into the economy. The results have indicated that the revenue generation rate has a positive influence on the country's economic stability. These results agree with the studies of Yan (2011), where the business enterprises that have better earnings show a considerable contribution to economic stability. This paper's findings have

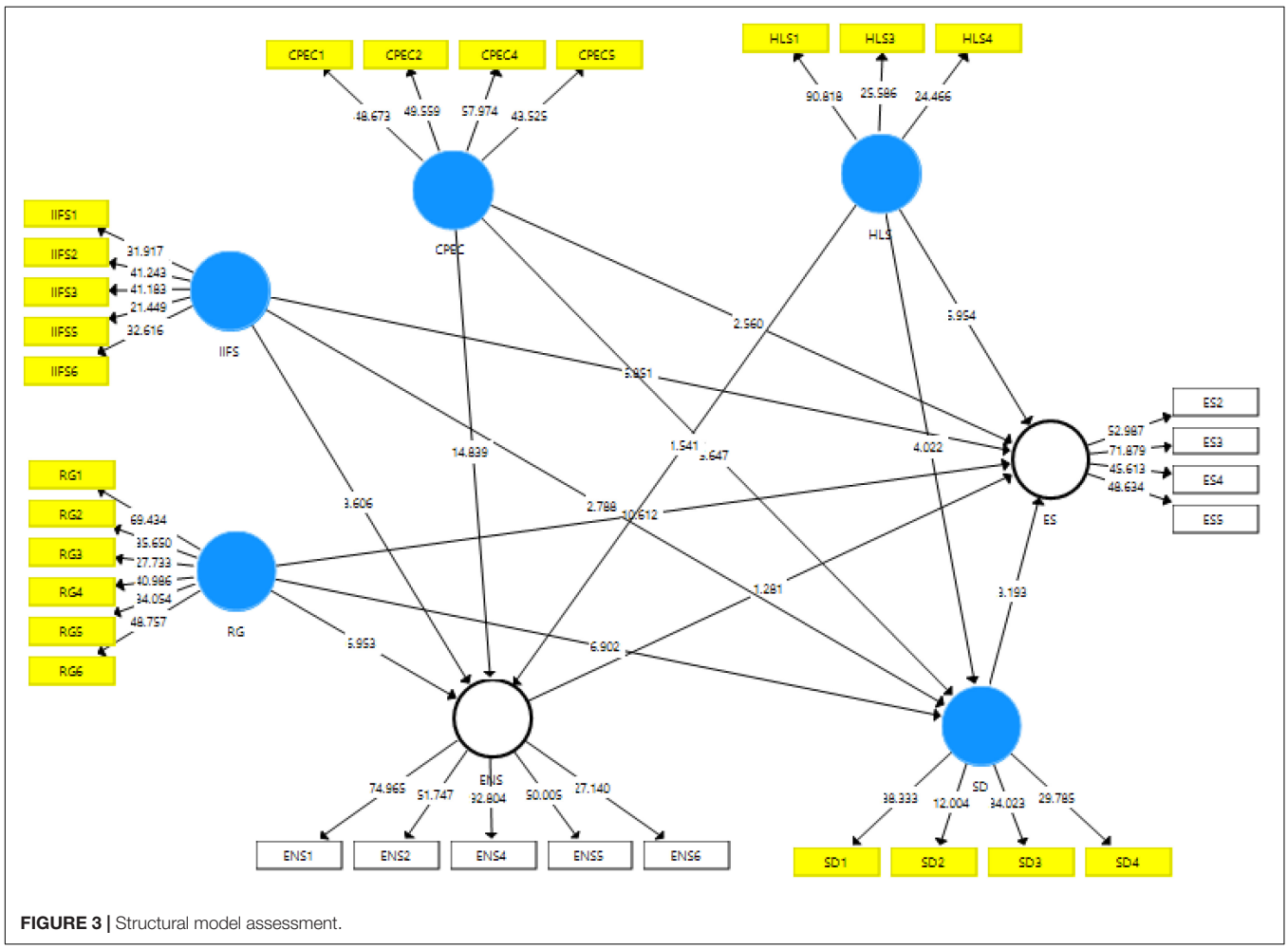

FIGURE 3 | Structural model assessment.

represented that CPEC has a significant impact on economic stability. These results are in line with previous studies (Hassan, 2020) according to which the CPEC project strengthens the countries' economic stability. The results have indicated that environmental sustainability is an appropriate mediator between CPEC project factors and economic stability. These results agree with previous studies (Ahmed, 2019) proving the same point. The results have also indicated that sustainable development is an essential mediator between CPEC project factors and economic stability. These results are in line with past studies (Khan et al., 2020) which prove that sustainable development strengthens the links between CPEC projects and economic stability factors.

From the perspective of theoretical implications, this study contributes to the literature on the economy. This study begins to describe the influences of honest leadership in business enterprises, the application of improved infrastructure, and the role of better revenue generation on economic stability at the same time. This study contributes to the literature by addressing environmental sustainability and sustainable development as mediators between honest leadership, improved infrastructure, revenue generation, CPEC, and economic stability. Similarly, this study makes empirical implications as it guides the economic regulators to regulate and stabilize the economy by establishing honest leadership, applying improved infrastructure, and better revenue generation. These results also support one perspective of the Hegemonic stability theory that argues that international openness is the cause of common good.

CONCLUSION

The results have proven that honest leadership in business enterprises has a positive association with economic stability. This paper examined that honest leadership in business enterprises improves enterprises' performance, which is an excellent contribution to economic stability. The results prove that higher quality infrastructure brings stability in economic activities as quality infrastructure improves business organizations' performance. The high rate of generation of revenue by business entities makes a positive contribution to economic stability. Moreover, it is concluded from the study that the CPEC project positively influences the economic stability of the associated countries. The introduction of the CPEC project between Pakistan and China has positively impacted the economy's stability as it stimulates both countries' economic activities. The CPEC has influenced different economic factors like leadership quality, the quality of infrastructure, and the revenue generation rate, which is of great importance in bringing stability to the economy.

While considering all the above, it is remarkably a fortuitous matter for us that despite the extreme pressure encountered by COVID-19 on almost every perspective of life. The CPEC not only sustains but also progresses under the leadership of all stakeholders. It is evident from the results of this research that when this projects works in its maximum capacity then it will support the economy of all stakeholders in a tremendous way despite the catastrophic effects caused by COVID-19.

Research Limitation

Regardless of its theoretical and empirical contributions, this study has several limitations that future scholars should remove in their studies. The collection of data in support of this study has been collected through a particular source. Future academics should collect data for their studies from more than one source. Future scholars should make necessary changes in their studies to make them available and applicable across the world. Finally, honest leadership, improved infrastructure, and revenue generation affected the economic stability analyzed by the current study and suggested that future scholars should address many other factors that affect economic stability.

Managerial Implication

Investors and managers must consider economic stability when making their decisions. This research helps them to understand the expected near future shifts in the business environment due to CPEC and prepare honest leaders with healthy infrastructure. Further, managers must consider that the government is focusing on economic stability with the help of environmental sustainability. Managers must bring themselves to the world standards of environmental protection which is also important during the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of the privacy and confidential nature of its respondents. Requests to access the datasets should be directed to waqas_sadiq2011@hotmail.com.

AUTHOR CONTRIBUTIONS

HL, JH, RK, and MS: conceptualization and writing – original draft. HL, JH, GA, and WA: data curation. HL, JH, and RK: formal analysis. GA, WA, MS, and JH: methodology. GA and WA: supervision. HL, JH, and MS: validation. HL, JH, RK, GA, WA, and MS: writing review and editing. All authors have read and approved the final version of the manuscript.

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COVID-19 and Pretentious Psychological Well-Being of Students: A Threat to Educational Sustainability

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Since the outbreak of COVID-19, reaction quarantine, social distancing, and economic crises have posed a greater risk to physical and psychological health. Such derogatory mental health stigma is associated with adverse outcomes in the student population. The purpose of the current study is to provide a timely evaluation of the COVID-19 pandemic and its adverse effects on students' psychological well-being to sustain economic sustainability. A thorough review of the literature and current studies, significant emphasis of socio-demographic indicators, interpretation of physical symptoms, home quarantine activities, and COVID-19 unique stressors were extracted. Data were collected through electronic surveys from 640 university students at local and foreign universities. The findings revealed substantial adverse effects resulting in varying levels of stress, symptoms of depression, and specific discomfort in the case. Among COVID-19 stressors, financial instability, unpredictability toward future/career, and media exposure have been described as common factors that cause poor psychological well-being and weaken economic sustainability. COVID-19, quarantine, self-isolation, and onerous interventions primarily weaken university students' mental health. The emphasis on this vulnerable category, however, is substantially absent from the literature. This research addresses the urgent need to develop possible solutions and preventive measures to promote economic sustainability by ensuring students' psychological well-being.

Keywords: COVID-19, economic sustainability, university students, psychological wellbeing, mental health, physical symptoms, home quarantine activities, COVID-19 stressors

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INTRODUCTION

In recent months, there have been many drastic changes that have changed how we live and how we die (Nyatanga, 2020; Wang et al., 2020). Cautions are becoming a part of life linked to the present COVID-19 pandemic situation (Nelson et al., 2020). Social media has made it difficult to stay away from reality and participate in debates (Shaw, 2020). These ongoing highlights and media debates make it difficult for each person to think about something else (Hossain et al., 2020). There is no question that the consequences of the present pandemic are not limited to physical limits but also psychological and mental well-being (Duan and Zhu, 2020).

During this period, it is normal for the general population to enter a state of acute stress and depression (While and Nightingale, 2020). Normal reactions to some unnatural situations result from a high degree of stress and anxiety (Roy et al., 2020). The underlying reasons for initiating poor psychological well-being and disturbed mental health are an escalation of infected cases, high mortality rate, and massive quarantine (Bao et al., 2020; Rubin and Wessely, 2020).

In line with the proposed agenda, recent research highlighted that quarantine people might experience psychological distress (Brooks et al., 2020). In the context of post-traumatic stress symptoms, this condition of confusion and volatility has induced psychological distress in university students (Cao et al., 2020). It is hardly unlikely for a college/university student to escape physically and mentally from the detrimental consequences of the COVID-19 pandemic. For university students, psychological stress is increased primarily because of performance pressure, potential uncertainty, and academic disruption (Zhai and Du, 2020a). With every second, its insidious influence affects their psychological and mental well-being in the form of elevated stress levels, anxiety, symptoms of depression, and some event-specific distress (Bao et al., 2020). However, to meet the current requirements, educational arrangements are being created (Khan et al., 2020). However, in the present pandemic scenario, traditional norms and related performance requirements are becoming increasingly difficult to match. University approach for handling students and steering their emotions during general well-being emergencies and keeping away from misfortunes triggered by emergencies has become an urgent concern (Cao et al., 2020). There is an immediate need to consider the implications of this ongoing global pandemic on the student community's mental health. In addition to this, there has been an emergence of research addressing pandemic impacts on healthcare workers or the general population in particular (Chen et al., 2020; Li et al., 2020b; Yang et al., 2020). There is, however, a shortage of such research focusing directly on the mental well-being of students during a pandemic situation (Son et al., 2020).

A recent study highlighted that during quarantine, and even after that period, students decided on poor psychological wellbeing and mental illness (Bao et al., 2020). A number of students have discussed about their experiences of stress and anxiety which they mainly facing because of academic work delays and lack of socialization (Cao et al., 2020). The propensity for stress or depression symptoms worsens due to radical changes in economic stability, especially in the job market (Anjum et al., 2019). In comparison, students have referred to agitation as post-isolation symptoms (Brooks et al., 2020). Approximately 83% of respondents agreed regarding their poor psychological well-being during quarantine (YoungMinds, 2020), according to YoungMind's recent findings taken *via* a worldwide survey. Besides, a recent study presented troubling figures that one in four university students had poor mental well-being and psychological well-being (Odriozola-González et al., 2020).

The effect of COVID-19 causes an academic disturbance, low motivation, and high pressure on university students while concentrating on maintaining their academic performance (Khan et al., 2020; Son et al., 2020). Educational institutions are still ineffective in predicting the effects of pandemic stressors on coping strategies and learning abilities for learners. Simply stated, the COVID-19 pandemic has positioned students with an unparalleled mental health burden, urgently requiring further review and immediate intervention. However, the literature lacks the technique to learn about certain psychological disorders and their negative consequences during the pandemic (Brooks et al., 2020). Therefore, a timely call to action is proposed that how the COVID-19 pandemic is disturbing student mental health in terms of their academic results, career plans, and future growth (Khan et al., 2020). Also, how stress, anxiety, depression, and event-specific distress (ESD) as a subscale of psychological well-being and mental health are mainly getting triggered in the presence of observed predictors (Hossain et al., 2020). Narcissism positively influences unethical pro-organizational behavior (Shah et al., 2020). Workplace ostracism has a positive relationship with stress (Sarfraz et al., 2019b). Organizational justice plays a partial mediating role in the employee's perception of CSR and employee's outcomes (Sarfraz et al., 2018).

Furthermore, it is a fact that countries with low and medium incomes, such as Pakistan, have insufficient resources to tackle both COVID-19 and the numerous mental health problems arising from the outbreak. Barley is based on this overlooked population in these South Asian countries. The current study's additional objective is to reduce this gap by providing comprehensive data, especially related to students from developed countries and their psychological health. Laterally, as suggested by Son and his colleagues (Son et al., 2020), it reacts to the disparities in mental health problems with sociodemographic features. This report also includes a substantial investigation into the ineffective treatment of students' psychological and mental health concerns. The emphasis is on understanding certain troubling factors and inadequate implementations of customary coping mechanisms that delay academic institutions' adverse academic and psychological results. As COVID-19 specific literature have consistent support and call for action in this adverse situation (Li et al., 2020a; Zhai and Du, 2020b).

METHODOLOGY

Research Design and Study Participants

A cross-sectional approach was implemented to develop the prerequisites for information related to the COVID-19 pandemic and its impact on university students' psychological well-being and mental health. For data collection to meet the maximum number of participants in a limited period, the snowball sampling approach was adopted. First of all, these respondents were contacted by email and asked to provide their real experience of COVID-19 and its effect on their psychological and mental well-being (Li et al., 2020b). Later, the research team asked respondents *via* social media accounts or Whatsapp groups for their voluntary contribution to the distribution of questionnaires. It may take longer than face to face (Zhang and Ma, 2020) to approach students *via* electronic media. However, the measures were adopted to prevent virus infection and health risk that can be developed through physical contact.

FIGURE 1 | Covid-19 pandemic and university student study model.

The **Figure 1** is depicting such factors (SDI, COVID-19 SPS, HQA, and COVID-19 SS) which are potentially effecting the psychological wellbeing and mental health of students in particular. It also highlighting the main concerns of student's mental health in the form of stress, anxiety, depression, and event specific distress.

The data collection process began on May 2, 2020, and ended on May 16, 2020. Participants were chosen from either local or foreign university after consenting to the eligibility requirements of being home quarantined and currently pursuing a degree. It was entirely voluntary, and without offering any reason, the participant could withdraw from the survey at any time. To begin with, participants were told that these surveys had no financial or non-financial benefits. In addition, their identity is kept secret and will not be used on other websites or for any other reason. Before starting the investigation, respondents gave their informed consent after going through the study's objectives and intent and completed a self-reporting questionnaire. Six hundred forty responses from a total of 678 responses were accepted for final review after initial screening. This study was performed online in complete accordance with the Helsinki Declaration concerning human participant testing. The study involving human participants were reviewed and approved by the COMSATS University Islamabad. The participants provided their written, informed consent to participate in this study.

Research Measures

Sociodemographic Features

Close-ended questions such as age, gender, current degree program, work responsibilities, and marital status were adopted for the survey to classify the socio-demographic data of students who participated in the recent study.

Self-Reported Physical Symptoms

Self-reported physical symptom knowledge was gathered through a series of close-ended dichotomous scales to provide an understanding of the respondent's experience of physical symptoms. A dichotomous scale (Yes or No) aimed to avoid respondents' misunderstanding and misinterpretation when reacting to their physical symptoms was used. Following consultation with medical professionals who had experience dealing with COVID-19 infected patients; a list of psychological symptoms was selected in addition to closeness toward COVID-19 symptoms. Concerning the experiences of COVID-19 symptoms, respondents were asked to reflect on their self-assessment or personal interpretation.

Home-Quarantine Activities and Particular Stressors of COVID-19

Home-quarantine activities and social stressors associated with COVID-19 are viewed as impacting psychological distress and poor mental health. The current study highlights students' psychological well-being and mental health effects due to the lockdown situation. Among these variables, quarantine practices have been subjected to social and natural routine disturbances that negatively trigger students' psychological well-being. There were options such as online social networking, recreational activity (e.g., entertainment show), physical exercise, educational activity, and scope for quarantine activity checklist to mention all other activities except those mentioned above. The scale was adopted from the study of Lima et al. (2020); four-point Likert scales ranging from 0 = not at all to 3 = sometimes in this 12 items-based scale. In addition to these practices, particular COVID-19 stressors, such as financial instability, fear of infection, and others were coordinated based on emerging literature on COVID-19 and students' mental health (Khan et al., 2020).

Stress, Anxiety, and Depression (Psychological Well-Being and Mental Health)

The student's psychological well-being and mental health were measured by assessing the self-reported level of stress, anxiety, and depression scale 21 from the Lovibond and Lovibond (1995) research. This scale comprises 21 questions that were split evenly between stress, anxiety, and depression. A four-point Likert scale ranging from 0 = never a problem, 1 often

a problem, 2 = always a problem, to 3 = often a problem follows this scale. Examples include "I found it difficult to wind down" (stress), "I was aware of my mouth's dryness" (anxiety), and "I did not seem to experience any good feeling at all" (depression; Alim et al., 2014). Examples include "I found it difficult to wind down" (stress).

Event-Specific Distress

The concept behind the adoption of event-specific distress was to evaluate student's experience of any particular incident relevant to stress (Horowitz et al., 1979). The frequency of four-point Likert scales ranged from 0 = not at all to 3 = sometimes in this 15 items-based scale. Examples include "I had trouble falling asleep or staying asleep, due to images or feelings that came into my mind" (intrusion) and "I kept away from reminders of it" (avoidance). This scale was previously used during the COVID-19 outbreak in China (Li et al., 2020b; Zhang and Ma, 2020) and Bangladesh (Khan et al., 2020).

Research Analysis

Perceptions linked to COVID-19 physical symptoms, home quarantine behaviors, COVID-19 particular stressors, and students' psychological and mental well-being hierarchical regression modeling (HLM) were introduced to explore the proposed connection between sociodemographic variables. To satisfy the presumption of a direct relationship, the purpose of assessing these relationships was to ensure the existence of association and the essence of association between variables. According to Rutter and Gatsonis (2001), "the importance of this method is influenced by concentrating only on deviation from the mean, removing possible confounds that might arise from the rating patterns of individuals." The final analysis is provided in various models that helped compare and analyze the intensity of different accessible models.

FINDINGS AND RESULTS

Table 1 reports a statistical analysis between them to summarize the correlation between sociodemographic variables and the students' psychological stability and mental health. According to **Table 1**, with unmarried status (78.7%), most of the respondents lied between the brackets of 20 and 29 years (49.2%). Among these students, their Master's degree was mainly checked (39.1%), and few of them had work responsibilities (27.6%). The proportion of male and female involvement was not very different from that of each other. There was a greater correlation between the age of students with perceived depression level ($B = 0.19$, $SE = 0.01$: $p < 0.05$) and event-specific discomfort ($B = 0.23$, $SE = 0.04$: $p < 0.05$) than stress and anxiety. On the other hand, after stress level ($B = 0.26$, $SE = 0.04$: $p < 0.05$), the degree of complexity and sophistication in the current level of respondent was found to have a strong effect on depression ($B = 0.28$, $SE = 0.02$: $p < 0.01$). The combined effect of marital obligations and job duties has less effect on the students' mental health, which may be attributed to the lower number of individuals identified as married and having job duties. The proportion of variance by sociodemographic factors is high in the degree of depression relative to all these models. It highlights the strong effect of depression on students' mental health, affecting stress or anxiety over longer periods.

TABLE 1 | Connexion between sociodemographic features and psychological well-being and mental health of students.

	N %	Model 1 Stress		Model 2 Anxiety		Model 3 Depression		Model 4 Event specific distress	
Indicators		***B***	***SE***	***B***	***SE***	***B***	***SE***	***B***	***SE***
Age									
30–39	27%	0.06	0.03	0.13	0.08	0.19*	0.01	0.23*	0.04
20–29	49.2%								
>20	23.8%								
Gender									
Male	42.7%	0.23*	0.02	0.19	0.03	0.18	0.08	0.19*	0.01
Female	57.2%								
Current degree									
Ph.D. Scholars	21.8%	0.26*	0.04	0.21*	0.07	0.28**	0.02	0.17	0.05
MPhil	19.4%								
Masters	39.1%								
Graduates	20.7%								
Marital status									
Married	21.2%	0.11	0.02	0.09	0.05	0.16	0.08	0.05	0.07
Unmarried	78.7%								
Job duties									
Yes	27.6%	0.16	0.05	0.13	0.08	0.07	0.03	0.08	0.04
No	72.4%								
R^2		0.18		0.14		0.21	0.17		
F		44.97		23.79		41.43	21.89		

*R^2, R square; B, Beta value; F, F statistics. *$p < 0.05$; **$p < 0.01$.*

Students' experience linked to the unique physical symptoms of COVID-19 on their psychological well-being and mental health during quarantine are recorded in **Table 2**. As per the statistical study, when they encountered high fever, most of the respondents were affected and observed the same COVID-19 positive symptoms ($B = 0.31$, $SE = 0.04$: $p < 0.01$). In normal circumstances, high fever has a negative effect on the students' psychological well-being, but the degree of impact was not high according to the standards. Stress ($B = 0.24$, $SE = 0.01$: $p < 0.05$) and ESD ($B = 0.19$, $SE = 0.08$: $p < 0.05$) were predicted for the incidence of cough or sore throat in students. The explanation for stress is that the temporary stress of COVID-19 symptoms can be expected. One of the major symptoms of exhaustion impacts the students' psychological well-being and mental health, but the severity of the effect is not significant. However, stress ($B = 0.32$, $SE = 0.05$: $p < 0.01$), anxiety ($B = 0.26$, $SE = 0.07$: $p < 0.05$), depression ($B = 0.21$, $SE = 0.09$: $p < 0.05$), and ESD ($B = 0.22$, $SE = 0.09$: $p < 0.05$) were the worst affected by breathing difficulties during COVID-19. Similarly, stress levels ($B = 0.29$, $SE = 0.07$: $p < 0.05$), anxiety ($B = 0.23$, $SE = 0.09$: $p < 0.05$), and depression ($B = 0.32$, $SE = 0.08$: $p < 0.01$) were positively influenced by the influence of lost taste and smell. The cumulative effect of the physical symptoms of COVID-19 influences the psychological well-being and mental health of the student. However, the proportion of variance in the experience of COVID-19 physical symptoms across all four models is high in Model 4 (see **Table 2**). It explains that the level of distress increases when students come in contact with COVID-19 news, social media conversations, or information exposure. It can be concluded that having physical symptoms associated with COVID-19 perception can cause anxious thoughts. The effect will only be for shorter periods when a case is encountered.

The association between home quarantine operations and students' mental health during isolation is shown in **Table 3**. The negative correlation between social networking and depression ($B = -0.29$, $SE = 0.04$: $p < 0.01$) was shown to clarify the internet's positive position during the quarantine period. However, according to COVID-19 figures, photos, and death tolls, it also positively impacted on event-specific anxiety ($B = 0.23$, $SE = 0.01$: $p < 0.01$). Educational events during the quarantine process played an important role in decreasing subscale mental health steps. On the other hand, negative aspects of increasing event-specific anxiety were also caused ($B = 0.19$, $SE = 0.08$: $p < 0.05$). The level of stress ($B = -0.21$, $SE = 0.04$: $p < 0.05$) and depression ($B = -0.28$, $SE = 0.02$: $p < 0.01$) was consistently decreased by the physical activities of students. Similarly, stress reduction ($B = -0.27$, $SE = 0.02$: $p < 0.05$) and anxiety ($B = -0.25$, $SE = 0.03$: $p < 0.05$) were highly affected by leisure behaviors during quarantine. The proportion of the difference between home quarantine behaviors in the event of stress is high compared to all these

TABLE 2 | Connexion between the presence of psychical symptoms and psychological well-being and mental health of students.

Indicators	Model 1 Stress		Model 2 Anxiety		Model 3 Depression		Model 4 Event specific distress	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
High fever	0.11	0.04	0.07	0.08	0.09	0.05	0.31**	0.04
Cough/Sore throat	0.24*	0.01	0.19	0.03	0.17	0.06	0.19*	0.08
Fatigue	0.07	0.03	0.04	0.06	0.11	0.05	0.02	0.07
Breathing issues	0.32**	0.05	0.26*	0.07	0.21*	0.09	0.22*	0.09
Loss of taste or smell	0.29*	0.07	0.23*	0.09	0.32**	0.08	0.15	0.04
R^2	0.23		0.16		0.11		0.34	
F	32.54		54.21		43.72		25.11	

*R^2, R square; B, Beta value; F, F statistics. *p < 0.05; **p < 0.01.*

TABLE 3 | Connexion between home quarantine activities and psychological well-being and mental health of students.

	Model 1 Stress		Model 2 Anxiety		Model 3 Depression		Model 4 Event specific distress	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Social networking	−0.06	0.03	−0.03	0.07	−0.29**	0.04	0.23**	0.01
Educational activities	−0.13	0.02	−0.19	0.03	−0.08	0.09	0.19*	0.08
Psychical activities	−0.21*	0.04	−0.17	0.04	−0.28**	0.02	−0.08	0.04
Recreational activities	−0.27*	0.02	−0.25*	0.03	−0.16	0.03	−0.05	0.03
R^2	0.25		0.14		0.18		0.19	
F	23.34		34.41		21.72		32.11	

*R^2, R square; B, Beta value; F, F statistics. *p < 0.05; **p < 0.01.*

models. In terms of stressful feelings, it highlights the strong effect on students' mental health, which appears to impair students' thinking habits, focus, and ability to cope.

Situational variables are often involved in persuading bad psychological and mental well-being apart from personal qualities and characteristics. The relation between COVID-19 unique stressors and students' mental health during isolation is shown in **Table 4**. The linear relationship between insufficient COVID-19 knowledge and the negative impact prediction of event-specific distress (B = 0.23, SE = 0.04: $p < 0.01$). It describes that students feel overwhelmed during quarantine when they experience a lack of knowledge directly related to COVID-19. Fear of being infected significantly increases the symptoms of depression (B = 0.18, SE = 0.02: $p < 0.05$). The occurrence of signs of depression is primarily due to the persistent rise in patients. The highest negative effect on stress (B = 0.31, SE = 0.04: $p < 0.01$), anxiety (B = 0.21, SE = 0.01: $p < 0.05$), depression (B = 0.38, SE = 0.03: $p < 0.01$), and ESD (B = 0.37, SE = 0.01: $p < 0.01$) was predicted by financial instability of all these COVID-19 unique stressors. It illustrates the financial problems, and the present situation is being robbed of by work market situations. Media attention also intervenes in this relationship, but the degree of impact is not important in either model. The proportion of variance of COVID-19 unique stressors in the case of stress is high compared to all these models. In terms of stressful thinking, this illustrates the strong effect on students' psychological well-being and mental health.

DISCUSSION

Like other people, students have faced complex natural challenges in the face of the current pandemic situation (Islam and Siddika, 2020). In this list of challenges, the main factors are health insecurity, job unpredictability, family aspirations, affected coping abilities, and physical challenges (Roy et al., 2020). This pandemic condition does not impact students' physical capabilities but has also placed a more significant strain on mental health and psychological well-being (Wang et al., 2020). In compliance with the statistical analysis obtained from the data collected after being quarantined by university students. In addition, because of quarantine and self isolation many of students reported that pre-existing mental health issues are getting worst (Sahu, 2020).

University/college students in this stage of COVID-19 are more vulnerable to mental health problems. The current study results illustrate the process of change that underlines the detrimental effects on the students' psychological well-being and mental health. The challenge of focusing on online classes was expressed by many of the students in line with results of Sahu (2020), which further triggered anxiety and guilt. A majority of students suffer from stress according to the subscales of psychological and mental well-being. In some situations, it turns to depression (Anjum et al., 2019). Among all other variables, the frequency of event-specific distress (ESD) is greater, which indicates that when they specifically experience any COVID-19 data, students feel more mental discomfort (Rubin and Wessely, 2020). Several respondents have reported extreme feelings of seclusion, helplessness, and panic attacks, leading to changing sleeping patterns and eating habits. Changes in mood swings and lifestyles may have a positive effect on the manifestation of symptoms of depression, according to Duan and Zhu (2020). Authentic leadership has a significant role in employee creativity (Sarfraz et al., 2019a).

The literature that has concentrated primarily on students' mental health is scarce so far (Son et al., 2020). However, this initiative records the immediate concerns regarding mental health problems and students' recommendations to deal with them (Cao et al., 2020). Therefore, rather than only concentrating on academic success, academic institutions need to establish countermeasures to preserve their students' psychological health. The institutional capacity to work is not limited to the effectiveness of their technical skills but to how they deal with stressful and scary circumstances (Liu et al., 2020). Building the skills to cope with the current pandemic situation will require a considerable amount of formal research, practical education, and interventions (Nelson et al., 2020). In view of the current results, there is an emerging need to raise awareness of students' mental health concerns (Duan and Zhu, 2020). The education

TABLE 4 | Connexion between COVID-19 specific social stressors and psychological well-being and mental health of students.

	Model 1 Stress		Model 2 Anxiety		Model 3 Depression		Model 4 Event specific stress	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Inadequate information	0.16	0.03	0.13	0.03	0.11	0.05	0.23**	0.04
Fear of infection	0.23	0.02	0.27	0.03	0.18*	0.02	0.09	0.07
Financial uncertainty	0.31**	0.04	0.21*	0.01	0.38**	0.03	0.37**	0.01
Future uncertainty	0.23*	0.02	0.29	0.07	0.26*	0.09	0.15	0.03
Inadequate food supply	0.11	0.07	0.04	0.01	0.03	0.05	0.03	0.04
Media exposure	0.13	0.06	0.19*	0.03	0.23*	0.03	0.16	0.06
R^2	0.31		0.21		0.23		0.26	
F	34.62		34.71		27.61		21.89	

*R^2, R square; B, Beta value; F, F statistics. *$p < 0.05$; **$p < 0.01$.*

support structure, career counseling, and non-conventional educational parameters of the higher education system need to be maintained immediately.

Nonetheless, some limitations should be overcome in future studies. Firstly, the sample size of current research is limited relative to the perspective horizon. Generally, studies with such schema have a large sample size to overcome the biases. To create a general understanding and compatible coping strategies, the sample size should increase in future studies with a similar understanding and population (Zhai and Du, 2020a). Second, the cross-sectional methodology design was mainly implemented during COVID-19 and quarantine to collect responses due to time constraints. This information gathering approach can only establish a short-term and incomplete view of students' mental health challenges. Future researches can consider longitudinal design to check the psychological health and similar conditions. Third, but without any requirements or conditions, data was gathered from students. However, this analysis follows the methodology of snowball sampling, which can create constraints and generalizability issues. Future research is necessary to rely on probability sampling methods to prevent unjustified results from restricted disciplines. Finally, to build an in-depth understanding of poor psychological well-being and mental health, the latest study focuses on exploring quantitative analysis rather than a more mixed approach (Wang et al., 2020). Further research is needed to determine the pandemic's impact on the mental well-being and well-being of students in its later stages after the peak period (Xie et al., 2020).

CONCLUSION

An exceptional disturbance has been generated by the persistent realities of COVID-19 and related stressors and expanded altered behaviors. Tertiary education institutions have switched to an emergency online learning format due to physical distancing steps introduced in response to COVID-19, which will be expected to intensify academic stressors further. This research is currently offering assistance to mitigate the overall effects of COVID-19 on higher education students' mental health. Evidence from the current study has supported the need to mitigate the adverse effects of COVID-19 and improve economic sustainability measures. Emerging studies examining the effects of COVID-19 on mental well-being have established an increased prevalence of moderate-to-severe self-reported depressive and anxious symptoms among students that indicate the widespread effects of confusion and health-related fears.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Review Committee from "COMSATS University Islamabad." Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

HL conceptualized and supervised the whole study. HH contributed in the design, write-up, data collection, and analysis. MZ aided in the write-up and data collection. All authors contributed in reading and approving the final version of manuscript.

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Virtual Capacity Building for International Research Collaborations in Times of COVID-19 and #Flygskam

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In the wake of the current global pandemic, international travel is restricted. This poses substantial challenges for research relationships aiming to build capacity and foster co-creation to achieve the Sustainable Development Goals, where global collaboration and communication is paramount. This is especially challenging when it comes to interactive dialogues that go beyond the typical one-way structure of online learning. Considerations on structural, technical and behavioral levels are needed to not only deal with these challenges but rather to take advantage of the new situation. This commentary outlines the lessons learned from an internationally operating project, co-developed to cope with travel restrictions. We discuss implications for future reduction of international travel to reduce carbon in the context of climate change.

Keywords: sustainability, co-creation, global relationships, capacity building, virtual communication

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INTRODUCTION

The Sustainable Development Goals (SDGs) address global challenges including climate change, equality, education and health for peace and prosperity. To create and implement evidence-based solutions, we need effective and targeted capacity building firmly embedded within best research practice (Division for Sustainable Development Goals, 2015). Such research capacity must be built on close communication and interaction across international borders. However, researchers are experiencing substantial challenges in delivering these activities due to current mind shifts toward criticizing and shaming airplane travel (Flygskam movement) in combination with travel restrictions due to the coronavirus disease (COVID-19) (WHO, 2020). This is an opportune moment to develop best practice for virtual interactions, which will not only facilitate working under the current circumstances but will allow us to reduce the carbon emissions generated by international projects in the future (Achten et al., 2013; Verplanken and Roy, 2016). The present commentary highlights practices, challenges and suggestions related to capacity building we undertook within the Global Challenges Research Fund's Blue Communities project (www.bluecommunities.org/Home) where researchers had to rapidly adjust delivery for participants from four countries from a face-to-face capacity-building program to a virtual format.

Capacity building is defined as "building abilities, relationships and values that will enable organizations, groups and individuals to improve their performance and achieve their development

FIGURE 1 | The four countries (Indonesia, Malaysia, United Kingdom and Vietnam) participating in the virtual capacity-building workshop (as depicted with the red lines) on stakeholder interaction that will be carried out in the case study sites (Taka Bonerate Kepulauan Selayar Biosphere Reserve, Tun Mustafa Park, Cu Lao Cham and Palawan; as depicted with the orange bullets).

objectives" (UNEP, 2002, p. 11). Whilst developing countries are often perceived as the receivers of capacity building from more developed countries, it is important to recognize the bidirectionality of this relationship, as researchers from both sides have valuable knowledge, experience and skills that can be transferred. For the benefits of capacity building to reach all participants co-creation is key (multiple actors are equally empowered and develop pathways to achieve mutual outcomes) to the process. Capacity building and co-creation typically involve a high degree of skill-based and practical training, requiring a high degree of interactivity, which traditionally takes place face-to-face. The current restrictions in international travel as well as the goal to cut down on carbon emissions challenge us to create ways of building capacity via virtual channels.

Current practices of virtual interaction include online learning, online conferences, webinars, livestreams as well as virtual meetings. While some of those practices (e.g., webinars) emphasize knowledge transfer and are often not interactive, others can be interactive (e.g., virtual meetings) but this potential interactivity is not yet fully exploited. The academic community has responded quickly to the challenges of delivering remote teaching. Although the teaching can be highly interactive, they are rarely co-created and often simply replace traditional formats of talks and presentations. Projects striving for mutual capacity building and co-creation (Chemi and Krogh, 2017) are in need of innovative ways to deliver the bidirectional transfer of knowledge, the acquisition of new techniques as well as providing room for flexibility and discussion.

The Global Challenges Research Fund (GCRF) Blue Communities Project connects researchers from five countries (Indonesia, Malaysia, the Philippines, the United Kingdom and Vietnam) with the aim of building capacity and delivering research on sustainable management of coastal communities and marine ecosystems in Southeast Asia. Like thousands of research teams around the world, Blue Communities is facing the challenge to keep meeting the project's goals without the benefits of face-to-face interactions during joint field visits (Holton, 2001). Considering the current situation we are forced to explore how we can build trust and dialogue, deliver international capacity building and advance research activities through virtual interactions.

Here, we describe lessons learned from a capacity building workshop originally intended to take place in Indonesia with participants from four countries (**Figure 1**). Due to the outbreak of the COVID-19 virus, the workshop was held remotely. The aim of this workshop was to build local capacity by demonstrating and co-creating various methods of running stakeholder workshops in the respective coastal communities. This type of capacity building requires a highly interactive exchange as the learning process is multidirectional. In our case, the United Kingdom partners were supposed to deliver methods training in social and behavioral science. The three case study partners from Indonesia, Vietnam and Malaysia were to contribute with their expertize in ecology, fisheries and marine biology and with in-depth information about the selected sites. The ideal outcome of the workshop would be a co-developed project plan with methods flexibly adapted to each site.

With the aim to welcome the challenge and to deliver high-quality outputs according to the funder's standards and our personal project goals, we had to adapt across three dimensions: behavioral, structural and technical. Behavioral adaptation covers all conscious amendments we identified to optimize interpersonal communication, group leadership and engagement. Structural and technical adaptation encompasses the consideration of different time zones, internet connectivity and additional equipment. In the following section, we present our identified key considerations across these three dimensions. Subsequently, we are going on to discuss the advantages and disadvantages of the virtual format, ending with some recommendations. Our insights are by no means meant to be exhaustive and can be extended or transferred to other virtual workshops requiring a high level of engagement and interaction.

BEHAVIORAL, STRUCTURAL AND TECHNICAL CONSIDERATIONS

The Importance of Icebreakers

Getting to know each other or building new rapport might be neglected when connecting online from multiple locations. We claim that with the added physical distance, it is even more important to establish personal connections between participants to make up for the lack of non-verbal communication. Some but not all partners in our workshop had already established working relationships. To build rapport we asked everyone joining the meeting to describe him- or herself in three short sentences including the professional background and expertize as well as a personal fun fact.

Facilitating Communication

We found that communication can be challenging in virtual settings, especially with poor connection. Therefore, we used

multiple routes of communication. These routes involved pre-workshop email exchange to develop the agenda and the workshop aims, collect topics to cover and to discuss a code of conduct. During the workshop we used a chat box within the software for all participants to ask questions. Workshop leaders took turns to monitor the chat box. In addition, we used email and phone conversations after the workshop to cover additional topics that could not be covered or required more expansion to provide closure.

We found having at least two people present in the same room per location was helpful, if this is possible given regulations on social distancing. This helps to stay on top of the multiple pathways of communication, share responsibilities and avoid the likely exhaustion that will occur during virtual capacity building (Schoenenberg et al., 2014). That said, we still experienced virtual capacity building as exceptionally draining for all parties involved, listening or presenting, which makes it absolutely necessary to have regular breaks (Connelly, 2018). For this reason, we split the originally planned one-day workshop into three consecutive sessions, in an attempt not to overload workshop leaders or participants. This also considered time differences between countries.

Communication Fine Tuning

Many subtle interactions that enable a face-to-face workshop cannot be directly transferred to virtual capacity building. In order to effectively communicate, cooperate and empathize with our colleagues we needed to find creative solutions. Compared to face-to-face workshops we cannot get an accurate feel if our partners are still motivated, tired or confused. Especially for the presenter it can be a daunting experience not to receive the verbal and non-verbal reassurance that would be implicit in any face-to-face interaction. Research has shown that very small delays (above 1200 ms) in visuo-audio feedback can lead to negative perceptions of participants on a personal level (Schoenenberg et al., 2014). It is crucial to create a perception of social presence despite the physical distance created by online communication (Aragon, 2003). Establishing a combination of information transfer, group work, result demonstration, discussion and breaks allows all participants to actively engage using the various channels of communication, and to efficiently switch between individual listening, individual responding, joint practicing, social discussing and recovering (Anzai and Simon, 1979; Hiltz et al., 2000; Yang and Liu, 2004; Chang et al., 2014).

Time Management

This brings us to the importance of time management. We experienced that virtual capacity building required more time than standard capacity building. This is due to materials that have to be adapted or prepared, the need for more breaks during the workshop, but also potential time lags between the sending and the receiving party making it necessary to repeat sequences more frequently. The Blue Communities capacity-building program had to be planned across three time zones with up to eight hour time difference. Ideally, workshops like this would take place during working hours for all parties involved. In reality, global interactions force us to be flexible. In our case, this meant that some teams connected during early mornings or late evenings. Collectively deciding on a time schedule that best suits the majority of participants is crucial.

Attitude and Motivation

When capacity building takes place remotely, a higher level of commitment is required than would be necessary for a face-to-face workshop (Mroz et al., 2019). We tried to accomplish this by carrying a very positive, energized mind-set and by creating an inclusive meeting atmosphere as recommended by Schneider et al. (2018). To benefit from the combination of direct and indirect interactions, wherever possible people from the same location should gather physically in one room and interact directly whilst interacting with the groups in other locations virtually. This helps to mix the virtual interaction with immediate collaboration but social distancing rules might mean participants have to connect separately, an additional strain to connectivity.

Connectivity Equipment and Platform

Obvious technical and structural requirements include a good internet connection, meeting rooms and relevant equipment. A stable internet connection can be problematic, especially in developing countries or remote areas as was the case for the Blue Communities project. We experienced interruptions during the meeting, difficulties in uploading and downloading materials as well as impeded functionality of different communication channels.

We established a set of instructions for 1) very strong bandwidth: all partners share their video and audio settings 2) partially problematic bandwidth: partner with problematic bandwidth to turn off video, all turn off audio apart from when they speak 3) problematic bandwidth: all partners turn off video and audio settings with the exception of the current speaker. This code of conduct was familiar to all parties involved, leading to fluent communication across conditions.

An important factor is the use of a platform that enables sharing screen, text chatting and uploading documents and pictures. These functions are essential for a high level of interactivity, as is the use of a good quality camera by the workshop leaders. We found a movable camera with zooming and focusing function to be particularly useful for ensuring interactive materials (flip charts and post-it notes) were legible on screen. We also found microphone quality to be important as better microphones reduce communication issues due to different mother tongues.

Supporting Materials

A crucial element was the use of comprehensive supporting materials. A pre-workshop checklist was distributed to all participants. Some items might seem self-evident in the context of face-to-face workshops, but they might be forgotten in virtual interactions (e.g., flip charts and post its). We found the mixture of physical and electronic materials useful.

As an additional resource, we prepared an electronic handbook, which contained a literature list, methods and data

analysis instructions. This helped to reduce the reliance purely on audio/video information. The scope of the handbook went beyond the content of the workshop itself and complemented other materials such as PowerPoint slides, which all were adapted to the new purpose of virtual capacity building. We identified visuals a key form of communication as they can be understood across language barriers and despite poor audio connections (Tufte, 2003; Susskind, 2005).

DISCUSSION

In this last section, we will discuss how we found ourselves benefitting from this novel situation as well as struggling with challenges we did not fully overcome. We will conclude with the main lessons learned to facilitate current and future projects relying on remote capacity building.

Finding Advantages in the Crisis

As a side effect of restricted travel, remote capacity building can reduce travel related carbon emissions beyond the pandemic. In addition, remote capacity building gives rise to more advantages than just carbon savings.

Strains on Resources and Health

Online capacity building workshops are a less costly way to achieve international skills and knowledge transfer than face-to face interactions. Costs for traveling, accommodation, meeting rooms and catering are reduced drastically. Along with the financial savings comes the time saved that is usually spent on planning, layovers, environmental adaptation and jetlag. This means that not only are virtual meetings more cost-effective but they also take less toll on our physical and mental wellbeing. We remain located in our familiar environment and time zone, which is in line with our evolutionary circadian rhythm (Minors et al., 1986; Reilly et al., 2005; Srinivasan et al., 2010). At the same time, we need to be aware that the rise of virtual meetings, home office confinement and movement restrictions during a pandemic can have negative effects on our physical and mental health (for overviews see Ammar et al., 2020a; Ammar et al., 2020b; Ammar et al., 2020c). Bentlage et al. (2020) as well as Chtourou et al. (2020) provide a range of evidence-based, practical recommendations of how to mitigate the psychosocial strain during home confinement, for example by remaining physically active.

Equality

Despite the aim to bridge the distance imposed by the virtual connection, there might also be advantages coming with the distance itself. People who struggle with face-to-face interactions might be able to communicate better without the presence of direct cues used to detect potential negative feedback from others (Stritzke et al., 2004). Similarly, virtual capacity building facilitates the inclusion of people for whom participating under traditional circumstances would be difficult or impossible (Pearson and Koppi, 2002). However, we need to be aware of setup adaptation for participants with sensory or cognitive impairments. This includes the appropriate use of visuals, the availability of additional supporting resources, the awareness of individual limitations and an active communication network between participants for mutual support. We also need to be aware that the intensified use of virtual technology bears the risk of causing further inequalities due to differences in accessibility of such technology and opportunity to acquire relevant skills. Cultural and gender related stereotypes are potentially less problematic for virtual collaborations than they would be in face-to-face interactions. There may be a reduced risk of cultural or religious offense due to inappropriate clothing, catering or schedules, especially if the workshop is co-created.

Disadvantages to Overcome

Despite the potential benefits of remote capacity building, we think it is important to acknowledge some disadvantages that we were unable to overcome in the limited time we had available during this crisis. We invite suggestions for strategies to help overcome these remaining barriers.

Language Barriers

Some challenges like cultural and gender-related roles and stereotypes seem to be diminished whereas some other challenges seem to be enhanced in remote communication. Language barriers are always a challenge within international collaboration. However, understanding each other and adapting to different linguistic varieties might be even more difficult in virtual settings and lead to disruptions or compromised team functioning (Neeley et al., 2012; Klitmøller and Lauring, 2013). On the individual level, uncertainty and diminished comprehension can lead to confusion or frustration and in the worst case to the refusal of active engagement (Barner-Rasmussen and Björkman, 2007). These challenges might lead to attempts to catch up with the content in parallel or being prone to external distractions. Overcoming these challenges takes patience by all team members, the provision of excellent supplementary material as well as the willingness to answer questions continuously.

Participant-To-Participant Interaction

While adequate trainer-participant interactions are relatively easy to realize and are perceived as normal and necessary, this may not be the case for participant-to-participant interaction. In our case, there has been an active dialogue between the United Kingdom and the partners from each country in South East Asia, but almost no interaction between Vietnam, Malaysia and Indonesia. For the main purpose of mutual capacity building, which should involve networking between all participants and learning from others' best practice, participant-to-participant interaction is indispensable. Actively encouraging participant groups to communicate with each other during designated tasks could overcome this challenge.

Considering the disadvantages, the delivery of virtual capacity building may not be appropriate for all training contents which still require direct physical interactions like for example complex field work activities or the handling of tools. When there is choice, the advantages and disadvantages of virtual and ordinary capacity building need to be carefully considered before making the decision to travel or not.

KEY TAKEAWAY MESSAGES

We need to question our existing practices and norms when it comes to global collaboration for capacity building and create new, innovative measures and strategies. Based on our three-day experience of virtual capacity building we have identified several key lessons that can apply for similarly structured activities.

Firstly, it is important to keep the dialogue active despite the obvious convenience of a one-way communication. An interactive dialogue is the key to the co-creation of project plans and enables us to go beyond one-way training and toward mutual capacity building.

Along the same lines, the workshop preparation should involve backup plans, allowing for the unexpected to happen. This flexibility is best realized through active communication between all partners, continuous co-creation and meticulous workshop development.

Thirdly, we need to make it clear to ourselves what the potential advantages and disadvantages of holding a virtual capacity building workshop are, prior to the process itself. This is to acknowledge the limitations inherent in the approach, which may call adoptions of specific structural, technological and behavioral adaptations.

Despite its non-physical nature, we feel that our virtual workshop did reduce the geographical difference amongst us. Not only by co-delivering our workshop but also by jointly rethinking our lessons learned for this article made us appreciate the togetherness of us as disparate workshop members striving to achieve a common aim despite the current challenges.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

All authors jointly conceived of the presented concept. IR developed the article structure and took the lead in writing the manuscript with input and feedback from all collaborators. SP supervised the process.

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ORIGINAL RESEARCH
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The Investor Psychology and Stock Market Behavior During the Initial Era of COVID-19: A Study of China, Japan, and the United States

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A highly transmittable and pathogenic viral infection, COVID-19, has dramatically changed the world with a tragically large number of human lives being lost. The epidemic has created psychological resilience and unbearable psychological pressure among patients and health professionals. The objective of this study is to analyze investor psychology and stock market behavior during COVID-19. The psychological behavior of investors, whether positive or negative, toward the stock market can change the picture of the economy. This research explores Shanghai, Nikkei 225, and Dow Jones stock markets from January 20, 2020, to April 27, 2020, by employing principal component analysis. The results showed that investor psychology was negatively related to three selected stock markets under psychological resilience and pandemic pressure. The negative emotions and pessimism urge investors to cease financial investment in the stock market, and consequently, the stock market returns decreased. In a deadly pandemic, the masses were more concerned about their lives and livelihood and less about wealth and leisure. This research contributes to the literature gap of investors' psychological behavior during a pandemic outbreak. The study suggests that policy-makers should design a plan to fight against COVID-19. The government should manage the health sector's budget to overcome future crises.

Keywords: COVID-19, investor psychology, stock market behavior, financial sustainability, masses psychology

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INTRODUCTION

The terminology of "Corona" is not newly invented in science. This single-stranded RNA virus' primary roots were observed in 1960, belonging to the Corona viridae family in the order Nidovirales (Galante et al., 2016; Kanwar et al., 2017; Guo et al., 2020; Mohsin et al., 2020b). The taxonomic naming comes from the virus' structure, which gives the appearance of crown-like spikes on the virus' outer surface (Azam et al., 2020; Sarfraz et al., 2020c; Shereen et al., 2020). The prey of the first coronavirus species was chicken and pig; there was no human–human transmission. From 1960 to 2020, different allied versions of the same family of viruses have been observed: the common cold in adults (COV 229E and COV OC43 in mid-1960); severe acute respiratory syndrome coronavirus (SARS-CoV-2003); human coronavirus with common cold, bronchitis, and asthma; chronic obstructive pulmonary

disease (COPD) exacerbations; pneumonia (HCOV NL63-2004 and CoV-HKU1); Middle East respiratory syndrome (MERS CoV-2012); and severe acute respiratory syndrome coronavirus-19 (SARS-CoV-2019 or SARS-CoV-2), displaying unmatched intensity and severity compared to the previous species of corona (Van Der Hoek et al., 2004; Kahn and McIntosh, 2005; Woo et al., 2005; Esper et al., 2006; Zaki et al., 2012). At the start of the virus breakout, the virus name was 2019-nCOV as per the International Committee on Taxonomy of Viruses (ICTV), and the Chinese Center for Disease Control and Prevention (CCDC) changed it into SARS-CoV-2 on January 7, 2020 due to its structure and symptoms. COVID-19 was first discovered in Wuhan's wet market, Hubei Province, China, in early December 2019, and this aroused global attention in late January 2020. The virus has been spreading exponentially, using human-to-human transmission through respiratory droplets, i.e., sneezing and coughing (Azam et al., 2020; Li et al., 2020; Sarfraz et al., 2020a; Shereen et al., 2020). During this incubation period, researchers focused on exploring, preventing, and treating patients. Still, the pandemic's psychological impact is the other side of the disease (mental illness). The global quarantine announcement has sparked several concerns: fear of separation from family, fear of illness and death, avoidance of medical facilities due to threat of infection, fear of unemployment, the threat of racism against people who live in or are perceived to be from the affected areas, fear of losing near and dear ones because of the virus, maintained space from minors and disabled or elderly family members due to infection, isolation, and recalling the severity of the treatment of infected people. These have become originators of anxiety, stress, and grave concern globally. These mental health aspects of the COVID-19 outbreak have affected individual lives as well as the financial markets.

Human Psychology and COVID-19

The current pandemic of SARS-CoV-2 has seriously influenced human psychology through a notable mental state of "anxiety." The term "anxiety" covers the population's reaction toward the epidemic to all media, whether the information is authentic or erroneous, e.g., inappropriate behavior of people concerning the abandonment of animals and panic buying of other foods. The panic attacks are not properly defined without linkage to anxiety disorder in the medical sense. Anxiety is a combination of different psychiatric disorders both internal (phobias, panic attacks, and panic disorder) and external (worry, stress, fear, painful experiences, or events). The psychological effect of COVID-19' has led to mass hysteria, post-traumatic stress disorder (PTSD), panic attacks, obsessive-compulsive disorder (OCD), and generalized anxiety disorder (GAD). The behavioral immune system (BIS) theory, stress theory, and perceived risk theory explain that negative emotion (anxiety, aversion) and negative cognitive assessment of human beings are developed for self-protection. People tend to develop avoidant behavior and strictly follow the social norms due to the pandemic's severe effects and the potential threat of disease (Cao et al., 2020; Lai et al., 2020; Sarfraz et al., 2020b). The anxiety, stress, and panic attacks of people due to COVID-19 have created two etiologies. The first is the identification of symptoms of acute respiratory distress syndrome (ARDS), such as cough and dyspnea, at high frequency (Preter and Klein, 2008; Javelot and Weiner, 2020). The second one is "false alarming" (Klein, 1993) as a psychopathological link to the catastrophic

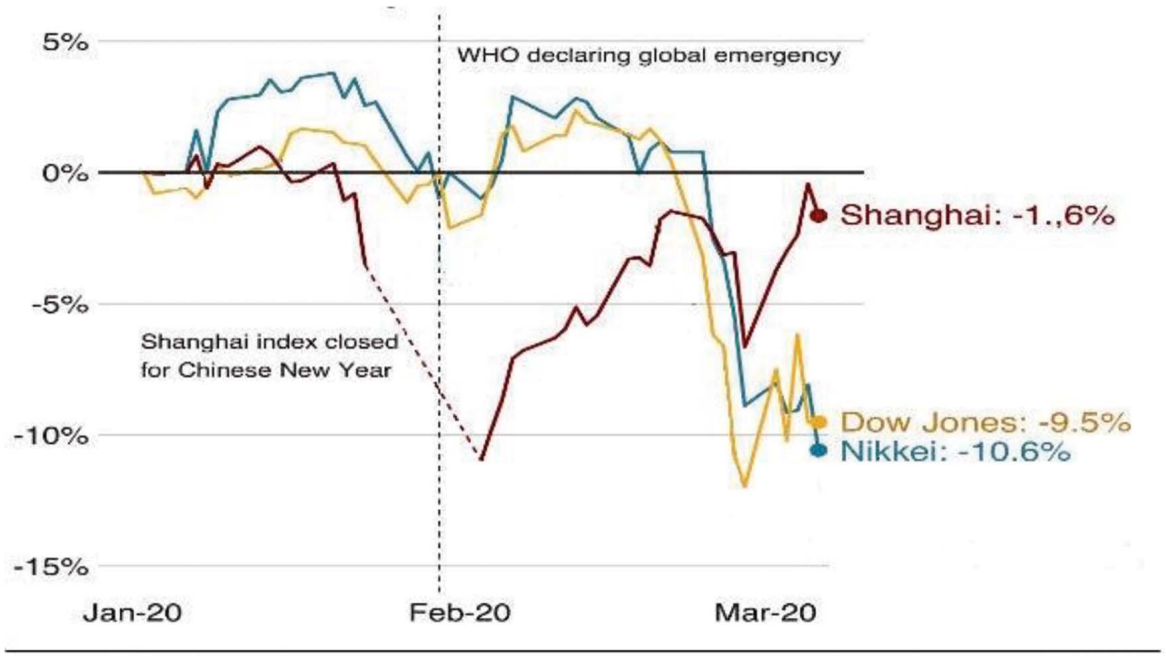

FIGURE 1 | Impact of COVID-19 on stock markets: Source Bloomberg.

TABLE 1 | Principle component analysis (PCA) of the variables (China).

The Eigenvalues	Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
Eigenvalues: (Sum = 5, Average = 1)	1	2.0545	0.4404	0.4109	2.0545	0.4109
	2	1.6141	0.7071	0.3228	3.6686	0.7337
	3	0.9070	0.5014	0.1814	4.5757	0.9151
	4	0.4057	0.3870	0.0811	4.9813	0.9963
	5	0.0187	–	0.0037	5	1

Source: Author's calculation.

interpretation of physiological sensation (respiration rate). The recurrence of panic attacks has increased the respiration rate and has become the reason for excessively avoidant behaviors and blind conformity (Li et al., 2020; Mohsin et al., 2020a). Psychopathology is a keen concern for this study because it has an intense effect on investor behavior. Stock market investors and business people generally spend most of their time in the workplace. However, they are currently mostly homebound; the present situation of the stock markets, investment decision pressure, and family members' psychological health now put pressure on investor psychology.

Investors' Psychology (Sentiments), Stock Market, and COVID-19

The COVID-19 outbreak has threatened every individual field of life to influence public health. The sustainability of the global stock market and financial markets also carries significant repercussions (Ali et al., 2020; Huang and Zheng, 2020). Being a part of the societal system, investor psychology (sentiments) and their optimism or pessimism about future stock prices can also change. A sharp decrease has been observed in Shanghai, Dow Jones, and Nikkei's stock prices due to investor sentiment volatility during the pandemic outbreak (see **Figure 1**). The visual presentation of **Figure 1** has shown a sudden downward trend in stock markets after the outbreak of the pandemic.

Existing literature has focused on the relationship between stock prices and investor sentiment. Lee et al. (2002) and Brown and Cliff (2004) explained that the past market returns are important sentiment determinants, while investor sentiment changes significantly correlated with the contemporary market return. The positive relationship between stock markets and sentiment will confirm that investor sentiment is a contrarian predictor for consequent market returns. Meanwhile, the sentiment impact is stronger if easy (hard) to value stocks are negatively (positively) influenced by sentiments (Baker and Wurgler, 2007; Xiang et al., 2020). Using the component of market index return, which is avoidant of fundamental macroeconomic factors, Lan et al. (2020) observed robust evidence that the pre-announcement abnormal return derives from investor sentiment. The sentiment determined overvaluation corrects within 1 month in the post-announcement period. The market timers tackle this sentiment situation and take advantage of issuing season shares. The stock price sensitivity in terms of the good news of earning is higher during a high sentiment period. In contrast, in a low sentiment period, the stock price sensitivity behaves negatively. As per analysis suggestions, the investor sentiment becomes the reason for the general mispricing of stock because of sentient-driven mispricing of earning contributions (Schmeling, 2009; Zouaoui et al., 2011; Mian and Sankaraguruswamy, 2012; Cheema et al., 2020). The high market competition indicated that sentiments and returns are positively related to each other, and this relationship disappears in low market competition. Although the financial crisis changes the situation irrespective of market competition, a positive relationship exists between sentiments and returns (Ryu et al., 2020). Investors can accept psychological pressure more sensitively and intensively than the lay person. Apart from the pandemic's rapid spread, the financial news, media, and amplifiers have worked as fear spreaders about COVID-19. Tetlock (2007) elucidated that spread of news about the stock market strongly affects investor psychology and sociology. The high media pessimism leads to downward pressure on market prices and vice versa. The investor sentiment theory also confirmed the consistent relationship between media content and individual investor behavior with disproportionately small stocks. This research is based on a new ideology of investor psychology and the stock market during the pandemic. There have been few studies in this area, but a bulk of research centers on both human psychology and COVID-19 as well as the stock market and COVID-19. Under the caption of investor psychology, the stock market, and COVID-19, we tried to explain this research's nature and relationship.

The psychological pressure negatively impacts investors and investing decisions, which can decline any individual country's economy. This study analyzed investor psychology and stock market behavior during COVID-19—a comparatively new debate about COVID-19. This research will contribute to the existing literature and open up new dimensions in understanding investor sentiment toward investment decisions in the stock

TABLE 2 | The eigen vector loadings (Japan).

Variable	PC 1	PC 2	PC 3	PC 4	PC 5
STURN	−0.0584	0.6588	−0.3581	0.6589	−0.0114
MFI	0.1759	0.6664	−0.1181	−0.7143	0.0283
RSI	−0.1244	0.3472	0.9187	0.1411	−0.0067
ΔCC	0.6881	−0.0323	0.0870	0.1528	0.7033
ΔCD	0.6904	−0.0193	0.0786	0.1109	−0.7102

Source: Author's calculation.

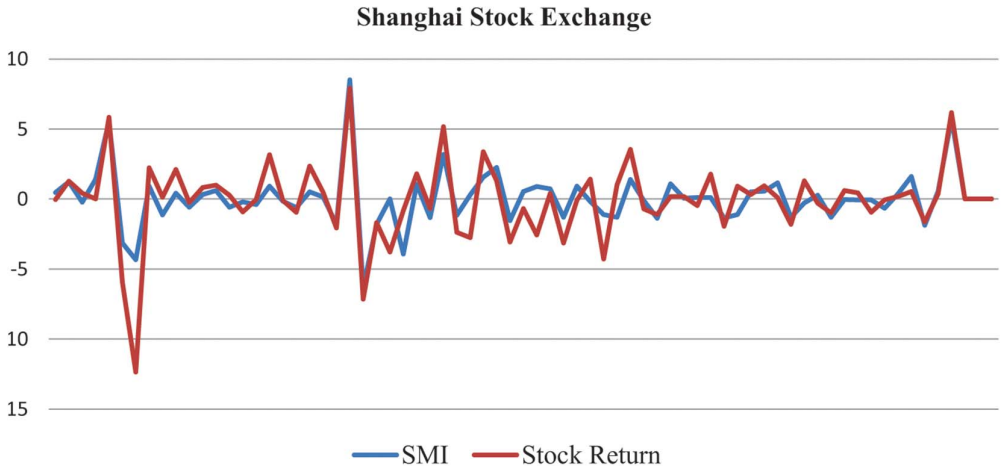

FIGURE 2 | Relationship between Shanghai stock returns and created Sentiment Index.

market under special circumstances during the outbreak of pandemics and times of intense anxiety. Our research differs from previous studies in the use of proxies of investor sentiment as indicators of the stock market and COVID-19. The strong theoretical upbringing of psychological behavior and the dynamic process of stock price fluctuation will deepen the understanding of readers, investors, and researchers. A sample of three different stock markets will help elaborate on investors' psychological and geographical sensation during investment decisions in a pandemic.

DATA DESCRIPTION AND METHODOLOGY

Data Description

Our research includes daily observations of three different stock markets, i.e., Shanghai stock market, Nikkei, and Dow Jones, from January 20 to April 27, 2020. The market selection is based on two reasons. The first is the impact of COVID-19 on investor sentiment during the pandemic, i.e., the Shanghai Stock Market (China). The second is to check the global impact by using Nikkei and Dow Jones. The reason behind the selected data span is the global spread of COVID-19. The sample period starts from the data declaration of all sample markets because the synchronized data lead to accurate results. The data are collected from stock markets in China, Japan, and the United States. The analyzed data are secondary and publically available on mentioned databases, i.e., Bloomberg for stock markets data and WHO for COVID-19.

Methodology

The Sentiment Index (SMI) model used in this research is presented below:

$$SMI_{m,t,i} = \alpha_1 STURN + \alpha_2 MFI + \alpha_3 RSI + \alpha_4 \Delta CC + \alpha_5 \Delta CD + \varepsilon_t \quad (1)$$

TABLE 3 | Ordinary correlations (United States).

	STURN	MFI	RSI	ΔCC	ΔCD
STURN	1				
MFI	0.5348	1			
RSI	0.1233	0.1892	1		
ΔCC	−0.1045	0.1607	−0.1127	1	
ΔCD	−0.0991	0.1878	−0.1153	0.8018	1

Source: Author's calculation.

In eq. 1, $SMI_{m,t}$ indicates the first principal component estimated by eq. 1's linear combination of the standardized variables. Stock exchange turnover ratio (STURN) is the turnover of the respective stock exchange, MFI is the Money Flow Index, RSI is the Relative Strength Index, Δ CC is the change in daily confirm cases, and Δ CD is the daily confirmed deaths.

Stock Exchange Turnover Ratio

The stock market's trading activity can be measured by turnover ratio; subsequently, it is used in the primary measurement model. Ying (1966) and Rehman et al. (2017) have explained that more considerable turnover is an indication of a rise in stock prices (Bullish Market), while small turnover reflects a fall in stock prices (Bearish Market). The stock exchange turnover ratio is calculated by using the following equation:

$$STURN = 100 \times \frac{VM_{Daily}}{VM_{Monthly}} \quad (2)$$

where VM_{Daily} is used for daily volume, $VM_{Monthly}$ is the average volume of the month, and STURN is calculated using a running or moving basis, which means the previous dropping value and adding the next one.

Money Flow Index

The MFI comprises daily stock prices and turnover information. An increase in money flow indicates the market trend. The

TABLE 4 | Principle component analysis (PCA) of the variables (China).

The eigenvalues	Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
Eigenvalues: (Sum = 5, Average = 1)	1	1.8735	0.6057	0.3747	1.8735	0.3747
	2	1.2678	0.3853	0.2536	3.1413	0.6283
	3	0.8825	0.0721	0.1765	4.0238	0.8048
	4	0.8104	0.6446	0.1621	4.8342	0.9668
	5	0.1658	–	0.0332	5	1

Source: Author's calculation.

rising trend in the MFI increases the buying pressure, whereas the rise in the falling trend increases the selling pressure. The following formula is used to calculate the MFI:

$$Daily\ Prices = \frac{Low + High + Close}{3} \tag{3}$$

$$Money\ Flow = Daily\ Prices \times Turnover \tag{4}$$

When the current day price is higher than the previous day, the money flow is positive, while there is a comparatively lower current day price than the previous day, the money flow is negative (Tolonen, 2011; Wang et al., 2015; Marek and Marková, 2020). The daily MFI has been calculated as follows:

$$MFI = 100 \times \frac{Positive\ Money\ Flow_{Daily}}{Positive\ Money\ Flow_{Daily} + Negative\ Money\ Flow_{Daily}} \tag{5}$$

Relative Strength Index

The technical analysis used the RSI, a momentum indicator that measures the magnitude of recent price changes, to evaluate the oversold or overbought condition in stock or other asset prices (Russell, 1978; Wilder, 1978; Russell and Franzmann, 1979; Ivascu and Cioca, 2019). An oscillator is a display board of RSI between two extremes (low and high with a range of 0–100). Suppose the oscillator shows an upward trend with RSI $\geq$ 70 value, meaning that a security is overbought or overvalued. In that case, a positive but downward trend with RSI $\leq$ 30 value indicates an oversold or undervalued condition.

$$RSI_{Daily} = 100 \times \frac{\Sigma (P_{t,i} - P_{t-1,i})_+}{\Sigma \left| P_{t,i} - P_{t-1,i} \right|} \tag{6}$$

$$(P_{t,i} - P_{t-1,i})_+ = \left| P_{t,i} - P_{t-1,i} \right|$$
$$if\ P_{t,i} - P_{t-1,i} > 0,\ \ otherwise\ P_{t,i} - P_{t-1,i} = 0$$

Change in Daily Confirmed and Death Cases

The changes in daily confirmed and death cases of COVID-19 are used to capture investor mood swings regarding the spreading pandemic. This term was used by Chen et al. (2010, 2014) to check the impact of market index change on investor mood. The changes in daily confirmed cases and daily death cases are calculated as follows:

TABLE 5 | The eigen vector loadings (Japan).

Variable	PC 1	PC 2	PC 3	PC 4	PC 5
STURN	0.6844	−0.1151	−0.1598	−0.0468	0.7005
MFI	−0.1786	0.6863	0.3105	−0.5451	0.3217
RSI	−0.6003	−0.3142	0.2582	0.3109	0.6145
ΔCC	−0.1380	0.5865	−0.5755	0.5360	0.1357
ΔCD	0.3469	0.2702	0.6929	0.5628	−0.0989

Source: Author's calculation.

$$\Delta CC = CC_t - CC_{t-1,i} \tag{7}$$

$$\Delta CD = CD_t - CD_{t-1,i} \tag{8}$$

Relationship Between Stock Market Index and Investor Sentiment

The SMI regressed on the stock market volatility series during COVID-19. The following regression equation checks the respective sentiment and market return relationship:

$$Y_{m,t-1,i} = \alpha + \beta lnSMI_{m,t-1,i} \tag{9}$$

$Y_{m,t-1}$ is the market return of the stock market's indicator concerning time, while $SMI_{m,t-1,i}$ is the Sentiment Index. The calculation of $Y_{m,t-1}$ is done by the following equation:

$$R_{m,t,i} = 100 * Log\left(\frac{P_t}{P_{t-1}}\right) \tag{10}$$

In this equation, P_t is the current market price (closing), and P_{t-1} is the preceding market price (closing).

RESULTS

Principle Component Analysis

The principle component analysis (PCA) is employed to extract meaningful information from multivariate data (orthogonal linear transformation) and present the information in the form of a set of new variables by use of scalar projections, which are called principal components (PC). The total number of PCs is less than or equal to the original number of variables. That is why the new variables or PCs are known as a linear combination

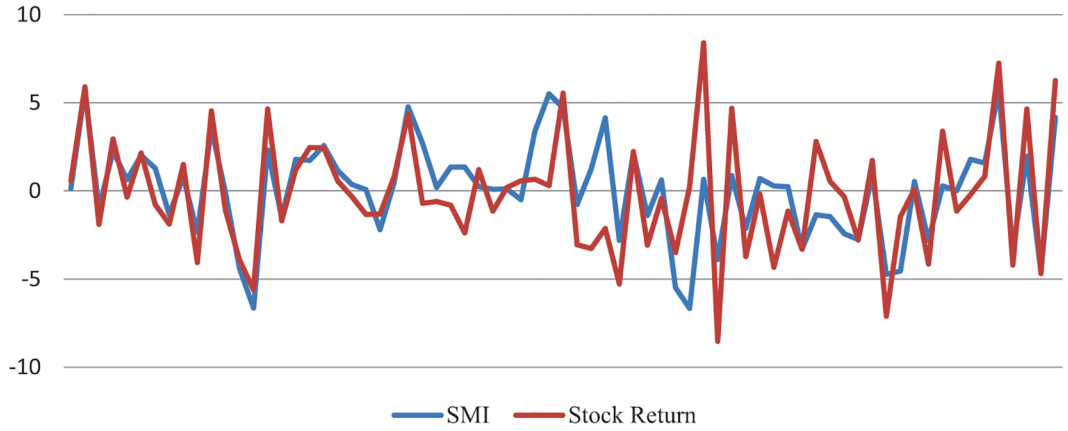

FIGURE 3 | Relationship between Nikkei 225 market returns and created Sentiment Index.

of actual variables. The PCs are used as direction identifiers and correspond to the total variation of the data set. The multivariate data dimensionality reduces by using PCA with minimal loss of information. The eigenvalues explained that every PC retains the amount of variation. The division of variation between PCs as the eigenvalues is large for first PCs and small for subsequent ones. The first PC, or the PC with more than one eigenvalue, was used to check the correlation because of the increased variation retention of the data set.

Shanghai Stock Market

The principal component analysis of the selected variable for the Shanghai Stock Market is presented in **Tables 1**, **2**. According to Kaiser Criterion, the principle component with an eigenvalue not less than 1 will be used (Yeomans and Golder, 1982; Braeken and Van Assen, 2017; Rehman et al., 2017). The eigenvalue of PC-1 is 2.0545, which meets the criteria of maximal variation. The numeric presentation of PC-1 shows 41.09% of the Shanghai Stock Market relationship, which is the highest value compared to other principal components. The following index was created by using the first principle component:

$$SMI_{SSE,t} = -0.0584STURN + 0.1759MFI + -0.1244RSI + 0.6881\Delta CC + 0.6904\Delta CD$$

The relationship between Shanghai stock returns and the created SMI is graphically presented in **Figure 2**.

The correlation matrix results are displayed in **Table 3**, which is employed to check the multicollinearity among independent variables. The multicollinearity check is essential for the accuracy of results because inter-correlation among independent variables in a multiple regression model can mislead the results. When the regressor shows a value of more than 0.80, then the data series shows multicollinearity. The correlation matrix range for the Shanghai Stock Market is from −0.0991 to 0.8018, ensuring the data series is free from multicollinearity.

TABLE 6 | Ordinary correlations (United States).

	STURN	MFI	RSI	ΔCC	ΔCD
STURN	1				
MFI	0.5349	1			
RSI	0.1234	0.1892	1		
ΔCC	−0.1045	0.1607	−0.1128	1	
ΔCD	−0.0991	0.1878	−0.1154	0.8008	1

Source: Author's calculation.

Nikkei 225 Stock Market

The PCA of the selected variable for the Nikkei 225 stock market is presented in **Tables 4**, **5**. According to Kaiser Criterion, the principle component with an eigenvalue not less than 1 will be used (Yeomans and Golder, 1982; Braeken and Van Assen, 2017; Rehman et al., 2017). The eigenvalue of PC-1 for the Nikkei 225 stock market is 1.8735, which captures maximum variation and gets the full support of Kaiser Criterion. The cumulative proportion value of PC-1 shows 37.47% of the Nikkei 225 stock market relationship with a set of selected variables. The following index was created by using the first principle component:

$$SMI_{N225,t} = 0.6844STURN + -0.1786MFI + -0.6003RSI + - 0.1380\Delta CC + 0.3469\Delta CD$$

The relationship of Shanghai stock returns and created SMI is graphically presented in **Figure 3**.

The correlation matrix results are displayed in **Table 6**, which is employed to check the multicollinearity among independent variables. The range of correlation matrix for the Nikkei 225 stock market is between −0.0991 and 0.8008, which rejects the existence of multicollinearity.

Dow Jones Stock Market

The PCA of the selected variable for the Dow Jones stock market is presented in **Tables 7**, **8**. The eigenvalue of PC-1 is 1.7291,

TABLE 7 | Principle component analysis (PCA) of the variables (China).

	Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
The eigenvalues						
Eigenvalues: (Sum = 5, Average = 1)	1	1.7291	0.2446	0.3458	1.7291	0.3458
	2	1.4845	0.7252	0.2969	3.2136	0.6427
	3	0.7594	0.0917	0.1519	3.9730	0.7946
	4	0.6677	0.3083	0.1335	4.6406	0.9281
	5	0.3594	–	0.0719	5	1

Source: Author's calculation.

TABLE 8 | The eigen vector loadings (Japan).

Variable	PC 1	PC 2	PC 3	PC 4	PC 5
STURN	−0.2275	0.5515	0.6948	0.3344	0.2226
MFI	−0.1650	0.5628	−0.6981	0.4107	−0.0009
RSI	−0.1960	−0.5985	0.0193	0.7743	0.0590
ΔCC	0.6798	0.0110	−0.0776	0.1278	0.7179
ΔCD	0.6484	0.1443	0.1534	0.3219	−0.6570

Source: Author's calculation.

which captures maximum variation and gets the full support of Kaiser Criterion (Yeomans and Golder, 1982; Cioca et al., 2014; Braeken and Van Assen, 2017; Rehman et al., 2017). The cumulative proportion value of PC-1 shows 34.58% of the Dow Jones stock market relationship with chosen variables, which is the highest value among all principal components. The following index was created using the first principle component:

$$SMI_{DJ,t} = -0.2275STURN + -0.1650MFI - 0.1960RSI$$
$$+0.6798\Delta CC + 0.6484\Delta CD$$

The relationship between Dow Jones stock returns and the created SMI is graphically presented in **Figure 4**.

The correlation matrix results are displayed in **Table 9**, which is employed to check the multicollinearity among independent variables. The importance of multicollinearity is observed because inter-correlation among independent variables in a multiple regression model can betray the results. The range of the correlation matrix for the Dow Jones stock market is from −0.0367 to 0.6135, which guarantees the data series free from multicollinearity.

The regression results are presented in **Table 10**, which shows the coefficient (β) −0.2532, −0.2532, and −0.0264 as the value of the SMI with 0.0056, 0.0056, and 0.0000 probability values for Shanghai, Nikkei 225, and Dow Jones stock markets, respectively. According to this study, the SMI is negative and significantly related to stock returns at a 1% level of significance (Baker and Wurgler, 2007; Chen et al., 2014). The importance of SMI explicated that investor sentiments are strongly affected by volatility and investment decision of the stock market during the pandemic. The results have also shown the negative impact of COVID-19 on investor sentiment and stock market returns. The spreading pandemic disturbs the general public's daily routines and interrupts stock markets, financial markets, and investor psychology toward investment decisions.

DISCUSSION

After the pandemic outbreak and the WHO's classification of it as a public health emergency, investors' psychological pressure

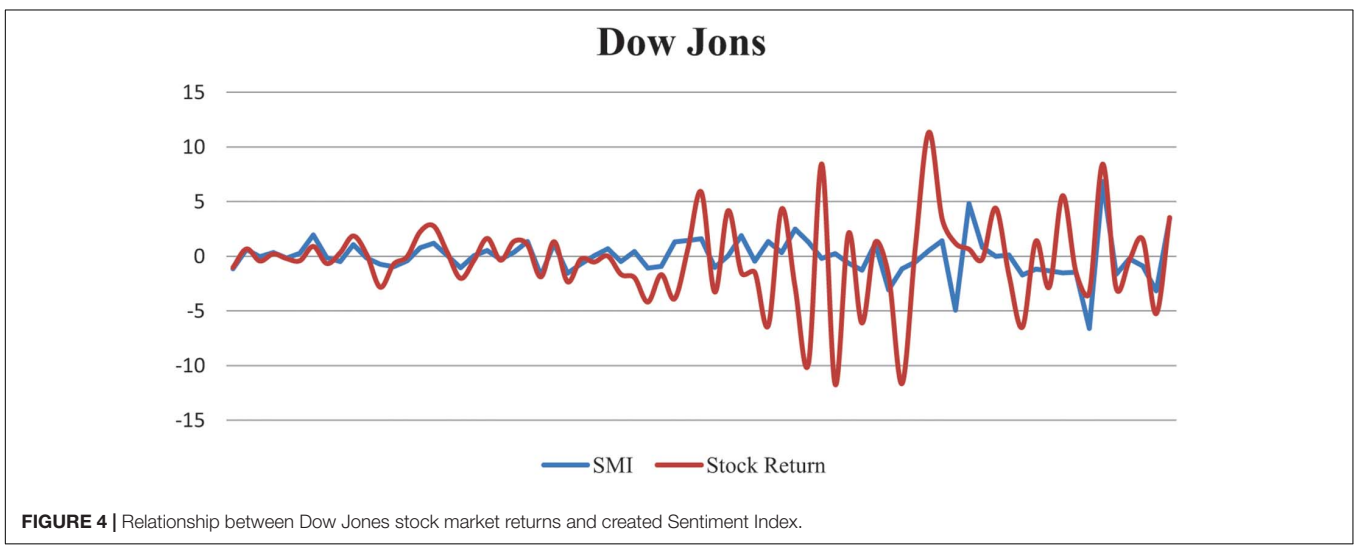

FIGURE 4 | Relationship between Dow Jones stock market returns and created Sentiment Index.

TABLE 9 | Ordinary correlations (United States).

	STURN	MFI	RSI	ΔCC	ΔCD
STURN	1				
MFI	0.2490	1			
RSI	−0.2251	−0.2420	1		
ΔCC	−0.2134	−0.1088	−0.1600	1	
ΔCD	−0.0367	−0.0572	−0.1932	0.6135	1

Source: Author's calculation.

TABLE 10 | The relationship between stock exchange and Sentiment Index during COVID-19.

	α (consent)	β
Shanghai stock exchange		
SMI (Sentiment Index)	−0.9453	−0.2532*
Prob.	0.0079	0.0056
T-statistic	[−2.7388]	[−2.8627]
Nikkei 225		
SMI (Sentiment Index)	−0.9453	−0.2532*
Prob.	0.0079	0.0056
T-statistic	[−2.7388]	[−2.8627]
Dow Jones		
SMI (Sentiment Index)	8.6546	−0.0264*
Prob.	0.0000	0.0000
T-statistic	[117.3315]	[−6.5732]

**Shows 1% level of significance.*
Source: Author's calculation.

and response showed a downward trend in stock markets. The sudden reduction in Shanghai (1.6%), Dow and Jones (9.5%), and Nikkei (10.6%) can be observed in **Figure 1**. The numerical facts of stock markets are collected from Bloomberg's official site, and the investor sentiment is generated using different proxies. The selected proxies represent different circumstances that might be affected the psychological behavior and decision power of investors. In this research, daily data of stock markets and increase in COVID-19 (death and confirmed cases) are used, accurately covering investors' daily psychological pressure. The PCA is employed due to its useful features: correlation removal, improved algorithm performance, repaired overfitting among variables, and reduction of high dimensions into low dimensions for clear visualization of every single component. The research results elucidated a negative and significant relationship between investor psychology and investment decision under pandemic outbreaks for all selected markets. The stock market movement along the investor SMI in **Figures 2–4** has shown the beneficial relationship between investor psychology and stock market returns. The investors or business people were generally outbound for 10–15 h per day. During pandemic, however, they were homebound, which affected their psychology adversely. This research provides some precautionary measures for releasing the pandemic and investment pressure. Investors should adopt behavior therapy—home-based relaxation exercises to control their anxiety and depression. The small-scale version of their official stock market setup should be established in their homes, and visits to the offices should be reduced. The global paramedical staff and scientists are continually struggling to elucidate the vaccines. Until they succeed, everyone should follow the precautions, i.e., wearing a mask, sanitizing, and maintaining distance in workplaces and the like. The less psychological control or pressure can help investors invest money and keep stock markets and economies on track.

CONCLUSION

The origin of the current "COVID-19" pandemic is considered to be the wet market of Hunan, Hubei Province, China. Within 1 month from its evolution, COVID-19 has spread to 109 countries, and the pandemic has gained intense global attention. The sudden outbreak of the pandemic and the rapid increase of its spread have left a significant impact on human physiology and psychology. The psychological effect disrupts the psychology of the general public and investor psychology toward stock market investment decisions. The increasing number of cases and deaths worldwide due to COVID-19 has made the economic situation more uncertain and unpredictable. A sudden and dramatic downward trend in financial markets is observed in Chinese and global financial markets, such as Shanghai, Nikkei 225, and Dow Jones, which are down by −1.6, 10.6, and −9.5% points, respectively. There are no promising clinical treatments or prevention strategies developed against COVID-19 until now, threatening human psychology. At the same time, healthcare workers are searching for a solution to the question of vaccination against COVID-19 and psychiatrist-designed psycho-therapeutic strategies to cope with the threat, stress, and anxiety of the pandemic, which have a devastating effect on daily life.

This research paper examined the relationship between the stock market and investor psychology regarding stock market investment decisions during the pandemic. By employing PCA, this research observed a downward trend in stock markets and the pandemic's negative impact on investor sentiment. This investigation confirmed the economic crises in the Shanghai, Nikkei 225, and Dow Jones stock markets during the pandemic. The results have pointed out that the threat of health strongly affected the psychology of investors. The created SMI behaved negatively with a significance of 1% for three selected markets. The three selected markets represented three different world areas with diverse geographical backgrounds, financial positions, cultures, resources, and traditions to check global investor behavior. The significant relationship between the SMI and the stock market during a pandemic confirmed that the behavior of almost every nation fighting COVID-19 and investor financial behavior is the same across China and other developed countries. This study concluded that health crises and psychological disorders among the general public affect the economic condition and financial position of individual and global investors.

Limitations and Suggestions

The pandemic is still under discussion, and healthcare workers are trying to find a solution to the issue of vaccination. It is

doubtlessly tough to run global systems, such as the stock market, from the workers' individual homes, but to stop working due to anxiety or psychological threat is also not the solution to the problem. Investor sentiment creates tremendous uncertainty for stock markets and commensurate with a potential crisis of scale and speed. The governments and policy-makers should have to set some domestic and international policies for this unpredictable situation for workplaces. The pandemic is a worldwide issue, but the courageous actions of governments, global citizens, policy-makers, healthcare workers, scientists, and investors can enable us to overcome this global crisis.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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The Age Structure, Stringency Policy, Income, and Spread of Coronavirus Disease 2019: Evidence From 209 Countries

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This article aims at answering the following questions: (1) What is the influence of age structure on the spread of coronavirus disease 2019 (COVID-19)? (2) What can be the impact of stringency policy (policy responses to the coronavirus pandemic) on the spread of COVID-19? (3) What might be the quantitative effect of development levelincome and number of hospital beds on the number of deaths due to the COVID-19 epidemic? By employing the methodologies of generalized linear model, generalized moments method, and quantile regression models, this article reveals that the shares of median age, age 65, and age 70 and older population have significant positive impacts on the spread of COVID-19 and that the share of age 70 and older people in the population has a relatively greater influence on the spread of the pandemic. The second output of this research is the significant impact of stringency policy on diminishing COVID-19 total cases. The third finding of this paper reveals that the number of hospital beds appears to be vital in reducing the total number of COVID-19 deaths, while GDP per capita does not affect much the level of deaths of the COVID-19 pandemic. Finally, this article suggests some governmental health policies to control and decrease the spread of COVID-19.

Keywords: COVID-19 cases, income, stringency policy, COVID-19 deaths, 70-aged people, median aged people, 65-aged people, government responses

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INTRODUCTION

Throughout human history, societies have witnessed numerous epidemic diseases (such as the Black Death, Spanish influenza, SARS, MERS, Ebola, and Zika) that have led to political, social, economic, and technological changes (Garrett, 2007; UN, 2014; Baldwin and Mauro, 2020; Ojo, 2020). The last experienced pandemic is coronavirus disease 2019 (COVID-19), which continues to

have a profound global impact on the world. COVID-19, which has been declared a pandemic by the World Health Organization (WHO) on March 11, 2020, is a virus epidemic that has affected the whole world severely since its occurrence in Wuhan, China, in December 2019 (Sohrabi et al., 2020).

As expressed by many eminent scientists and especially by the WHO, the contagiousness of the virus causing COVID-19 disease was high. Over seven million COVID-19 cases and more than 400,000 deaths were reported to WHO by June 2020 (WHO, 2020a). The distribution of total COVID-19 cases around the world was as follows: America (0.478), Europe (0.327), Eastern Mediterranean (0.094), South-East Asia (0.054), Western Pacific (0.027), and Africa (0.020) (WHO, 2020a). In addition, the proportion of deaths was 0.457 (Europe), 0.455 (America), 0.037 (Eastern Mediterranean), 0.026 (South-East Asia), 0.018 (Western Pacific), and 0.008 (Africa) (WHO, 2020a). This virus is novel and no treatment methods such as vaccines or drugs still exist. The virus has inevitably caused severe uncertainty and anxiety in the whole world.

During the epidemic, various economic, and non-economic measures have been taken by governments all over the world (Bruin et al., 2020; Delivorias and Scholz, 2020; Nicola et al., 2020). By following these precautions, the economic and social costs of the pandemic are still being tried to be minimized by eliminating the negative effects of the epidemic. The costs of these pandemic outbreaks in countries can be classified into two groups: (i) direct costs due to emergent need for intervention to outbreaks like medical testing, diagnosis, treatment, and equipment costs; or (ii) indirect costs related to economical production and productivity losses due to the epidemic (Demir, 2020). These costs are expected to have several effects on social and economic life in both the short- and long-term (Ali and Alharbi, 2020; Nicola et al., 2020). These social influences resulted in poverty, income inequality, less access to essential public services, distorted social psychology, and limited social communication. At the same time, the economic effects caused undesirable changes in macroeconomic indicators. According to the estimates of ILO (2020), it is expected that the increase in global unemployment will be 5.3 million for the best scenario and 24.7 million for the worst scenario.

Considering the main effects of the COVID-19 pandemic, demographic characteristics (like age, gender, and others) come to the fore in the distribution of these effects in societies. In studies examining the effects of the COVID-19 pandemic, they have been focused on various topics such as mortality rate (Bonanad et al., 2020; Bulut and Kato, 2020; De Paz et al., 2020; Jin et al., 2020; Liu et al., 2020a; Meo et al., 2020; Roberton et al., 2020), psychological effects (Ahmed et al., 2020; Cao et al., 2020; Gorrochategi et al., 2020; Shrira et al., 2020), and the spread of the disease (Banerjee et al., 2020; Chen Z. et al., 2020; DeBiasi et al., 2020; Dolores De Luca et al., 2020; Huang et al., 2020; Li et al., 2020; Liu et al., 2020b,c; Meo et al., 2020; Mustafa and Selim, 2020; Palmieri et al., 2020). Two main findings have been reached: (a) mortality rates associated with COVID-19 are higher in individuals over 65 years of age than in younger individuals, and (b) by age groups, the impacts of the intensity of COVID-19 disease on community psychology vary. As age increases, negative psychological effects such as stress, anxiety, and depression have occurred more among individuals over 65 years old. Briefly, the specific features of the virus such as high contagion rate and risk of death have different effects primarily on populations with different age structures. For instance, the contagion rate of COVID-19 is higher in children and young age groups, while the mortality rates are higher in older people, especially those over 65 years.

Although there exist several studies examining the effects of COVID-19 from different perspectives in the relevant literature, econometrical analyses estimating the relationship between age structure and the pandemic are limited. Additionally, one may claim that majority of the existing literature follows some comparison analyses and/or some econometric analyses in which heterogeneous structure and quantile structure of the data are not considered.

In this regard, in this research, the outputs from 209 countriesare expected to reveal unbiased, efficient, and consistent results to explore the basic determinants of COVID-19 cases and deaths. The purpose of this article is to determine the impact of age structure and government policy in response to the COVID-19 outbreak (stringency policy) in 209 countries in the world by applying the generalized linear model (GLM), generalized moments method (GMM), and quantile regression model (quantile).

The article is organized as follows: after the section "Introduction," the second section contains the "Data and Methodology." The third section introduces the "Study Findings." The fourth and fifth sections will reveal the "Discussion and Conclusion," respectively.

DATA AND METHODOLOGY

Data

The data, data source, and the list of cross-sections (countries) are given in **Appendix Tables A1**, **A2**. The variables are total cases per million; total deaths per million; the shares of the median age population, age 65 population, and age 70 and older population; stringency index; GDP per capita; and the number of hospital beds, respectively. The stringency index (or stringency policy index) indicates the governments' policies in response to the COVID-19 outbreak and contains information on containment and closure policies, such as school closures and restrictions in movement; economic policies, such as income support to citizens or provision of foreign aid; and health system policies such as the COVID-19 testing regime or emergency investments into healthcare.

Methodology

This article employs the methodologies of GLM, GMM, and quantile regression to yield the relevant model estimations by

following the functions given in Eqs 1–6.

$$\text{Total COVID}-19\text{ cases} = \alpha 10 + \alpha 11\ (\text{Median age population}) + \alpha 12\ (\text{Stringency policy}) + e \quad (1)$$

$$\text{Total COVID}-19\text{ cases} = \alpha 20 + \alpha 21\ (\text{Age 65 and older population}) + \alpha 23\ (\text{Stringency policy}) + \phi \quad (2)$$

$$\text{Total COVID}-19\text{ cases} = \alpha 30 + \alpha 31\ (\text{Age 70 and older population}) + \alpha 32\ (\text{Stringency policy}) + \eta \quad (3)$$

$$\text{Total COVID}-19\text{ deaths} = \alpha 40 + \alpha 41\ (\text{Median age population}) + \alpha 42\ (\text{Total COVID}-19\text{ cases}) + \alpha 43\ (\text{GDP per capita}) + \alpha 44\ (\#\text{Hospital beds}) + s \quad (4)$$

$$\text{Total COVID}-19\text{ deaths} = \alpha 50 + \alpha 51\ (\text{Age 65 and older population}) + \alpha 52\ (\text{Total COVID}-19\text{ cases}) + \alpha 53\ (\text{GDP per capita}) + \alpha 54\ (\#\text{Hospital beds}) + \text{ɾ} \quad (5)$$

$$\text{Total COVID}-19\text{ deaths} = \alpha 60 + \alpha 61\ (\text{Age 70 and older population}) + \alpha 62\ (\text{Total COVID}-19\text{ cases}) + \alpha 63\ (\text{GDP per capita}) + \alpha 64\ (\#\text{Hospital beds}) + \varsigma \quad (6)$$

Where e, ϕ, η, s, ɾ, and ς denote the residuals of the estimated models. The age variables represent the shares of median age, age 65, and age 70 and older people in the population. #Hospital beds indicate the number of hospital beds.

Generalized moments method, which can be considered as a nested estimation method (maximum likelihood, least squares, instrumental variables, and two-stage least squares), is one of the most preferred methods of econometric analysis in recent years. The GMM allows us to estimate the moments of a population distribution relative to the moments predicted from a particular sample (Burguete et al., 1982; Hansen, 1982; Asteriou and Hall, 2015).

The Arellano and Bond (1991)-type one-step estimator uses the identity matrix as a weighting matrix (Cameron and Trivedi, 2005). The one-step GMM uses the weighting matrix and the estimator as defined in Eqs 7 and 8. It can be shown that the estimator is the optimal panel GMM estimator as $u_i|Z_i$. is iid $\left[0,\sigma^2 I_t\right]$.

$$W_N = \left[\sum_i Z_i' Z_i\right]^{-1} = \left[Z'Z\right]^{-1} \quad (7)$$

$$\hat{\beta}_{2SLS} = \left[X'Z\,(W)^{-1}\,Z'X\right]^{-1} X'Z\,(W)^{-1}\,Z'y \quad (8)$$

Normal distribution plays an important role in linear and nonlinear regression models. GLMs are those of the nonlinear models without normal distribution assumption in the dependent variable (Collins, 2008).

Generalized linear model consists of three components: distribution of the dependent variable, systematic part with linear estimators, and link function (De Jong and Heller, 2008). The probability density function of the response variable from the exponential distribution family can be written as shown in Eq. 9.

$$f(x;\varphi,\omega) = m(x,\omega)\exp\left\{\frac{x\varphi - n(\varphi)}{k(\omega)}\right\} \quad (9)$$

Where $k(.)$,$n(.)$, and $m(.)$ are certain functions. The term φ is the natural location parameter. The term ω is the scale parameter. In Eq. 9, the term φ is the canonical parameter, the term ω is the propagation parameter, and $m(x, \omega)$ is a known function. The choice of the functions $n(\varphi)$ and $m(x, \omega)$ determines the actual probability function such as the binomial, normal, or gamma.

Notably, in the case of heterogeneity structure in the variance, the OLS analyses might fail to estimate the coefficients efficiently and consistently. Under heterogeneity structure in the variance, we need alternative regression models such as quantile regression models in which heterogeneity structure and quantile structure of the data are considered (John and Nduka, 2009; Katchova, 2013). Quantile regression aims to estimate the conditional median or other quantiles, such as the 10th quantile, 25th quantile, 75th quantile, and 90th quantile of the response variable (Ong et al., 2015).

Quantile regression determines the model for the selected percentiles in the conditional distribution of the dependent variable (Palma et al., 2020). Hence, traditionally, the linear regression model is expressed as follows:

$$z_i = \alpha_0 + \alpha_1 y_{i1} + \cdots + \alpha_p y_{ip} \quad i = 1, \ldots, n \quad (10)$$

Parameter p in Eq. 10 shows the number of parameters in the equation. The term$i$ is equal to the number of data points. As a similar formation to the linear regression model, the quantile regression model equation for the τ-th quantile can be written as follows:

$$Q_\tau(z_i) = \alpha_0(\tau) + \alpha_1(\tau)\,y_{i1} + \cdots + \alpha_p(\tau)\,y_{ip} \quad i = 1, \ldots, n \quad (11)$$

Thus, alpha coefficients have become functions that change depending on the quantile (Dye, 2020).

STUDY FINDINGS

The cases and deaths denote the cases and deaths from the COVID-19 pandemic. The cross-sections have been chosen based on the availability of data for 209 countries as of (a) April 2, 2020; (b) June 2, 2020; and (c) August 2, 2020, and depicted in **Figures 1–3**, respectively.

Table 1 shows the impacts of different age structures (shares of median age, age 65, and age 70 and older people in the population) on COVID-19 total cases per million as of April 2, 2020, in 209 countries. The second and third columns exhibit

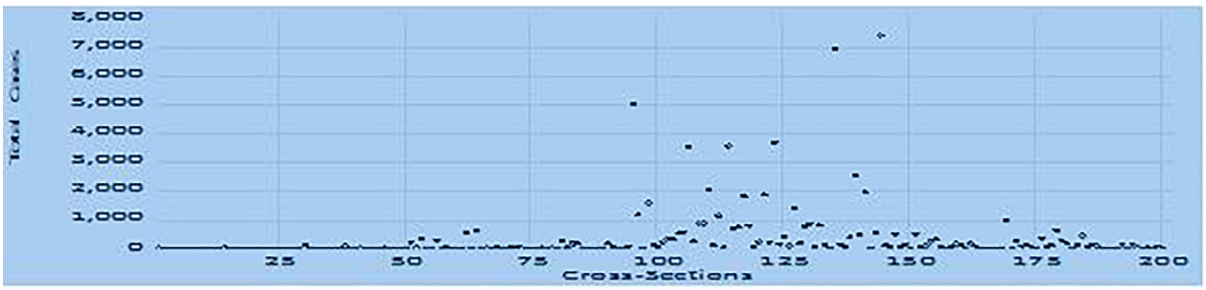

FIGURE 1 | Total COVID-19 cases per million (April 2, 2020).

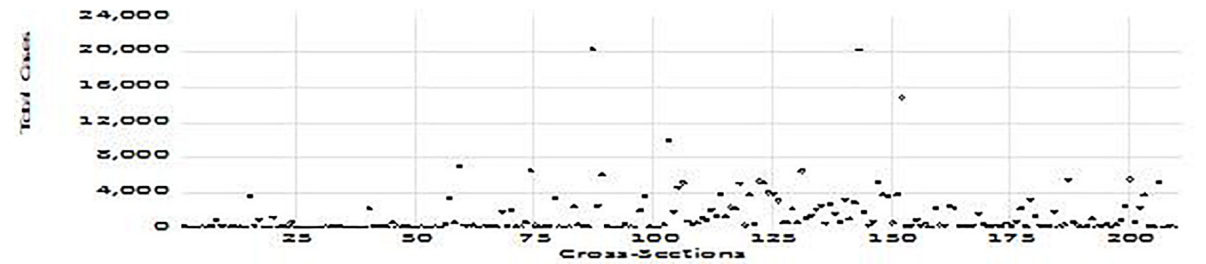

FIGURE 2 | Total COVID-19 cases per million (June 2, 2020).

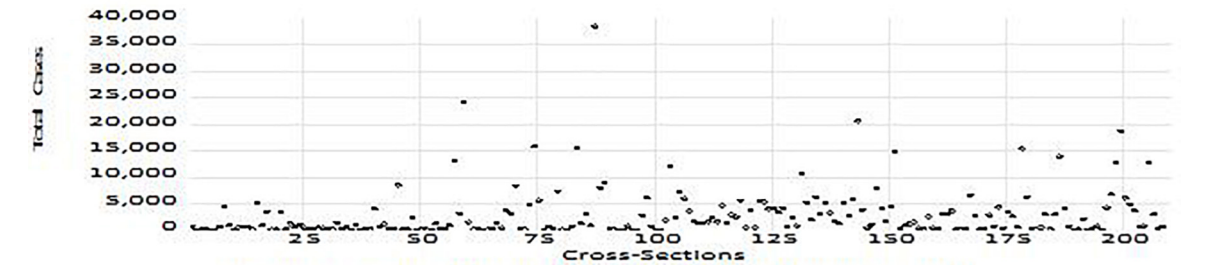

FIGURE 3 | Total COVID-19 cases per million (August 2, 2020).

the GLM and GMM estimations. Besides GLM and GMM, due to the heteroscedasticity structure of the data, we have decided to follow quantile regression analyses to observe the parameter estimations at different quantiles of the data as the routine recommended in Katchova (2013).

In **Table 1**, GMM, GLM, and quantile (at 50 and 75 quantiles) regression analyses exhibit significant positive contributions of shares of median age, age 65, and age 70 and older people in the population to the total COVID-19 cases. The quantile estimations did not find a significant impact of the median age population on total cases at the 25th quantile. The quantile 50th (median) estimation reveals that the unit increase in the share of median age people caused the total number of COVID-19 cases to increase by 1.61 units. Moreover, the COVID-19 cases will be 5.88 units (cases) more due to a unit increase in the share of median age people at the 75th quantile. **Table 1** reveals that upon a 1-unit increase in the share of median age in the population, the number of total COVID-19 per million increased significantly by 7.91 units (by GLM estimation) and by 6.80 units (by GMM estimation).

Table 1 reaches the evidence that an increase in the percentage of people aged 65 and older increased the total number of COVID-19 cases by 2.42 units at the 25th quantile. The quantile 50th (median) estimation exhibits that a1-unit increase in the percentage of peopleaged 65 and older increased the total number of COVID-19 cases by 8.97 units. The COVID-19 cases will be 24.51 units (cases) more due to a unit increase in the percentage of people aged65 and older at the 75th quantile.

Table 1 indicates the impacts of people aged 70 and over on the total COVID-19 cases. All three estimation models state that the higher the share of people aged70 and over in the population, the more the COVID-19 cases will be. The quantile regression results give more details on the influence of age structure on the number of cases. The quantile estimation results in **Table 1** show that if any country has an additional one more unit of the share of the population aged 70 and over, that country will have 3.73

TABLE 1 | The impact of age structure on COVID-19 total cases in April 2020.

Independent variables	GLM[1,2]	GMM[3,4,5]	Quantile (25)[6,7,8]
Median age	7.91 (1.13) [6.98] {0.00}	6.80 (1.40) [4.84] {0.00}	0.35 (0.26) [1.34] {0.18}
			Quantile (50)[6,7,8]
			1.60 (0.28) [5.66] {0.00}
			Quantile (75)[6,7,8]
			5.88 (0.98) [5.98] {0.00}
Aged-65_older	27.40 (3.19) [8.58] {0.00}	2 3.46 (3.70) [6.32] {0.00}	2.41 (1.14) [2.11] {0.03}
			Quantile (50)[6,7,8]
			8.97 (1.39) [6.40] {0.00}
			Quantile (75)[6,7,8]
			24.51 (4.96) [4.93] {0.00}
Aged-70_older	43.17 (4.85) [8.89] {0.00}	37.47 (5.71) [6.56] {0.00}	3.73 (1.79) [2.08] {0.03}
			Quantile (50)[6,7,8]
			15.42 (2.19) [7.01] {0.00}
			Quantile (75)[6,7,8]
			42.66 (5.66) [7.53] {0.00}

[1]By Newton-Raphson-Marquardt steps. [2]The coefficient covariance is computed using observed Hessian. [3]Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 5.0000). [4]Standard errors and covariance are computed following the estimation weighting matrix. [5]Instrument specification: total-cases-per-million (−1). [6]Sparsity methods: Kernel (Epanechnikov) using residuals. [7]Bandwidth methods: Hall-Sheather. [8]Estimation successfully identifies the unique optimal solution. () shows standard errors, and {} denotes probability values.

TABLE 2 | The impact of age structure on COVID-19 total cases on June 2020.

Independent variables	GLM[1,2]	GMM[3,4,5]	Quantile (25)[6,7,8]
Median age	39.12 (4.65) [8.41] {0.00}	37.81 (5.10) [7.40] {0.00}	3.93 (1.68) [2.33] {0.02}
			Quantile (50)[6,7,8]
			12.07 (1.92) [6.28] {0.00}
			Quantile (75)[6,7,8]
			46.62 (9.38) [4.96] {0.00}
Aged-65_older	106.08 (14.4) [7.33] {0.00}	127.1 (18.3) [6.93] {0.00}	18.49 (5.74) [3.21] {0.00}
			Quantile (50)[6,7,8]
			45.65 (7.55) [6.04] {0.00}
			Quantile (75)[6,7,8]
			143.04 (23.68) [6.04] {0.00}
Aged-70_older	161.1 (22.19) [7.26] {0.00}	157.7 (22.72) [6.93] {0.00}	30.41 (7.99) [3.80] {0.00}
			Quantile (50)[6,7,8]
			71.79 (13.13) [5.46] {0.00}
			Quantile (75)[6,7,8]
			214.8 (32.12) [6.68] {0.00}

[1]By Newton-Raphson-Marquardt steps. [2]The coefficient covariance is computed using observed Hessian. [3]Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 5.0000). [4]Standard errors and covariance are computed following the estimation weighting matrix. [5]Instrument specification: total-cases-per-million (−1). [6]Sparsity methods: Kernel (Epanechnikov) using residuals. [7]Bandwidth methods: Hall-Sheather. [8]Estimation successfully identifies the unique optimal solution. () shows standard errors, and {} denotes probability values.

more units of the total cases (at the 25th quantile), 15.42 more units of the total cases (at the 50th quantile), and 42.66 more cases (at the 75th quantile of the total case data) as of April 2, 2020, in 200 countries.

Table 2 yields the influences of the share of the median age population on the COVID-19 pandemic as of June 2, 2020, in 209 countries. GLM, GMM, and quantile estimations reached significant positive coefficients of the share of median age on COVID-19 cases. GLM and GMM estimations are 39.13 and 37.81, respectively. The predictions of quantiles (25), (50), and (75) are 3.94, 12.07, and 46.62, respectively.

The quantile regressions show that the impacts of the share of people aged 65 (share of peopleaged 70) on the expansion of COVID-19 are 18.49 (30.41) at the 25th quantile and 143.04 (214.88) at the 75th quantile on June 2, 2020 (**Table 2**).

Table 3 yields the magnitudes of the responses of total COVID-19 cases per million to the unit increase in shares of median age, age 65, and age 70 in the population as of August 2, 2020, in 208 countries. In **Tables 1–3**, the estimation results have similar remarks depicting that the impact of age structure on dispersing of the COVID-19 epidemic (i) tends to increase significantly from median age to age 65 and from age 65 to

TABLE 3 | The impact of age structure on COVID-19 total cases on August 2020.

Independent variables	**GLM**[1,2]	**GMM**[3,4,5]	**Quantile (25)**[6,7,8]
Median age	91.91 (10.58) [8.68] {0.00}	84.47 (12.21) [6.91] {0.00}	10.33 (4.94) [2.09] {0.03}
			Quantile (50)[6,7,8]
			36.01 (5.78) [6.22] {0.00}
			Quantile (75)[6,7,8]
			112.7 (15.49) [7.27] {0.00}
Aged-65_older	222.6 (34.15) [6.51] {0.00}	301.7 (49.39) [6.10] {0.00}	40.46 (15.30) [2.64] {0.00}
			Quantile (50)[6,7,8]
			120.5 (19.32) [6.23] {0.00}
			Quantile (75)[6,7,8]
			335.31 (53.97) [6.21] {0.00}
Aged-70_older	333.38 (52.65) [6.33] {0.00}	465.6 (78.30) [5.94] {0.00}	48.05 (24.5) [1.96] {0.05}
			Quantile (50)[6,7,8]
			171.4 (28.9) [5.92] {0.00}
			Quantile (75)[6,7,8]
			541.9 (83.3) [6.50] {0.00}

[1]By Newton-Raphson-Marquardt steps. [2]The coefficient covariance is computed using observed Hessian. [3]Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 5.0000). [4]Standard errors and covariance are computed following the estimation weighting matrix. [5]Instrument specification: total-cases-per-million (–1). [6]Sparsity methods: Kernel (Epanechnikov) using residuals. [7]Bandwidth methods: Hall-Sheather. [8]Estimation successfully identifies the unique optimal solution. () shows standard errors, and {} denotes probability values.

age 70+ in the population; (ii) tends to increase from April 2, 2020, to August 2, 2020; and (iii) tends to increase considerably from lower quantile to higher quantile of the data for 209 cross-sections.

The impacts of different age structures on COVID-19 total cases in the continents of Europe, America, Asia, and Africa are given in **Appendix Table A3**. Two main outcomes appear. Firstly, the adverse effects of age structures on total cases in all continents are subject to a prominent increase from median age to age 70 and older people. This output confirms the earlier results given in tables from 1 to 9. Secondly, the negative effects of median age, age 65, and age 70 populations in Europe on COVID-19 cases are greater than the negative effects of the same age groups on COVID-19 cases in the other three continents. The negative effects of these age groups on total cases in the American continent are higher than the negative effects of the same age groups in the other two continents (Asia and Africa). The impact of the COVID-19 pandemic on people with chronic diseases such as hypertension and cardiac insufficiency (Chen Y. et al., 2020; Ip et al., 2020; Polverino et al., 2020; Roncon et al., 2020), diabetes (Bornstein et al., 2020; Guo et al., 2020; Liu et al., 2020c; Zhang et al., 2020c,d), and cancer (Fratino et al., 2020; Zhang et al., 2020a) is more serious. Chronic diseases are especially higher in older adults (Atella et al., 2018; Zhao et al., 2018; NCOA National Council on Aging [NCOA], 2020) because changes in gene expression during aging are seen as one of the most important biological markers of aging and chronic diseases (Mueller et al., 2020).

The average lifetime and population rates in terms of diabetes and smoking might also have a considerable role in the level of the COVID-19 pandemic. In **Figures 4A, A.1, A.2** show that the percentages of female smokers in the female populations are relatively higher in Europe and America than those in Asia and Africa and that the percentages of male smokers in the male populations are greater in Asia and Europe than those in Africa and America. The statistical output of high rate of smoking in Europe might be the cause of the higher rate of COID-19 cases in Europe. According to theWHO (2020b), there is evidence that a relationship exists between smoking and increased severity of disease and death in hospitalized COVID-19 patients.

Figure 4A.3 evaluating the prevalence of diabetes, which is one of the chronic diseases, exhibits that the continents with the higher rates in all age groups are America and Asia, respectively. **Figure 4A.4** shows that the average life expectancy is relatively higher in the continents of Europe and America than that in Asia and Africa. The longer average lifetime might increase the possibility of having chronic diseases in population density. This interpretation of course needs to be confirmed also by econometric models which can depict the impacts of a lifetime on COVID-19 cases in each continent separately.

In addition to the pie charts (**Figure 4A**; from **Figures 4A.1–A.4**), the bar chart (**Figure 4B**) has been also added to the paper in order for the potential reader to be able to follow the manuscript clearly and fluently.

As a possible determinant of COVID-19 total cases, we also considered the stringency index (government measures/policies in response to the COVID-19 outbreak) for each cross-section in the panel data. The stringency index (stringy policy) exhibits the composite measure based on COVID-19 response indicators including school closures, workplace closures, and travel bans as explained in **Appendix Table A1**. **Table 4** reveals the role of the countries' stringency policies in determining the spread of total COVID-19 cases in panel data as of April 2020 and June 2020, respectively.

Since the stringency index is not available during August 2020, we could not observe its impact on total cases during August. The GLM and GMM outputs yielded a negative sign but insignificant effects of stringency policy on total cases (to save space, we do not place these outputs here). Quantile regressions, on the other hand, revealed significant negative estimated impacts of stringency policy on COVID-19 total cases. The tables underline

FIGURE 4 | (A) Selected indicators (average values) for continents (June, 2020). **(B)** Bar charts.

that (a) the increase in median age, age 65, and age 70 and older population will increase the COVID-19 cases during both April and June 2020; (b) the stringency policy is found significant to lower COVID-19 cases at the 25th, 50th, and 75th quantiles during April 2020; and (c) the stringency policy is important to diminish COVID-19 cases at the 75th quantile in June 2020.

Table 4 results yield that the governmental policies in response to the COVID-19 pandemic through governments' restrictions on traditional (face-to-face) education, traditional daily social life, commerce, travel, and public and private sector services became successful to reduce the spread of COVID-19 disease.

TABLE 4 | he impact of age structure and stringency policy on spread of COVID-19 cases.

Independent Variables	Quantile (25)	Probability	Quantile (50)	Probability	Quantile (75)	Probability
(In terms of April 2, 2020)*						
Median age	1.19	0.11	5.70	0.000	20.32	0.0002
Stringency index	−0.27	0.21	−1.34	0.003	−4.47	0.0011
(In terms of June2, 2020)**						
Median age	8.03	0.08	24.29	0.0001	90.01	0.0000
Stringency index	−1.54	0.36	−4.82	0.0244	−18.31	0.0007
(In terms of April 2, 2020)*						
Aged-65_older	6.29	0.0066	13.81	0.0000	38.87	0.0002
Stringency index	−0.29	0.0538	−0.53	0.0000	−1.28	0.0081
(In terms of June 2, 2020)**						
Aged-65_older	23.92	0.0154	61.30	0.0007	160.63	0.0000
Stringency index	−0.61	0.5313	−1.40	0.2607	−3.46	0.0391
(In terms April 2, 2020)*						
Aged-65_older	8.44	0.0101	21.57	0.0000	60.56	0.0000
Stringency index	−0.22	0.0924	−0.48	0.0004	−1.15	0.0001
(In terms of June 2, 2020)**						
Aged-70_older	36.70	0.0076	97.57	0.0017	246.78	0.0000
Stringency index	−0.53	0.5286	−1.23	0.3221	−2.85	0.0304

Because of the absence of the stringency index data, August 2020 outputs are not available. (*) As of April 2, 2020, in 159 countries, (**) as of June 2, 2020, in 160 countries.

The restrictions brought about distance education, social distancing, delays in travel, and closures of public and private working places, entertainment places, and wedding venues; church and mosque activities and other types of social gatherings were also restricted. For instance, according to Beck and Hensher (2020), the bans/restrictions due to the COVID-19 outbreak in Australia were successful through the government's request to "stay at home." The restriction policies, besides other privileges, targeted to impose some implementations on high-risk populations (e.g., older aged people and people having several infectious) to prevent the healthcare system from being overwhelmed by reducing especially the demand for intensive care units.

The article additionally analyzes the total deaths due to COVID-19 (**Appendix Table A4**). **Appendix Table A4** has four emergent outcomes: (i) The number of COVID-19 cases is significant in determining the number of COVID-19 deaths; (ii) no matter what the age structure (the share of the median age, age 65, and age 70 in the population) is, it has positive significant impacts on COVID-19 deaths; (iii) the number of hospital beds has a negative significant effect on COVID-19 deaths; and (iv) GDP per capita has a negative significant effect on the number of deaths in the model in which median age is employed. In the models in which the age 65 and age 70 populations are employed, the income (per capita GDP) seems to be insignificant.

As GDP per capita increases, the COVID-19 death rate of the median age population gets lower. As the share of the median age population increases, the number of total deaths per million decreases. If hospital beds per thousand increased by 1 unit, total deaths per million will decrease by 1.84 units. Another reason for the increase in COVID-19 deaths is total cases per million. On the other hand, the findings show that GDP does not help people aged 65 and 70 and older to prevent death due to COVID-19. Considering especially the G20 countries, it might be observed that there is no common association between the values of per capita GDP and mortality. In some countries, per capita GDP and mortality rates from COVID-19 follow a positive association, while in some countries, these two variables move in the opposite direction.

For instance, taking into account the G20 countries with the highest income, while the mortality rates from COVID-19 are found relatively higher in the United States, the United Kingdom, and France, these rates are found relatively lower in Australia, Canada, Germany, and Japan (WHO, 2020b; World Bank, 2020).

On the other hand, the relationship can be evaluated in terms of diagnostic capabilities which refer to the equipment required at the diagnosis stage, such as equipment, testing, and laboratories (Aggarwal et al., 2015). For COVID-19, diagnostic tests (PCR and CRISPR) have stood out among these capabilities (Vandenberg et al., 2020). It might be stated that there is a heterogeneous structure between these tests representing diagnostic capabilities and GDP levels of countries. The total number of tests is subject to change from one high-income country to another high-income country. For instance, the tests realized in the United States, the United Kingdom, France, and Canada are 222 million, 47 million, 29 million, and 13 million, respectively. The number of tests implemented in countries with relatively low income might also vary significantly. For instance, the test numbers of China, India, Turkey, and Pakistan are 160 million, 155 million, 21 million, and 6 million, respectively (Statista, 2020).

DISCUSSION

Although different ages (median, 65, and 70+) have significant positive contributions to the number of total COVID-19 cases, the older population has a relatively more significant contribution to the number of cases due to some chronic

illnesses that older people may have, such as heart disease, cancer, and diabetes.

The question is whether health administrators can follow more efficient policies that can lower the increasing rate of chronic illnesses. Health administrations, with greater allocated administrative budgets, can follow more efficient public health policies to reduce tobacco use and exposure to secondhand smoke and poor nutrition, including diets low in fruits and vegetables and high in sodium and saturated fats. Besides, relevant policies should be implemented to increase physical activity and to reduce excessive alcohol use in societies (CDC, 2020). It is also necessary to keep people away from the use of nonprescription drugs (Seyed-Hosseini et al., 2010).

The bans and/or restrictions due to the COVID-19 epidemic were found successful through the administrators' policy to "stay at home." However, one might ask if authorities considered also the adverse effects of the stringency policy. The government policies in response to the COVID-19 pandemic should consider also some potential adverse results such as depression, anxiety, loneliness, stigma, basic commodity insecurity, violence, and other adverse consequences in social life (Zhang et al., 2020b). There exist several articles in the COVID-19 literature regarding mental healthcare from a medical perspective (Teng et al., 2020). To reduce the adverse effect of restriction due to COVID-19, scientists, gerontologists, virologists, therapists, epidemiologists, and policymakers should consider simultaneously to reach a balance in public health (Golubev, 2020).

During the COVID-19 pandemic, the highest priority should be given to functional medical care and vital societal services. To prevent the public from additional physical and mental distress, government authorities, public health management services, and the public itself should consider maintaining physical activity (Jakobsson et al., 2020).

During the COVID-19 pandemic, the countries' healthcare infrastructure becomes more important to reduce the fatalities caused by the outbreak. In this stage, societies and their representative authorities ought to give more priority to health and environmental issues than other domestic and foreign affairs/politics. Domestic and international actions should keep the current dialog on the role of domestic and global markets in sustainable development considering the quality environment and health (Crawford, 2006; Mihalache-O'Keef, 2018).

Continental differences in the number of high-risk groups, particularly the presence of older people in Europe and the Americas, may raise the question of whether these governments' public health policies are ineffective. The recent experience postulates the existence of ineffective measures for suppressing and controlling transmission in Europe and the United States. These measures must be supported by financial and social programs that encourage community responses and address the inequities that have been amplified by the pandemic (Alwan et al., 2020). Thus, permanent restrictions will be required in the short-term to lessen transmission and fix ineffective pandemic response systems in order to prevent future lockdowns. By contrast, some countries like Japan, Vietnam, and New Zealand have shown that robust public health responses contribute positively to reduce transmission, allowing life to return to nearnormal. Besides, it is necessary to adopt measures that must change rapidly and fundamentally if these tensions are to be successfully managed, aimed to correct collective action, information asymmetries, irrationality, negative externalities, and the related free-riding phenomenon persistently distorting the Member States' combined efforts, resulting in deficient attempts to contain the spread of COVID-19 (Kovac et al., 2020). Hence, the lack of institutional mechanisms, long-term planning, and willingness to invest in healthcare have all come to light with the COVID-19 outbreak (Peeri et al., 2020). In consequence, both regions, Europe and the United States, need to assume a well-coordinated policy response to limit economic, social, and health damage and re-establish financial stability (Regling, 2020).

LIMITATIONS

We conducted multicollinearity tests for estimated models through VIF analyses. The findings indicate that all estimated models, except the model in which the independent variables are median age, age 65, and age 70 populations, do not suffer from multicollinearity. Multicollinearity needs to be considered seriously. On the other hand, the multicollinearity problem may not be a serious problem when R^2 is high and individual t statistics are significant (Johnston, 1984). Blanchard (1987) also states that multicollinearity is essentially a data deficiency problem and sometimes researchers might have no choice over the available data for parameter estimations (Kennedy, 1998). However, considering multicollinearity a problem in estimations, further study might launch ridge regression and/or a combination of cross-sectional data and time series (pooled data) or drop some variables from the model to eliminate the multicollinearity issue.

Although our research conducted efficient panel model estimations, future researches might follow different methodologies such as panel spatial models to discover the direct and indirect effects of explanatory variables on COVID-19 cases. Our research employed 209 cross-sectional observations of April, June, and August 2020. Due to the lack of data for the stringency index in August, this article could not analyze the impact of government policies in response to the COVID-19 outbreak during August. Future works might explore the stringency index of August 2020 and analyze its effect on the spread of the COVID-19 pandemic. Future works can also consider analyzing the adverse effects of government policies in response to the COVID-19 epidemic (depression, anxiety, loneliness, and stigma) quantitatively.

CONCLUSION

This article considers evaluating the potential determinants of the spread of COVID-19 pandemic disease in 209 countries around the world. This work has observed (a) the impacts of the shares of median age and older age population (age 65 and age 70 or older) on COVID-19 total cases, (b) the effect of stringency policy on COVID-19 cases, and (c) the influences of total COVID-19

cases, age structure, number of hospital beds, and income level on the number of total deaths due to COVID-19. The highlights and results of this research are as follows:

(i) GLM, GMM, and quantile regressions indicate that age structure is vital in determining the total number of cases in April, June, and August of 2020. The impact of age structure on COVID-19 shows a prominent increase from median age to age 70 and older people. According to quantile (75) regression analyses in August 2020, the effect of a unit increase in the age 65 population on total cases is three times greater than the effect of a unit increase in the median age population on total cases. The impact of the share of age 70 in the population on total cases is 1.6 times greater than that of the share of the age 65 population.

(ii) Stringency policies cover government policies inresponse to the COVID-19 outbreak such as school closures, workplace closures, travel bans, and others, which are found significant to lower COVID-19 cases during April and June 2020. The bans/restriction regulations should impose some additional practices on high-risk people (older people with chronic disease) to reduce the demand for intensive care units of healthcare systems.

(iii) The estimations also yield that the availability of more hospital beds can reduce the number of deaths stemming from the COVID-19 epidemic. This output indicates the necessity of more employment of physical/technical equipment and associated medical personnel, especially in intensive care units.

(iv) Except GLM estimations, GMM and quantile regression estimations assert that GDP per capita does not matter in both less developed and developed countries, which have been affected by the corona pandemic. This outcome might exhibit evidence that low-income countries as well as high-income countries couldnot prevent their societies from deaths due to COVID-19 disease.

(v) Continental-based findings indicate that higher-risk groups (with the presence of older people) in Europe and America are higher than those in Asia and Africa.

The outputs of this work might suggest that policymakers of both developed and less developed countries follow strict health policies to diminish the adverse effects of COVID-19 disease. The relevant health policies might be (a) the policy of staying at home; (b) if necessary, considering meetings only in hygienic places by observing social distancing efficiently and by wearing masks; (c) the policy of recommending/supporting the essential medicine and health products/technologies; (d) following healthy diabetes/eating/drinking modules/programs; (e) considering regular sport and exercises; (f) following distance education programs; (g) subsidizing e-commerce and/or shopping through media; and (g) implementing the policy for people aged 65 or over to follow strictly items (a), (b), (c), (d), (e), and (f). These suggestions have the potential to lower the level of undesired adverse effects of COVID-19 disease in the world.

Overall, this research paper underlines the fact that age 65 or 70 and older populations might affect prominently the undesired results of the pandemic. This article, hence, suggests that administrators follow the outcomes of this research to diminish the potential current and future influences of COVID-19 on the welfare of the societies through some efficient health, education, commerce, and social programs.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

FB: conceptualization, methodology, data curation and analysis, visualization, project administration—supervision and coordination, writing, original draft preparation, reviewing, editing, and validation. MD: project administration—supervision and coordination, writing, original draft preparation, reviewing, editing, and validation. SK: software, conceptualization, analysis, project administration—coordination, writing, original draft preparation, reviewing, and editing. DL: investigation, conceptualization, analysis, project administration—coordination, writing, original draft preparation, reviewing, and editing. FÜ: data curation, original draft preparation, reviewing, editing, and validation. PG: writing, original draft preparation, and reviewing. EM: original draft preparation, reviewing, and editing. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.632192/full#supplementary-material

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APPENDIX

TABLE A1 | The variables and sources.

Variable	Definition	Source
Total_cases_per_ million	Total confirmed cases of COVID-19 per 1,000,000 people	European Centre for Disease Prevention and Control
Total_ deaths_per_million	Total deaths attributed to COVID-19 per 1,000,000 people	European Centre for Disease Prevention and Control
Population	Population in 2020	United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2019 Revision
Median_ age	The median age of the population, United Nation projection for 2020	United Nation Population Division, World Population Prospects, 2017 Revision
Aged-65_ older	Share of the population that is 65 years and older, most recent year available	World Bank – World Development Indicators, based on age/sex distributions of the United Nations Population Division's World Population Prospects: 2017 Revision
Aged-70_ older	Share of the population that is 70 years and older in 2015	United Nations, Department of Economic and Social Affairs, Population Division (2017), World Population Prospects: The 2017 Revision
GDP_per_ capita	Gross domestic product at purchasing power parity (constant 2011 international dollars), most recent year available	World Bank – World Development Indicators, source from the World Bank, International Comparison Program database
Stringency_ index	Government Response Stringency Index: composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest response)	Oxford COVID-19 Government Response Tracker, Blavatnik School of Government
Hospital_beds_ per_ thousand	Hospital beds per 1,000 people, a most recent year available since 2010	OECD, Eurostat, World Bank, National Government records, and other sources

OWID COVID-19-data, October 2020.

TABLE A2 | The list of the cross sections.

Continent	Location
Africa	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Cote d'Ivoire, Democratic Republic of the Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Western Sahara, Zambia, and Zimbabwe.
Asia	Afghanistan, Armenia, Azerbaijan, Bahrain, Bangladesh, Bhutan, Brunei, Cambodia, China, Georgia, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Laos, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Palestine, Philippines, Qatar, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Timor, Turkey, United Arab Emirates, Uzbekistan, Vietnam, and Yemen.
Europe	Albania, Andorra, Austria, Belarus, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, and Vatican.
North America	Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bonaire Sint Eustatius, and Saba, British Virgin Islands, Canada, Cayman Islands, Costa Rica, Cuba, Curacao, Dominica, Dominican Republic, El Salvador, Greenland, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sint Maarten (Dutch), Trinidad and Tobago, Turks and Caicos Islands, United States, and United States Virgin Islands.
Oceania	Australia, Fiji, French Polynesia, Guam, New Caledonia, New Zealand, Northern Mariana Islands, and Papua New Guinea.
S. America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Islands, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

TABLE A3 | The impact of age structure on spread of COVID-19 total cases in continents generalized linear model (Newton-Raphson/Marquardt steps).

Independent Variables	Coefficient	Standard error	*z*-Statistic	Probability
(In Europe)				
Median age	16.25	3.38	4.80	0.0000
Aged-65_older	38.01	7.96	4.77	0.0000
Aged-70_older	58.89	12.07	4.87	0.0000
(In Asia)				
Median age	2.86	0.68	4.19	0.0000
Aged-65_older	9.92	2.92	3.39	0.0007
Aged-70_older	14.18	4.44	3.18	0.0014
(In America)				
Median age	3.30	0.67	4.86	0.0000
Aged-65_older	11.68	2.00	5.81	0.0000
Aged-70_older	18.30	3.24	5.64	0.0000
(In Africa)				
Median age	0.64	0.13	4.78	0.0000
Aged-65_older	4.24	0.61	6.89	0.0000
Aged-70_older	7.02	1.04	6.74	0.0000

TABLE A4 | The total deaths due to COVID-19 pandemic generalized linear model (Newton-Raphson/Marquardt steps).

Independent variables	Coefficient	Standard error	*z*-Statistic	Probability
Median age	1.00	0.37	2.70	0.0068
Hospital beds per thousand	−1.84	0.98	−1.87	0.0608
GDP per capita	−2.74	1.09	−2.50	0.0124
Total cases per million	0.028	0.00	8.40	0.0000
Aged-65_older	1.14	0.41	2.73	0.0063
Hospital beds per thousand	−1.84	0.98	−1.88	0.0595
GDP per capita	−0.44	0.37	−1.19	0.2336
Total cases per million	0.02	0.00	7.67	0.0000
Aged-70_older	1.90	0.61	3.10	0.0019
Hospital beds per thousand	−2.08	0.98	−2.11	0.0342
GDP per capita	−0.41	0.35	−1.16	0.2432
Total cases per million	0.02	0.00	7.31	0.0000

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Service Innovation in Human Resource Management During COVID-19: A Study to Enhance Employee Loyalty Using Intrinsic Rewards

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This research focuses on the employee loyalty aspect of private hospitals in Pakistan during the COVID-19 pandemic, seriously impacted by strict work demand and work-family conflict. To manage this issue, social rewards and psychological rewards played a role as a mediator. The study uses a causal research design with a correlational study design in a non-contrived environment. Minimal researcher interference has been assured. AMOS 24 has been used to deal with the mediation in study design with bootstrap methodology. The study was conducted on 250 nurses of different private hospitals across Punjab province using a proportionate stratified sampling technique. A finding of this study suggests that nurses remain loyal to their organizations despite having uncompromising work demands and facing work-family conflict when they are provided with social and psychological rewards on their job by their organizations.

Keywords: job satisfaction, employee loyalty, nurses, service innovation, COVID-19, human resource management

INTRODUCTION

The health care sector is considered one of the crucial sectors of all. Its primary purpose is to provide top-class facilities and assistance to the concerned persons. Suppose the health care industry's mission and purpose are to provide top class assistance (Peltier et al., 2003). In that case, the professionals who work for this sector must be considered the central point for its effective running. Further, the well-being of the professionals will ensure the availability of high standards in this sector.

Hospitals need skilled staff, especially nurses, to achieve organizational effectiveness and provide outstanding patient care. It is tough to locate successful nurses, considering the ongoing global nursing crisis (Price and Mueller, 1981). The same situation goes all over Pakistan, especially in one of the biggest Punjab province.

Nurses could be considered one of the essential parts of the health care industry. Their attentive and vigilant services are incredibly vital for patient's treatment and recovery. That could only be possible if they are satisfied with their job and showed loyalty toward their current organization (Abdullah et al., 2020; Kengatharan and Kunatilakam, 2020). Hospital administration needs to provide the best working conditions for the professionals who work there, so that patient's health and treatment must not be compromised at any level. While the COVID-19 situation is at its peak

at the start of the year 2020, competent and professional medical staff is uncompromised in this situation. Hospitals, especially those that belong to the private sector, must develop innovative HRM practices to retain their medical team, including nurses (Needleman and Hassmiller, 2009).

This study aims to provide insight into nurses' minds from a work-family conflict and work demand point of view. While especially considering the COVID-19 situation as a significant influencer over society. Fulfillment of this study's objectives will ultimately provide reliable information to the hospitals and health organizations to keep nurses loyal to their organization while considering only the intrinsic or non-monetary rewards. Punjab province is one of the main hubs for the best medical care and facilities all over Pakistan, and it is filled with numerous private hospitals. During the COVID-19 situation, the economic conditions declined sharply worldwide, and Pakistan is no exception in this scenario. This latest pandemic brings many managerial and organizational problems due to a sudden increase in the patient count and work-family conflict situation, which arises in every house with the evolving pandemic situation. Every house member of these nurses is worried about their loved ones, forcing them to quit their job during this daunting situation.

So, hospitals are looking forward to non-intrinsic rewards to cope with this work and family conflict situation. Due to declining economic conditions, they cannot afford monetary rewards on a more extensive and more prolonged scale. So, they have to focus on the management of non-monetary benefits. This study focuses on finding viable solutions for hospital management so they could be able to retain their valuable employees with the help of non-monetary rewards during this COVID-19 situation.

Study Significance

Every organization wants to apply a combination of monetary and non-monetary rewards so they could be able to retain their valuable employees in the longer run. This study will help hospital administration promote a healthy work environment to maintain their existing staff and attract competent and capable nurses. Further, by promoting a healthy work environment, employee loyalty will ultimately increase, resulting in nurses' more efficient and effective performance. This study will also be helpful full of expanding employee loyalty toward that organization. This study's findings will also help the administration of other public and private hospitals in Pakistan to enhance their environment and working standards.

LITERATURE REVIEW AND STUDY BACKGROUND

It is paramount to consider why the study is carried out on these variables before the comprehensive literature review. It is essential to investigate these variables before conducting a survey. We need to know why these variables are chosen as independent, mediator, and dependent variables. What kinds of hypotheses endorse them in their entirety? As discussed earlier, due to COVID-19, the environment is evolving swiftly, and health organizations must bring creativity to their human capital framework. This pandemic situation will ultimately help sustain its critical workers (Hafeez et al., 2020).

COVID-19 also brings the work-family conflict factor to a new level. Everyone is concerned about the health of their loved ones who are working in hospitals and acting as a front-line soldier before this deadly virus. Their family members ask them to leave their jobs or minimize contact with their potential COVID-19 patients. In this scenario, hospitals need to bring incentives to uplift their health staff's social and psychological aspects. So, they could be willing to perform their services during this too tense scenario. After considering this scenario, this study comes up with the following theoretical model, which is also theoretically supported by the boundary theory and border theory presented by Lavassani and Movahedi (2014). This theory discusses the impact of work-family conflict on employee loyalty toward organizations and their job satisfaction **Figure 1**.

Further, previous literature also supports this kind of study (Benligiray and Sönmez, 2012; Tziner and Sharoni, 2014; Yang et al., 2017) discusses that health organizations need to work on their employees management skills. So they could be able to understand the behavior of their employees more comprehensively, which will result in a more enhanced loyalty toward the organization and job satisfaction. This research gains more importance due to the COVID-19 scenario because health organizations now need to raise their employee's loyalty. Cognitive CEO enhances environmental responsibility (Sarfraz et al., 2020). Perceived organizational states that employees are valued by the organization (Sarfraz et al., 2019).

Work Demand

In the healthcare industry, the demand for nurses' work is concerned with the outcome of nurses. It can but is not restricted to receiving patients or their relatives' grievances for the inability to fulfill their demands. Patients or their families had a wrong impression. That may also entail not getting enough time to satisfy patients and family members (AbuAlRub, 2004). Patients could often be unaware of the degree to which patients' symptoms or procedures reveal them. They cannot attend to patients through excessive tasks in their office. Moreover, they must maintain professional units other than their own (Ernst et al., 2004). By considering and discussing the information mentioned above, the below-mentioned hypothesis is proposed for further analysis.

All the below-mentioned hypotheses are supported by the boundary theory (Lavassani and Movahedi, 2014). These hypotheses follow this theory's parameters, which discuss the connection between an employee's personal and work life from different significantly essential perspectives.

H1: Work demands create a positive impact on employee's loyalty toward their organization.

H2: Work demands mediated by Social rewards positively impact employee's loyalty toward their organization.

H3: Work demands mediated by Psychological rewards positively impact employee's loyalty toward their organization.

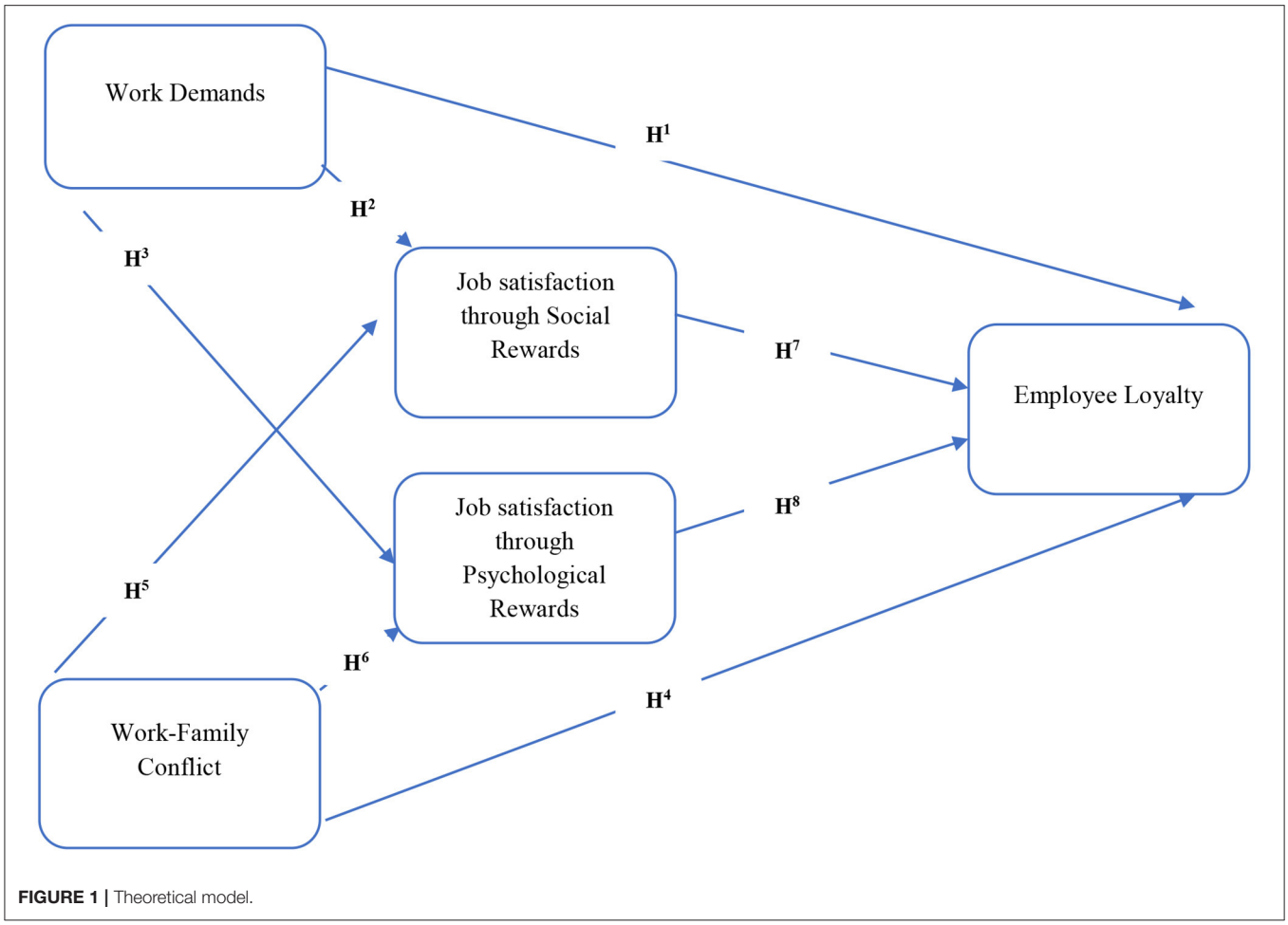

FIGURE 1 | Theoretical model.

Work-Family Conflict

The work-family dispute is called a particular type of inter-role rivalry where work-family roles are conflicting. Work-family conflict has two dimensions: work-to-family conflict (WFC) happens when work-to-family interactions and responsibilities intervene. The conflict between family and employment (FWC) occurs as family commitments conflict with work-life (Drexler and Fujimoto, 2008). Jobs and family clash when a career interfere with individuals, other professional positions, and desires. They will differ from time to time for mates, fitness, military service, schooling (Grzywacz et al., 2006). Work and family conflicts are a type of inter-role conflict where one area sometimes impacts or spills into other domains.

That means that the work domain is used to influence or spill the family domain, and the family domain influences or spills the work domain (Ghislieri et al., 2017). When efforts to fulfill work, role demands interfere with one's ability to meet family demands and vice versa. It also occurs when one role interferes with an individual's effectiveness in other parts, and these roles are work roles and family roles (Thomas and Ganster, 1995). It is further defined as: "work-family conflict refers to the degree to which the demands of one role has an impact on the demand of the other role." It's a conflict as a degree to which an individual obligation to fulfill family requirements is affected by the work-life interruption and a degree to which a personal responsibility to achieve job requirements are affected by family (AlAzzam et al., 2017). The following presented hypothesis is related to the discussion mentioned above and encompasses this research study's philosophical approach.

H4: Work-family conflict creates a positive impact on employee's loyalty toward their organization.

H5: Work-family conflicts mediated by Social rewards positively impact employee's loyalty toward their organization.

H6: Work-family conflicts mediated by Psychological rewards positively impact employees' loyalty toward their organization.

Job Satisfaction Through Social Rewards

An evaluation of the literature illustrates that job satisfaction phenomena have been broadly studied in many fields, including military, nursing, public sector, business, psychology, and sociology. The idea has developed over time. But did not produce a distinctive implication. It is a composite phenomenon influenced by various factors (Ravari et al., 2012). We could define job satisfaction as a "pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences"

(Locke, 1976). Broadly we could relate job satisfaction as "the extent to which employees like their jobs" (Stamps, 1997).

Social rewards play a dominant role in developing and maintaining employees' satisfaction regarding their jobs across all occupational groups. Extrinsic rewards given in an organization appear to play a significant role regarding this matter (Mottaz, 1985). Social rewards could be considered as a vital element for better employee productivity (Roy, 1953). Young women and female workers give more importance to social rewards than rewards related to job leisure-related aspects (Marini et al., 1996). The social rewards are used loosely across studies and typically denote any social stimuli or interactions that participants experience as rewarding (Beauchamp et al., 1983). Social rewards propel individuals into social proximity in the wild under more expensive and patchier conditions than the laboratory cage, motivating communication with others (Izuma et al., 2008). Social benefits create a good sense of well-being as one experiences belonging is recognized during social activities by others, and can experience superiority through tasks and social interactions (Ocean and Smith, 1993). Social rewards are more cheap or free and can be even more potent than materials. One can be given even more often and immediately after behaviors you like (Panksepp, 2000).

The social reward is a loyalty-Marketing program that rewards users for tweeting and posting fakebooks about the brand they like and working with many casinos. Social rewards engage similar neural circuits as non-social and alter neural sensitivity to the value of non-social rewards in adolescence, precisely when another person presents. At the same time, participants engage in a risk-taking process (Jessen, 2010). The following proposed hypothesis is related to the discussion mentioned above and encompasses this research study's philosophical approach.

H7: Social rewards create a positive impact on employee's loyalty toward their organization.

Job Satisfaction Through Psychological Rewards

Job satisfaction is "an attitudinal variable that represents the extent to which people like (satisfaction) or dislike (dissatisfaction) their jobs" (Spector, 1997). We could consider job satisfaction as one of the numerous constructs that have frequently been used to explain the nursing staff's functioning circumstances, mainly due to its significant associations with other variables (Cortese, 2010). From the 19th century onwards, job satisfaction has been studied extensively due to its critical nature and relationship with other important variables related to organization and employee psychology. Psychological rewards given to employees shows a strong relationship between work and family life balance, thus enhancing the satisfaction about one's job and increasing the trust toward their organization (Voydanoff, 2004).

Psychological rewards, in which we could consider admiration, high opinion, and essential work, are characteristic of personality improvement, ultimately enhancing a sense of worth and satisfaction (Behson, 2002). Psychological rewards such as status enhancement and personality enrichment will also play a vital role in improving employee productivity and loyalty and trust in its organization (Allen, 2001). A reward is an appetizing stimulus provided to alter the actions of a person or any other species. Rewards act as a strengthener. Rewards are an analytical way to characterize an entity's beneficial meaning, activities, or an inner physical condition that a person assigns (Hofmans et al., 2013). Operational conditioning, also named instrumental training, is a form of learning, which happens by incentives and consequences for actions. Via functional operation, a person connects a specific activity with a result (Scott-Ladd et al., 2006).

According to the pragmatic approach to belief, knowledge is commonly viewed as a justified and true belief and is more rewarding than satisfying social and material needs. A reward is a subjectively pleasurable or satisfying event or experience that follows the completion of a task. The attainment of reward is a reinforcement for the conditioning paradigm preceding action (De Gieter et al., 2008).

Behaviors are committed to strengthen or prevent punishment. Incentive theory suggests that acts are targeted at receiving incentives. The word incentive describes an occurrence creating an excellent or optimistic emotional experience. The incentive is also used to convey an event that raises the likelihood or rate of action-related activity (Jehanzeb et al., 2012). The following presented hypothesis is related to the discussion, as mentioned earlier, and encompasses this research study's philosophical approach.

H8: Psychological rewards create a positive impact on employee's loyalty toward their organization.

Employee Loyalty

These days, employee loyalty is vital for any company and organization to enhance and improve their organizational structure, excellence, and efficiency. Now-day, employee loyalties are declining toward their company or organization. Several organizations want to uncover some methods to enhance their employee loyalty. If an organization understands its employee's needs effectively and efficiently, this phenomenon could cultivate employee loyalty toward its organization (Vischer, 2005).

We could define Employee loyalty as employees consider that they have no doubts or qualms regarding working for their company or organization. They believe that it will be the best choice for them in the present and future. From an organization's perspective, an employee will be considered an important resource and vital asset. Different benefits and rewards can increase the employee's productivity and loyalty toward the organization. There is a high cost for changing an employee regardless of his or her position in an organization. Because building organizational commitment is not an easy job. Employers need to realize why their employees are psychologically associated with their organization—most of the time, it is much more than regular perks and benefits. Psychologically connected and loyal employees are the best employees because they are engaged and creative, and they feel corroborated and respected (LaMalfa, 1996).

RESEARCH METHODOLOGY

A hypothesis study has been used for this research to explain the nature of the relationship between understudy variables. The data as shown **Table 1** data in of nurses have been drawn from the concerned HR offices of different private hospitals. The reason for selecting private hospitals is that they do not offer permanent job structures like a public or government-owned hospital. That is why they need to focus more on their work environment and reward system. So, they could be able to retain their valuable staff in the longer run.

This study has used a Correlational type of investigation because it needs to check the variables' relationship through hypotheses. Research has been conducted in a natural environment. That is why it will be considered a non-contrived study setting. This study has minimal researcher interference toward respondents regarding the filling up of questionnaires. In this study, the data is collected from nurses; that's why this study's unit of analysis is individual. The researcher has implemented a cross-sectional study method for this study. It involves the study of all a population, or a representative subset, at one specific point in time.

The stratified sampling methodology is used to collect an equal number of nurses from each ward. Because of the risk of infection from the COVID-19 virus is the same in every ward, it is vital to collect data through stratifying sampling methodology. Nurses are the leading group in the healthcare sector.

The nurse's attendance register is the population framework in this study, through which the data is collected for this research study. In some hospitals, the data was collected by the researcher. In contrast, it was collected with different friends' help to connect with that hospital medical staff and other doctors in some hospitals. In some cases, the data is collected from the homes of nurses who are working in different private hospitals.

TABLE 1 | Demographic profile of the respondents.

Category	Subdivision	Frequency	Percentage
Marital status	Married	150	60
	Un-Married	100	40
Currently working ward	Medicine	28	11.2
	Gynecology	28	11.2
	Surgery	28	11.2
	Pediatrics	28	11.2
	ENT	28	11.2
	EYE	28	11.2
	Orthopedics	27	10.8
	Cardiology	27	10.8
	Physiotherapy	28	11.2
Age	Below 25 years	40	16
	25–30	65	26
	31–35	80	32
	36–40	45	18
	40 and above	20	8
Education	Intermediate	110	44
	Bachelors	128	51
	Masters	12	5
	M.Phil	0	0
	Phd	0	0
Experience	Below 5 years	50	20
	6–10 years	85	34
	11–15 years	65	26
	16–20 years	40	16
	Above 20 years	10	4

Empirical Settings and Data Collection

These studies have been conducted on nurses of different private hospitals of Punjab province, 500 questionnaires have been distributed among them, and almost 270 questionnaires have been received, maintaining the response rate of 55%. A reliable and valid questionnaire has been used for this study. Among which 20 questionnaires were with incomplete information, so the analysis was done with 250 complete responses. Respondents' demographic profile is mentioned below.

The respondents were nurses of different hospitals, and the data collected during the pandemic situation by using various resources to avoid human contact as applicable as possible. All private hospitals have different departments like Surgery, Orthopedics, Pediatrics, Cardiology, Ear, nose, and throat (ENT), Gynecology. So, we will use the Stratified Sampling method. In this way, we could be able to draw a sample of nurses from each department.

TABLE 2 | Pooled CFA model fitness tests.

Name of Category	Name of index	Index full name	Value in analysis	Acceptable value	References
Absolute Fit	RMSEA	Root mean square of error approximation	0.049	<0.80	Browne and Cudeck, 1993
Incremental Fit	CFI	Comparative fit index	0.938	>0.90	Bentler, 1990
Parsimonious Fit	Chisq/df	Chi square/degrees of freedom	1.590	>5	Hu and Bentler, 1999

TABLE 3 | Pooled confirmatory factor analysis (independent, mediating & dependent variable).

Scale	Items	Factor loadings	Scale reliability
Work Demand	I am worried about receiving complaints from patients or their relatives for not meeting their demands.	0.739	0.716
	I have to bear the negative sentiment of patients or their relatives.	0.640	
	I do not have sufficient time to meet patients' and their relatives' demands.	0.656	
	I am unsure of the extent of patients' conditions or treatments that I should reveal to them.	0.742	
	Excessive duties in the workplace prevent me from attending to patients.	0.705	
	I have to maintain professional units other than my own.	0.816	
Work-family conflict	The burden of work affects my domestic life.	0.770	0.777
	The amount of time my job occupies makes it difficult for me to fulfill family responsibilities.	0.993	
	The burden of work makes it difficult for me to undertake my personal chores and/or engage in hobbies.	0.558	
	My job produces a strain that makes it difficult for me to fulfill my family duties.	0.856	
	I have to adapt my schedule for family activities/outings to accommodate my work responsibilities.	0.708	
Job satisfaction through social rewards	Your nursing colleagues are cooperative with you during your job.	0.707	0.703
	Physicians you work with are cooperative with you during your job.	0.739	
	The hospital provides opportunities for social contact at work.	0.640	
	The hospital provides opportunities for social contact with your colleagues after work.	0.701	
	Hospital administration provides opportunities to interact with other disciplines.	0.776	
	Hospital administration provides opportunities to interact with faculty.	0.656	
Job satisfaction through psychological rewards	Hospital administration provides opportunities to belong to department and institutional committees.	0.742	0.716
	Hospital administration provides opportunities to participate in nursing research.	0.802	
	Hospital administration provides opportunities to write and publish.	0.816	
	You were admired by your immediate supervisor.	0.605	
	You have received recognition for your work from superiors.	0.775	
	You have received recognition for your work from peers.	0.825	
	You have received a fair amount of encouragement and positive feedback on your work.	0.763	
	You have given control over your work setting.	0.543	
	You have given opportunities for career advancement.	0.705	
	You have a given amount of responsibility.	0.816	
	You have given control of your work conditions.	0.643	
	You have given a chance to participate in organizational decision-making.	0.641	
	I would like to be working at this organization 2 years from now.	0.634	
Employee loyalty with the organization	Hospital administration communicates openly and honestly	0.825	0.719
	Hospital administration is committed to win/win solutions (does not take advantage of its staff or patients)	0.763	
	I trust the Hospital administration to behave with fairness and integrity	0.543	
	Employee loyalty is appropriately valued and rewarded at this organization	0.705	
	I believe this hospital deserves my loyalty	0.816	
	Over the past year, my loyalty to this hospital has grown stronger	0.643	
	This Hospital administration values people and relationships ahead of short-term benefits	0.641	
	This hospital sets the standard for excellence in its industry	0.816	

TABLE 4 | HTMT analysis.

	Work demand	Work-family conflict	Social rewards	Psychological rewards	Employee loyalty
Work demand					
Work-family conflict	0.075				
Social rewards	0.172	0.067			
Psychological rewards	0.117	0.090	0.048		
Employee loyalty	0.220	0.030	0.035	0.568	

TABLE 5 | SEM, model fitness tests.

Name of category	Name of index	Index full name	Value in analysis	Acceptable value	References
Absolute fit	RMSEA	Root mean square of error approximation	0.057	<0.80	Browne and Cudeck, 1993
Incremental fit	CFI	Comparative fit index	0.914	>0.90	Bentler, 1990
Parsimonious fit	Chisq/df	Chi square/degrees of freedom	1.814	>5	Hu and Bentler, 1999

Study Instrument

For measuring Work demand/Job Stress and work-family conflict, we will use the "Nurses' Occupational Stressor Scale," which is specifically developed for nurses by Chen et al. (2020). This scale is based on a five-point Likert scale. For social and psychological rewards, this study will use the Mueller-McCloskey Satisfaction Scale, commonly known as (MMSS), which is developed in (1990). It was specially designed to investigate the level of job satisfaction amongst the nurses. It was a multidimensional survey developed to evaluate and examine nursing team satisfaction (Mueller and McCloskey, 1990). The instruments were rated and measured on a 5-point Likert scale with higher numerical values showing greater satisfaction. The reliability, construct validity of the scale, and the internal consistency (Cronbach's alpha = 0.89) were acceptable (Misener et al., 1996). While investigating employee loyalty, we will use a proven questionnaire known as the employee loyalty acid test, which is used to measure employees' loyalty toward their organization (Subramani, 2013).

STUDY RESULTS

Confirmatory Factor Analysis

It is necessary to conduct the confirmatory factor analysis for accurate and precise results for all variables. For this study, it is decided to conduct a pooled CFA analysis. It runs all the latent variables at the same time to achieve the required model fitness. The pooled CFA method is a lot easier and better than the Individual CFA since it runs all the latent variables simultaneously, which is time-saving (Afthanorhan et al., 2014; Chong et al., 2014).

The model fit indices shown in **Table 2** acceptable fit between the data and the proposed measurement model. The values of the Comparative Fit Index (CFI = 0.938), Root Mean Error of Approximation (RMSEA = 0.049). Chi-square to Degree of Freedom Ratio ($x^2/df = 1.590$) are all meeting the cut-off criteria, so the values of the fitness indices meet the excellent standards for model fitness (Lomax and Schumacker, 2004; Hoe, 2008; Anderson et al., 2010).

Pooled CFA Model Fitness Tests after running the pooled CFA, it is also necessary to check and verify each item's reliability for further research. CFA of this study's the data was used to measure reliability as shown in **Table 3**, convergent validity, and discriminant validity. The data was used to measure discriminant validity as shown in **Table 4**. The reliability of the measurement scales was measured with composite reliability, which is preferred to report a scale's reliability (Netemeyer et al., 2003), a widely used indicator.

Discriminant validity is used to confirm that the measurement scales are distinct from other measures used in the study. Discriminant validity was measured using the HTMT analysis in which the cut-off criteria for strict discriminant validity are 0.850 and for liberal discriminant validity is 0.900 (Henseler et al., 2015). Therefore, it is established that all the measurement scales used in the study differ from each other, so the data used in our study fulfills the requirements of convergent and discriminant validity and is suitable for further analysis.

Structural Equation Modeling

Structural equation modeling (SEM) was used in the Structural model to test the hypotheses, using AMOS 24. As the proposed model contains mediation, the SEM technique was used to analyze all of the paths simultaneously (Iacobucci et al., 2007;

TABLE 6 | Structural model: direct effects.

Hypothesis	Causal path	Lower bound	Upper bound	*P*-value	Standardized estimated
H1	Work demand→Employee loyalty	−0.162	0.093	0.690	−0.032
H4	Work-family conflict→Employee loyalty	−0.183	0.026	0.206	−0.080
H7	Social rewards→Employee loyalty	0.096	0.378	0.008	0.335
H8	Psychological rewards→Employee loyalty	0.219	0.464	0.001	0.430

TABLE 7 | Results of structural model: indirect effects.

Hypothesis	Causal path	Lower bound	Upper bound	*P*-value	Standardized estimated
H2	Work demand→Social rewards→Employee loyalty	0.060	0.174	0.001	0.20
H3	Work demand→Psychological rewards→Employee loyalty	0.027	0.140	0.006	0.35
H5	Work-family conflict→Social rewards→Employee loyalty	0.052	0.153	0.035	0.15
H6	Work-family conflict→Psychological rewards→Employee loyalty	0.019	0.098	0.004	0.12

Hoe, 2008; Alavifar et al., 2012). The model fit indices as shown in **Table 5** for the structural model are meeting the acceptance criteria.

Hypothesis Testing

The results of the structural model are shown in **Tables 6**, **7**.

The SEM statistics show that H1 (Work DemandEmployee Loyalty), H4 (Work-family conflictEmployee Loyalty) are rejected on the grounds of significance level, as the SEM results show that the *P*-values of these hypotheses are not significant. These results suggest that these variables do not have a direct significant positive impact on employee loyalty. While H7 (Social RewardsEmployee Loyalty), H8 (Psychological RewardsEmployee Loyalty) are accepted on the grounds of significance level, as the SEM results show that the *P*-values of these hypotheses are significant. These results suggest that these variables have a direct significant positive impact on employee loyalty.

These results showed the complete picture of this research study. The study showed that H2 (Work DemandSocial RewardsEmployee Loyalty, $\beta = 0.20$, $P = 0.001$) is positively significant and suggests that when organizations provide social rewards to their valuable employees, their loyalty remains firmly with the organizations. Even when the work demand or job stress is exceptionally high, we could see that during this current scenario based upon the COVID-19 pandemic, the hospitals are under immense pressure during this present scenario.

The study showed that H3a (Work DemandPsychological RewardsEmployee Loyalty, $\beta = 0.35$, $P = 0.006$) is also positively significant and suggests that organizations provide a psychological reward to their valuable employees, their loyalty remains firmly with the organizations. Even when the work demand or job stress is exceptionally high, we could see that during this current scenario based upon the COVID-19 pandemic, the hospitals are under immense pressure during this present scenario.

This hypothesis showed that H2b (Work-Family ConflictSocial RewardsEmployee Loyalty, $\beta = -0.15$, $P = 0.035$) is positively significant and suggests that organizations provide social rewards to their valuable employees, their loyalty remains firmly with the organizations. Even when the work demand or job stress is exceptionally high, we could see that during this current scenario based upon the COVID-19

pandemic, the hospitals are under immense pressure during this present scenario.

This specific hypothesis showed that H3b (Work-Family Conflict Psychological RewardsEmployee Loyalty, $\beta = 0.12$, $P = 0.004$) is also positively significant and suggests that organizations' psychological rewards valuable employs then their loyalty remains firmly with the organizations. Even when the work demand or job stress is exceptionally high, we could see that during this current scenario, which is based upon the COVID-19 pandemic, the hospitals are under immense pressure during this current scenario.

DISCUSSION

It is evident from the findings that nurses' job satisfaction in hospitals could be ensured through social and psychological rewards while considering work demand and work-family conflict as an independent variable while considering the COVID-19 pandemic situation as a huge influencer. Even though previous studies don't have COVID-19 conditions, they still support such results (Lu et al., 2005; Dignani and Toccaceli, 2013). Another study done by Ma et al. (2003) suggests that intrinsic rewards played a vital role in changing employee behavior toward their organization. They remain loyal to their organizations, and the low turnover ratio ensures they have a high level of employee performance, leading to patient satisfaction.

While looking into the results, we could find that in the case of the work demand variable, the psychological rewards could play a vital role in enhancing nurses' loyalty toward their organization compared to the social rewards (Rice et al., 2017). Suppose any hospital administration wants to invest resources in developing these kinds of rewards and are looking forward to eradicating the negative impact of work demand or job stress on employee loyalty toward their organization if they don't have enough resources to develop both kinds of rewards. In that case, they must need to focus on developing psychological rewards. If they want to work on work-family conflict, they should focus on developing social rewards.

CONCLUSION

It is concluded from the above discussion and findings that nurses are one of the essential pillars in the health sector. Without them, it is impossible to run the hospital and different health organizations. That is why it is also imperative to keep them happy and loyal to their organization to work more in the same organization (Bakertzis and Myloni, 2020), thus generating more productivity and successful work. To complete that kind of task, we must focus on the social and psychological rewards. According to this study findings, they will help the organizations keep their employee loyal and happy with them. Finding new avenues for building employee loyalty is not a new topic in literature. The researchers could also introduce online HRM services to enhance the impact of social and psychological rewards (Sadiq et al., 2020a,b).

Study Managerial Implications

This study could also be used to investigate other industry employee behavior, including education, banking, aviation, etc. Still, they must use other questionnaires because the questionnaire used to collect nurses' data in this study is specifically designed for nurses. They could also adapt this questionnaire according to their requirements after changing its statement and applying CFA for reliability and validity. Moreover, this study could also be conducted in other geographical scenarios to verify its generalization. Researchers could also change the combination of the different variables for future research purposes.

Moreover, this study will provide insight into nurses' minds about their work-family conflict and job pressure in contrast with the health organizations' intrinsic rewards. These insights will help managers re-evaluate their HR policies. They could introduce a more robust and practical intrinsic rewards method in their organization for better productivity and enhanced employee loyalty.

Study Limitations

This research is conducted in a hospital of a specific province, so it could not be generalized. The geographical area could also be considered as a limitation of that study. Moreover, time and resource limitations are other limitations of this study. It could also be possible that the results could change when the COVID-19 pandemic is over. Moreover, it's a possibility that nurses could not focus on this questionnaire's contents due to their hectic work requirements. This limitation is entirely accurate. Because during the COVID-19 scenario, the work pressure on these nurses is exceptionally high.

Moreover, they also need to look after their home and personal matters during these hectic times. That's why the data collection was an extremely challenging job in this study. However, the questionnaire which is used in this study is authentic, valid, and reliable. It is well written and understandable according to by the nurses according to their job specifications.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of ethical restrictions. Requests to access the datasets should be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

MA, DH, MSar, and MSad: conceptualization. MA, MSar, and MSad: data curation and formal analysis. MA and DH: methodology and supervision. MA and MSar: validation. MA and MSad: writing—original draft. MA, DH, and MSad: writing review and editing. All authors contributed to the article and approved the submitted version.

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Mood Sensitive Stocks and Sustainable Cross-Sectional Returns During the COVID-19 Pandemic: An Analysis of Day of the Week Effect in the Chinese A-Share Market

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This study examines two stock market anomalies and provides strong evidence of the day-of-the-week effect in the Chinese A-share market during the COVID-19 pandemic. Specifically, we examined the Quality minus Junk (QMJ) strategy return on Monday and FridayQuality stocks mean portfolio deciles that earn higher excess returns. As historical evidences suggest that less distressed/safe stocks earn higher excess returns (Dichev, 1998).. The QMJ factor is similar to the division of speculative and non-speculative stocks described by Birru (2018). Our findings provide evidence that the QMJ strategy gains negative returns on Fridays for both anomalies because the junk side is sensitive to an elevated mood and, thus, performs better than the quality side of portfolios on Friday. Our findings are also consistent with the theory of investor sentiment which asserts that investors are more optimistic when their mood is elevated, and generally individual mood is better on Friday than on other days of the week. Therefore, the speculative stocks earned higher sustainable stock returns during higher volatility in Chinese market due to COVID-19. Intrinsically, new evidence emerges on an inclined strategy to invest in speculative stocks on Fridays during the COVID-19 pandemic to gain sustainable excess returns in the Chinese A-share market.

Keywords: Quality Minus Junk strategy, COVID-19, speculative stocks, mood, sustainable cross-sectional Returns

INTRODUCTION

A significant boost in economic uncertainty was observed after the outbreak of Corona virus (COVID-19) and the consequences of the virus led the world toward a turbulent economy (Baker et al., 2020). To control the spread of the pandemic, the Chinese government has enacted strict measures, such as lockdown, that may have had some negative impact on the economy (Fareed et al., 2020; Shehzad et al., 2020). A substantial impact was observed on the economic activities of the country and economic slowdown was expected. Capital markets are an important part

of economic development and, therefore, the Chinese stock markets were also badly influenced by this pandemic. US stock markets have also observed their highest ever levels of volatility (Baker et al., 2020). Though many studies have observed the economic policies (Huang et al., 2020) and economic consequences (Chen et al., 2020) of the pandemic in China, observing the impact of COVID-19 on speculative stocks and its effect on particular days of the week is still an unexplored area of research. Therefore, this study presents an examination of the effect of specific days of the week on young and distress anomalies during the time of Covid-19 in light of the sentiment hypothesis.

Birru (2018) provided a striking pattern of anomaly returns in the U.S. stock market. Specifically, Birru's (2018) findings explained that the speculative leg of portfolios gains the highest (lowest) returns on Mondays when they fall on the long (short) leg of the anomalies[2]. Speculative stocks are young or distressed stocks or those that are not easy to value, which are suited for speculation and highly affected by investor sentiment. Psychology research predicts that individuals' moods comparatively improve on Fridays and worsen on Mondays. Hence, the speculative side of stocks tends to outperform (underperform) due to increases (decreases) in moods on Fridays (Mondays). This scenario leads to the day-of-the-week effect in cross-sectional stock returns.

It is difficult for academicians and practitioners to understand all factors that should be considered in relation to the theory of asset pricing (Elton et al., 1998). This phenomenon has been addressed by considering individual and market rationality in the Efficient Market Hypothesis and Capital Assets Pricing Model existing finance theories (Rasheed et al., 2016). An ambiguous, uncertain, volatile, and complex investment environment triggers investors to speculate outcomes and challenge the existing market efficiency assumptions of rational and well-informed investors. In such situations, investors are constrained from cognitive resources and timing effects. The limited capacity to process information results in poor judgment and decision-making. This situation is addressed in behavioral finance research under the three distinct pillars of sentiment, biases, and heuristics (Hirshleifer, 2001). Behavioral finance researchers critique traditional finance theories and argue in favor of the psychological aspect of investors as a core determinant of asset pricing. Sentiments, which are part of human psychology, affect investors' decision-making both individually and collectively (Peterson, 2016). Therefore, researchers have explored the role of individual and market sentiments in the mispricing of stocks. Research on investor sentiment and its role in explaining cross-sectional variations led researchers to develop divergent viewpoints (Bormann, 2013).

Various scholarly research outcomes discuss the empirical explanations of asset pricing bubbles as external factors of capital markets, like macroeconomic factors (Ying et al., 2019, 2020). These mainly originate from regulatory reforms made to correct the flaws in investment regulation norms. However, factors affecting the asset pricing bubbles cannot solely be observed through the endogenous factors of investor behaviors that lead to excitement or losing confidence over financial markets (Öztürk et al., 2020). This study contributes to the literature: it presents a specific explanation of stocks as being sensitive to sentiment, and it provides evidence of cross-sectional variations of returns on particular days by linking a speculative leg of anomalies with mood theory from psychology literature. This study also provides different investment strategies to earn excess returns across the days of the week by investing in speculative stocks.

Economists have always argued that the decision-making process cannot be properly analyzed in the absence of knowledge about the psychological aspect of an individual's thought process, as an individual's thinking is shaped by the co-existence of both internal and external sentimental factors (Hume and Hendel, 1955). Psychology research goes one step further than statistics and traditional economics in its treatment of the process of decision-making under conditions of uncertainty by centering on the nature of the stimulus rather than simply focusing on the outcomes resulting from that stimulus. In order to objectively examine a stimulus, every event that has happened should be considered equally likely to occur, and extreme variations in statistics should be considered outliers to the stimulus. However, this assumption puts finance scholars on the blind path of behavioral responses under varied stimuli by avoiding the psychological facets of information processing and learning (Estes and Burke, 1953). Sentiments facilitate the process of decision-making by influencing information processing and the learning phase (Davidson et al., 2000). The process of learning can be a gradual phase or sometimes can be a sudden occurrence that is dependent upon information processing from a variety of perspectives (Kahneman, 2011).

Therefore, using the QMJ factor developed by Asness et al. (2019), this study explored the cross-sectional variations in speculative anomalies on different days of the week in the Chinese A-share market during the COVID-19 pandemic. The following are our motivations for conducting this study. First, the speculative characteristics of stocks exist at the same time as the peculiarity between junk and quality stocks, according to Asness et al. (2019). The findings of Asness et al. (2019) revealed that data from multiple countries indicated that quality stocks outperformed junk stocks. Quality stocks are those that are easy to value and safe to invest in, whereas junk stocks are those that are not easy to value, are accompanied by investment risks, and are suitable for speculation or have speculative characteristics. Meanwhile, the process of identifying the day-of-the-week effect in QMJ stocks resembles the analysis conducted by Birru (2018). Second, Birru's (2018) analysis is appropriate for the U.S. market but is an unresolved question for other markets, like China's, that have unique structures. With the economic development of China, rapid growth was observed in the Chinese stock market, raising it to the distinction of being the second largest stock market in the world. However, regardless of its size, trading patterns in the Chinese stock market are most chaotic amongst emerging markets, with higher volatility and highest and lowest cycles determined by individual investors and huge interference from the government. Chinese firms hold maximum individual shareholding patterns and less institutional

[2]Long leg means portfolio deciles that earn higher excess returns, as historical evidence suggests that old age stocks earn higher excess returns (Birru, 2018).

shareholding; therefore, it is important to verify this relationship in the Chinese market because individuals are more sensitive to investor sentiment than institutions are. Our third motivation for conducting this investigation is that our findings will contribute an additional explanation for cross-sectional variations to the literature. Asness et al. (2019) provided the explanation that cross-sectional variations occur due to mispricing; our results elaborate on this explanation by connecting the QMJ factor with investor sentiment and making this explanation more specific than those elicited through prior research. Lastly, it is very important to determine that how speculative stocks behave during the pandemic and post-pandemic time period because speculative stocks are prone to sentiment. Therefore, it is expected that speculative stocks should perform better on Fridays due to higher mood and investor sentiment should also be high because stock markets contain higher volatility due to the effect of the pandemic.

MATERIALS AND METHODS

In this section, we discuss the data sources and methodology used to calculate portfolios based on anomalies for which the speculative leg exists in the junk factor. Data were obtained from the Wind Database, which is the largest financial database for Chinese data. The time period covered in our analysis is from February 2020 to September 2020, and we targeted the A-share market of China and collected data from both the Shanghai and Shenzhen stock exchanges. We chose the post-January timeframe for data collection for the following reasons. First, we needed to consider the pandemic time period. On January 23, just a day before the Chinese New Year, Wuhan was sealed and the government suspended all Chinese New Year festival activities. Additionally, the government suspended all public gatherings and all schools were closed.

The pandemic also affected economic activities and an economic slowdown was observed in the Chinese economy. On February 3rd, the Chinese stock markets reopened and faced a decline in the index on the first day. Therefore, the pandemic lockdown due to COVID-19 is the main event window of the stock market and it is important for researchers to test the impact of COVID-19 on the speculative stocks on specific days of the week. Although different trading principles were introduced years ago, most companies did not know how to implement them, which created several discrepancies at the time. Another reason we selected the data during COVID-19 is that we imposed the condition to take a minimum number of observations for each portfolio cut point. The analysis of the QMJ effect on different days of the week is similar to the analysis of the anomalies that are sensitive to investor sentiment referred to in Birru's (2018) work.

In this paper, the QMJ factor is used to analyze the distress anomaly and stocks that are young. The distress anomaly was measured following Ohlson's (1980) O-Score method, and the age anomaly was measured using the method from Baker and Wurgler, 2006) [Sections "Anomaly 1: Distress (O-Score)" and "Anomaly 2: Age" elaborates on both anomalies]. By following these methods for each anomaly, 10 equal deciles were generated for the purpose of analyzing portfolios. Further, we considered only the first and tenth deciles of each anomaly because quality stocks are those that fall in the tenth decile and junk stocks fall in the first decile of each anomaly. Portfolios based on both anomalies are rebalanced annually. Therefore, the first decile of all anomalies was predicted to perform better, as the speculative leg exists in the junk side of the anomaly. Moreover, a new strategy emerged with the prediction of higher QMJ returns on Mondays compared to Fridays because of the existence of the speculative leg in the junk side of the anomalies. Details of the anomalies and predicted returns are provided in **Table 1**.

Anomaly 1: Distress (O-Score)

Financially distressed stocks are sensitive to sentiment and highly affected by sentiment because higher distressed stocks are more risky and riskier stocks are prone to sentiment. The variation in sentiment will have a contemporary effect on returns and highly affect the prices of stocks that are not easy to value or very subjective to value or are difficult to arbitrage (Baker and Wurgler, 2006).

According to Dichev (1998), more highly distressed firms outperform stocks that are not distressed. Therefore, speculative characteristics fall in the junk side of the anomaly, so the predicted QMJ returns should be greater on Mondays than on Fridays. The speculative leg should perform better on Fridays and have a reversal effect on the QMJ factor.

Ohlson's (1980) O-Score model is measured as

$$-1.32 - 0.407\log(TA) + 6.03TLTA - 1.43WCTA + 0.076CLCA - 1.720ENEG - 2.37NITA - 1.83FUTL + 0.285INTWO - 0.521CHIN \quad (1)$$

Here in Eq. 1, TA denotes Total Assets, while TLTA represents the leverage ratio and comprises the book value of Total Debt to Total Assets. WCTA is the ratio of Total Working Capital divided by Total Assets. CLCA refers to the inverse of the liquidity ratio and is measured by Current Liabilities over Current Assets. If the value of Total Debt is greater than the value of Total Assets, then the ENEG will be 1, and if it is less than the Total Assets, then it will be 0. NITA is the ratio of Net Income to Total Assets and is measured as Net Income divided by Total Assets. FUTL is the ratio of funds received through operations divided by Total Liabilities. INTWO will be 0 if the Net Income is positive in either of the 2 previous years, and it will be 1 if the Net Income is negative for the last 2 consecutive years. CHIN is estimated by $(NI_t - NI_{t-1}) \,/\, (|NI_t| + |NI_{t-1}|)$, and here NI denotes Net Income.

Anomaly 2: Age

Stocks that are comparatively young are sensitive to sentiment. Moreover, young stocks will be most affected by sentiment.

Historic evidence suggests that old stocks earn higher returns than young stocks. For example, in the long run, Initial Public Offerings tend to underperform (Ritter, 1991). Therefore, older stocks are classified as quality stocks and young stocks are classified as junk stocks,

TABLE 1 | Description of anomalies and speculative investment strategies.

	Age anomaly	O-score anomaly
Quality stocks	Decile 10	Decile 1
Junk stocks	Decile 1	Decile 10
Speculative leg	Decile 1	Decile 10
Predicted quality minus junk strategy returns on Friday	Lower	Lower
Predicted quality minus junk strategy returns on Monday	Higher	Higher
Predicted speculative leg return on Friday	Higher	Higher
Predicted speculative leg return on Monday	Lower	Lower
Explanation (why speculative)	Young stocks	Close to distress

The table describes the division of samples for anomalies and speculative strategies. It indicates the division of anomalies into Quality and Junk stocks, and also indicates the expected speculative leg for each anomaly and offers a brief explanation for speculative reasons. ***Table 1*** *also reports the expected returns for speculative leg on a particular day.*

according to the QMJ strategy. For the age anomaly, the speculative leg is in the junk side of the strategy and predicts that QMJ strategy returns will be higher for Mondays than for Fridays.

Age is calculated using the Baker and Wurgler (2006) method, where age is the number of months since the firm appeared in the Chinese stock market. For the age anomaly, portfolios are rebalanced annually at the end of December.

RESULTS AND DISCUSSION

QMJ Strategy Returns

Table 2 (Panels A and B) presents weekly alpha values for QMJ strategy returns in the presence of different asset pricing models for Fridays and Mondays during the COVID-19 period. The findings are consistent for both anomalies on Fridays because Fridays earn negative QMJ strategy returns, as the speculative leg falls in the junk side of the anomaly. Fridays alone account for 109 basis points in excess of returns for young stocks than for older stocks, and distress stocks also earn 66 basis points in excess of returns for distressed stocks than for non-distressed stocks on Fridays. Therefore, findings are consistent for both anomalies based on the theory that Fridays should see higher returns for the speculative leg of the anomaly than for the non-speculative leg. Our results are also consistent when we compare return patterns across days. Fridays earn a higher magnitude return for both anomalies than Mondays. Furthermore, our findings are consistent with the theory of investor sentiment and the psychology literature that finds that junk stocks perform better on Fridays because of happier moods and worsen on Mondays due to lower moods. Additionally, the findings are also consistent with the explanation that speculative stocks perform better on Fridays during the risky time period and Chinese stock markets faced higher risk during the COVID-19 time period.

TABLE 2 | Monday and Friday quality minus Junk strategy returns.

Panel A: Friday quality—junk				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age anomaly	−0.0109195	−0.0105443	−0.0098037	−0.0096892
(t statistics)	(−3.71)	(−3.52)	(−3.22)	(−3.14)
O-score anomaly	−0.0066307	−0.0071671	−0.0063236	−0.0047223
(t statistics)	(−3.23)	(−3.44)	(−3.02)	(−2.35)
Panel B: Monday quality—junk				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age anomaly	−0.0052552	−0.005139	−0.0047982	−0.0038774
(t statistics)	(−5.22)	(−5.02)	(−4.64)	(−3.89)
O-score anomaly	−0.0025017	−0.002875	−0.0025607	−0.0023636
(t statistics)	(−5.25)	(−6.14)	(−5.54)	(−5.21)

Table 2 *examines Quality Minus Junk strategy returns of the portfolios prepared on the basis of Age anomaly and O score anomaly to invest on Friday and Monday. Panel A represents QMJ weekly returns on Friday and panel B represents QMJ weekly returns on Monday. Both panels consist of the alpha values based on the Fama and French 5 factor model, Carhart 4 factor model, Fama and French 3 factor Model, and the Capital Assets Pricing Model. Portfolios are generated on the basis of Value weighted technique and alpha values are also adjusted for heteroskedasticity and autocorrelation.*

Friday Minus Monday

Table 3 provides a direct analysis of Fridays and Mondays, indicating that investors earn higher returns on Mondays when Monday's QMJ strategy returns are adjusted/deducted from Friday's QMJ strategy returns. The negative alpha values for age and O-Score anomalies from Panel C of **Table 3** again verified our results that Mondays see higher QMJ returns than Fridays because speculation characteristics fall in the junk side of the anomalies. Therefore, the Friday minus Monday strategy returns contain negative alpha values in order to provide a robust explanation for investor sentiment on a particular day. The results for age and O-Score anomalies are consistent with the mood theory that Mondays gain higher QMJ strategy returns in comparison to Fridays because moods are higher on Fridays than on Mondays and speculative characteristics fall in the junk side of the anomalies.

Here, the results also confirm the explanation of the day-of-the-week effect for young and distress anomalies that asserts that junk stocks earn higher returns on Fridays due to the existence of the speculative leg in the junk side of the anomaly, and the speculative leg

TABLE 3 | Friday minus Monday strategy returns.

Panel A: Friday (quality—junk)				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age	−0.0109195	−0.0105443	−0.0098037	−0.0096892
(t statistics)	(−3.71)	(−3.52)	(−3.22)	(−3.14)
O score	−0.0066307	−0.0071671	−0.0063236	−0.0047223
(t statistics)	(−3.23)	(−3.44)	(−3.02)	(−2.35)
Panel B: Monday (quality—junk)				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age	−0.0052552	−0.005139	−0.0047982	−0.0038774
(t statistics)	(−5.22)	(−5.02)	(−4.64)	(−3.89)
O score	−0.0025017	−0.002875	−0.0025607	−0.0023636
(t statistics)	(−5.25)	(−6.14)	(−5.54)	(−5.21)
Panel C: Friday—Monday				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age	−0.0056642	−0.0054053	−0.0051378	−0.0051378
(t statistics)	(−1.98)	(−1.85)	(−1.73)	(−1.73)
O score	−0.004129	−0.0042921	−0.0037629	−0.0023588
(t statistics)	(−2.02)	(−2.07)	(−1.79)	(−1.14)

Table 3 *examines Quality Minus Junk strategy returns of the portfolios prepared on the basis of Age anomaly and O score anomaly to invest on Friday and Monday. Panel A represents QMJ weekly returns on Friday, panel B represents QMJ weekly returns on Monday, and panel C represents the QMJ strategy returns for Friday minus Monday. All panels consist of the alpha values based on the Fama and French 5 factor model, Carhart 4 factor model, Fama and French 3 factor Model, and the Capital Assets Pricing Model. Portfolios are generated on the basis of Value weighted technique and alpha values are also adjusted for heteroskedasticity and autocorrelation.*

TABLE 4 | Asymmetric in the speculative leg.

Panel A: Friday junk				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age	0.0094369	0.0090749	0.0084361	0.0081909
(t statistics)	(3.15)	(2.98)	(2.73)	(2.62)
O score	0.003523	0.003808	0.0030405	0.0016345
(t statistics)	(1.72)	(1.83)	(1.45)	(0.80)
Panel B: Monday junk				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age	0.0028003	0.0027147	0.0023018	0.0014588
(t statistics)	(2.44)	(2.33)	(1.96)	(1.25)
O score	−0.0000801	0.0001467	−0.0000828	−0.0002737
(t statistics)	(−0.13)	(0.23)	(−0.13)	(−0.42)
Panel C: Friday junk—Monday junk				
	CAPM	**FF3**	**Carhart4**	**FF5**
Age	0.0066365	0.0063602	0.0059934	0.0067321
(t statistics)	(2.22)	(2.09)	(1.95)	(2.14)
O score	0.0036031	0.0036613	0.0031233	0.0021642
(t statistics)	(1.74)	(1.73)	(1.46)	(1.05)

Table 4 *examines Quality Minus Junk strategy returns of the portfolios prepared on the basis of Age anomaly and O score anomaly to invest on Friday and Monday. Panel A represents Junk portfolio weekly returns on Friday, panel B represents Junk portfolio weekly returns on Monday, and panel C represents the Junk portfolio returns on Friday minus junk portfolio returns on Monday. All panels consist of the alpha values based on the Fama and French 5 factor model, Carhart 4 factor model, Fama and French 3 factor, and the Model and Capital Assets Pricing Model. Portfolios are generated on the basis of Value weighted technique and alpha values are also adjusted for heteroskedasticity and autocorrelation.*

earns higher returns with higher moods during the COVID-19 period.

Asymmetric Returns of Junk Side

Panels A, B, and C of **Table 4** present the results of the difference in returns in the junk side of Fridays and Mondays. The theory of mispricing based on investor sentiment must provide asymmetric results when returns of the speculative leg are compared for both days. The sentiment-based explanation must be endorsable with the returns trend of the speculative leg. Hence, Panels A, B, and C display only the junk side of the anomalies based on young stocks and distress stocks. The strategy returns of the junk side portfolios for both days are separately given in Panels A and B, while Friday junk minus Monday junk weekly portfolio excess returns are presented in Panel C of **Table 4**. The results are robust with the explanation that returns should be asymmetric when the speculative leg on Fridays is tested against the speculative leg on Mondays, and our results reconfirm that young and distress stocks are sensitive to investor sentiment. Focusing on the alpha values of both anomalies, the results suggest that the explanation for the difference in returns in the junk side for young stocks and distress stocks (Panel C) is consistent with the sentiment hypothesis, based on investor mood that the day-of-the-week effect prevails in cross-sectional returns for the speculative leg. The literature predicts that the junk side of the anomalies contain the speculative leg; therefore, we only focus on it to verify that returns are asymmetric within the speculative leg across days.

Robustness Test

Macroeconomic News Impact

It is rarely possible for a systematic pattern to be found in the announcement of better or worse news on a specific day of the week, but it is likely that, due to these announcements, a systematic pattern of cross-section returns will be generated against these macro announcements. It is also possible that some anomalies are more sensitive to these announcements than others. Hence, we collected the data of the Producer Price Index and Consumer Price Index on a weekly basis following the methodology of Savor and Wilson (2013). We focused on the dates when these announcements were publicly declared. Panels A, B, and C of **Supplementary Table S1** provide results of the strategy returns for all anomalies. The specific return dates of these announcements are omitted from the portfolios. Our results are again robust with the existing explanation for both days that the prevailing variations are due to mood fluctuations, and macroeconomic news does not significantly impact the anomaly returns.

Firm Specific News Impact

There is a possibility that existing cross-sectional variations in the anomalies are due to non-random announcements

of organization-specific news. Hence, it is necessary for the validation of this argument that non-speculative and speculative stocks are clearly differentiated with regard to good news and bad news. To verify this explanation, we collected the firm-specific data of dividend announcements and earnings announcements and followed the methodology of Dellavigna and Pollet (2009), which recommends eliminating the earning announcement dates. We used a conservative approach for this analysis and omitted 2 days before and 2 days after the declaration. This approach is useful because ignoring these 5 days will not affect any day of the week because the elimination of 5 days will stand the balance of the week. Panels A, B, and C of **Supplementary Table S2** present the results of the anomaly returns and exclude the data from the announcement dates. Our results provide a robust explanation for existing variations that organization-specific news did not significantly change the magnitude or nature of existing relationship. A more direct explanation from our results is that cross-sectional variations were not observed as an impact of organization-specific news.

DISCUSSION

The psychological explanation of greater mood elevation on Fridays than on other days of the week predicts that the portfolios' returns should be higher on Fridays than on Mondays. The sentiment hypothesis explains that investor sentiment is higher during times of elevated moods for the speculative leg of the anomalies, and psychological research provides several significant findings that indicate higher moods are experienced on Fridays, while lower moods are experienced on Mondays. Therefore, portfolio returns based on both anomalies for the speculative leg should be greater for Fridays than for Mondays. The speculative leg of the anomalies exists in the junk side of both anomalies. The findings are robust for all the asset pricing models, and other models also provide a striking magnitude of excess in returns like those realized for the Capital Assets Pricing Model. Moreover, compared to the distress anomaly, young stocks earn a greater magnitude of returns for weekly portfolios.

The outcomes of direct analysis of Fridays and Mondays indicates that investors earn higher returns on Mondays when Monday's QMJ strategy returns are adjusted/deducted from Friday's QMJ strategy returns. The Friday minus Monday strategy returns contain negative alpha values in order to provide a robust explanation for investor sentiment on a particular day. The results are also robust with the explanation that returns should be asymmetric when the speculative leg on Fridays is tested against the speculative leg on Mondays. Moreover, the same findings were attained for both days that the prevailing variations are due to mood fluctuations, and macroeconomic news and Firm Specific news do not significantly impact the anomaly returns.

CONCLUSION

This study revealed a substantial anticipated relationship between anomaly returns and different days of the week. Chinese A-share market data from both the Shanghai and Shenzhen stock exchanges were used to evaluate the QMJ factor strategy that resembles the mutual measure of quality (non-speculative/long leg) stocks and junk (speculative/short leg) stocks. The QMJ strategy provided negative anomaly returns on a Friday, which confirmed our findings that junk stocks that also contain the speculative leg perform better than quality stocks due to elevated moods during the COVID-19 period. Our findings are consistent with the work of Birru (2018), who found that short leg/speculative leg stocks are sensitive to investor sentiment, and we have contributed to his findings in a way by testing a new investment strategy for quality and junk stocks in place of the long minus short strategy. The findings are also consistent with a new explanation that a higher risk prevails in Chinese stock markets due to the COVID-19 pandemic and speculative leg of the anomalies perform better on Friday than Monday as literature suggested that speculative stocks perform better on Friday during a higher risk time period. Therefore, we also observed that the QMJ strategy performed in the same way as Birru's (2018) long minus short strategy. The findings also reveal that the QMJ strategy premium is probably an indicator of behavioral mispricing.

Limitations and Future Directions

There are several limitations to this study. Firstly, a limited time period has been used for the current study because the post-pandemic time period is short. Therefore, this type of study would have more generalized findings with a larger time span. Secondly, this study has taken data from China, but the pandemic has affected almost the entire world so further studies can take data from several countries on a larger scale. Further, the future studies can test several anomalies to verify the effect of the pandemic on a larger scale.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

TY performed the formal analysis, the methodology of the manuscript, and technique applications through software. TA analyzed the data. QA conceptualized the idea and reviewed the manuscript. MZ reviewed and edited the draft and also helped in the data collection. YA reviewed the write-up of the manuscript. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.630941/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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COVID-19 and Spillover Effect of Global Economic Crisis on the United States' Financial Stability

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Due to the novel coronavirus pandemic (COVID-19), the lockdown engendered has had a vicious impact on the global economy. This analysis' prime intention is to evaluate the impact of the United States' economic and health crisis as a result of COVID-19 on its financial stability. Additionally, the investigation analyzed the spillover impact of the worldwide economic slowdown experienced by COVID-19 on the United States' financial volatility. The study applied an autoregressive distributed lag (ARDL) model and discovered that the economic and health crises that occurred in the United States portentously upset the future expectations of its investors. Conspicuously, the health crisis in Spain and Italy were ominous spillovers of the United States' financial instability in the short-run. Likewise, an economic crisis ensued in the United Kingdom because of COVID-19 causing spillover for the United States markets' financial instability. The examination evaluated that Asian and African nations' economic crises perilously affects the United States' financial stability. The study determined that financial instability occurred in the United States due to its own economic and health crises persisted for a longer period than financial disequilibrium that occurred in other nations. The analysis suggested some strategies of smart lockdown that the government of the United States and other nations should follow to restart the economic cycle through tighter controls to minimize losses by following the steps of (a) preparing a lockdown checklist, (b) monitoring completion of lockdown tasks, and (c) complete a close-down stock take or count.

Keywords: COVID-19 and financial stability, worldwide economic crisis, fear gage, economic sustainability, ARDL model

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INTRODUCTION

To date, the World Health Organization (WHO) has taken various initiatives against several viral infections (WHO, 2020). However, a few emerged to such escalated levels that could ravage economic infrastructure due to deadly lockdowns (Gladstone, 2020). The most well-known among the proclaimed pandemics include the influenza outbreak that appeared in 1918, severe acute respiratory syndrome (SARS) in 2002, and Ebola in 2013. These were deadly and devastating to social and economic infrastructure all around the globe (Gaffen, 2020; Fernandes, 2020). For

instance, the outbreak of influenza marked an overwhelming infection rate of one-third of the world population (Crosby, 2003). Second, SARS emerged in Guangdong, China and rapidly spread across Asian countries and their surroundings, it infected more than 8000 people, and consequently, the SARS epidemic caused the death of more than 900 people (Peiris et al., 2003).

Finally, Ebola became the third viral pandemic disease to generate a death toll of more than 11,300 people and caused a loss of $53 billion for the United States (Fernandes, 2020). Currently, the world is encountering a new viral pandemic known as novel coronavirus 2019 (COVID-19), which started in Wuhan, China, in December 2019, and reached other parts of the world very rapidly (Albulescu, 2020; Ashraf, 2020; Béland et al., 2020). In mid-March 2020, Europe became the new epicenter of COVID-19, beginning in Italy, the infection spread into the neighboring countries and then out to almost all parts of the world. It had infected 2,471,930 people, and 170,129 deaths had been reported worldwide by April 21, 2020 (Financial Times, 2020). The ease of transmission of COVID-19 from one person to another formed an emergency worldwide (Huang et al., 2020; Salisu and Akanni, 2020). As a result, numerous firms were compelled to temporarily halt their business activities.

Indeed, unemployment and inflation increased, while economic growth, tourism, and sales through online travel agencies (OTAs), hotels, and airlines fell suddenly throughout the globe (ILO, 2020; Leduc and Liu, 2020; Gössling et al., 2021). The economic shocks felt during the COVID-19 outbreak are estimated to be more dangerous than the economic shocks in SARS (Ayittey et al., 2020; World Economic Forum [WEF], 2020). A market diagnosis accomplished by Bloomberg concluded that COVID-19 has reduced China's first quarter of GDP growth by about 4.5% (Bocca, 2020). The effects of COVID-19 has also reshaped financial markets worldwide (Daube, 2020; Goodell, 2020; Mazur et al., 2020), and the market value of the United States Standard & Poor Index (S&P 500) has plunged to almost 30% since the outbreak of COVID-19 in the United States (USC) (Yahoo, 2020). **Figure 1** shows that the S&P 500 and Nasdaq index's market value had fallen by 14.9 and 12.4% from March 6 – March 18, respectively. However, other reputed markets of the world, i.e., DAX 30, Nikkei 225, FTSE 100, CAC 40, and CSI 300 had also suffered a deterioration of 25.4, 19.4, 21.4, 26.7, and 12.1% in their values due to the outbreak of COVID-19, respectively. Recently, the United States' 10-year treasury yield index encountered the highest decline of its history (Tarigan, 2020). Likewise, **Figure 2** below shows that the day-wise series of the financial volatility index (VIX) has upturned numerous times since 2008. The financial VIX, also known as "fear gauge," generated by Chicago Board Options Exchange (CBOE), is a reliable source to determine the level of financial stability (Chicago Board Options Exchange [CBOE], 2020). The index offers 30-day predictions for investors related to the volatility of the S&P 500 index (Leduc and Liu, 2020). It shot up to its highest level in the era of global financial crises (GFC) in 2007–2009. Similarly, the VIX also jumped at the time of the trade war between the United States and China (2018). However, in recent times, the outbreak of COVID-19 and its impact on the economy and stock markets increased the level of the VIX. Its highest point was equal to that of the GFC (2007–2009) (Just and Krzysztof, 2020; Sharif et al., 2020). Consequently, this investigation employed the VIX as a critical tool to measure the United States' financial volatility. Besides, this information shows that the financial stability of the United States has been severely affected by COVID-19.

This project set out to investigate the impact of COVID-19 on the financial stability of the United States. This study mainly evaluates the economic crisis and health crisis that took place because of USC. Furthermore, the examination recognized the spillover effect of economic and health crises, due to COVID-19 in the United States, Europe, Asia, and Africa, on the United States' financial volatility. The research utilized the data of confirmed cases as the nomination of lockdown condition and number of deaths because of COVID-19 as the nomination of the health crisis. The study stated that as the number of confirmed cases of COVID-19 increased, the lockdown condition became stricter, which led to a significant economic crisis. Additionally, deaths that happened due to COVID-19 indicate the lack of medical facilities and control in the pandemic, which led to a significant health crisis. The contribution of the paper to the literature can be expressed as follows:

This examination answered the imperious queries of researchers, academicians, policymakers, and investors. For instance, first, does the lockdown and health crisis in the United States expressively distress its financial stability? Second, do economic crises have a higher impact on financial stability than health crises? Third, does economic crisis in European nations and in the United States have the same effect on United States financial instability? Fourth, do economic and health crises in Asian countries spillover to the United States' financial vulnerability? Fifth, how does economic uncertainty move with COVID-19 fear in Arab nations? Sixth, how can the financial stability of the United States be saved from harmful waves of COVID-19? The author believes that answers to these questions will make clear the role of economic crisis and health emergencies, due to COVID-19 in the United States, European, Arabian, African, and Asian countries, for the United States' financial depression. Furthermore, a nation-wise strategic plan can be generated for their economic and financial sustainability.

Initially, this study ensured the appropriateness of the variables used with the help of two methodologies, the Phillip Perron (PP) test and the Augmented Dickey-Fuller (ADF) test. The investigation described the variables that had a varying level of integration, i.e., I(0), I(1), and no variable found to be stationary at I(2). Accordingly, an autoregressive distributed lag (ARDL) model was employed to ascertain the long- and short-run affiliation among variables.

The rest of this study is structured as follows: section "Data and Methodology" provides details on the analytical approach used in this investigation. Section "Findings and Interpretations" delivers a debate on results and a discussion of this investigation. Section "Conclusion" offers the conclusion, research implications, and limitations.

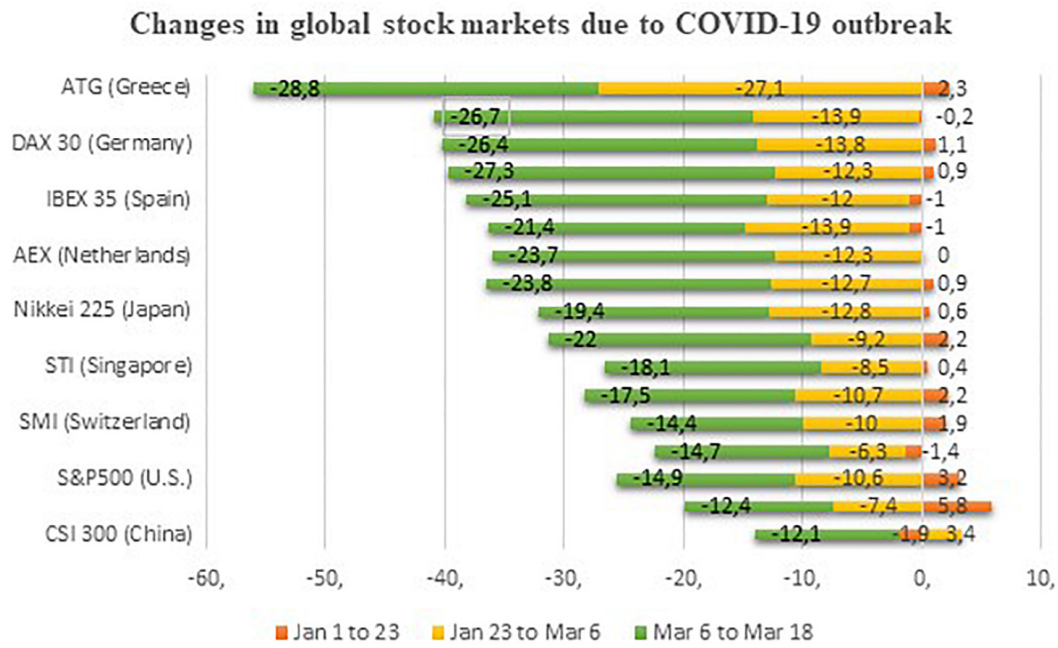

FIGURE 1 | Decline in financial markets due to COVID-19. Source: Statista (2020).

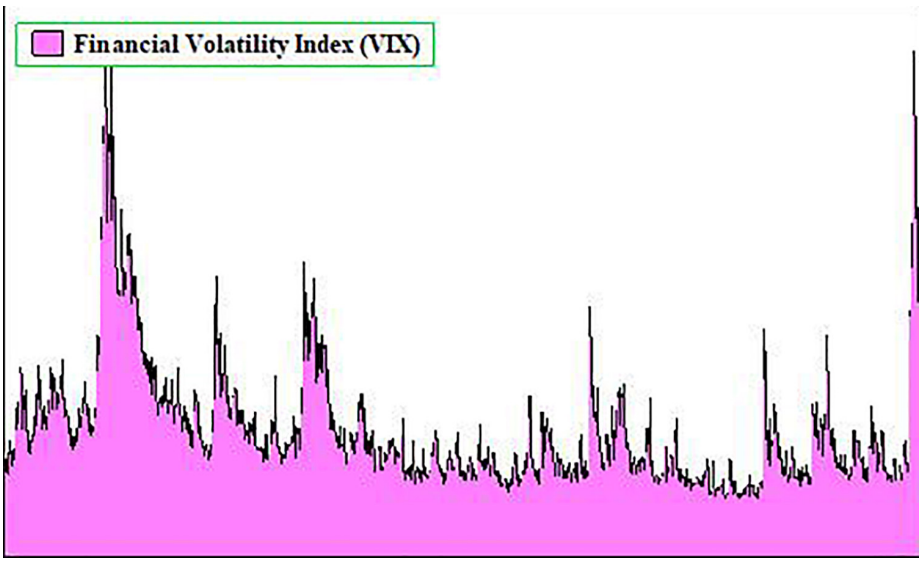

FIGURE 2 | Financial volatility index since 2007. Source: Chicago Board Options Exchange [CBOE] (2020).

DATA AND METHODOLOGY

Data

This investigation has utilized the daily data of the confirmed number of patients infected, the number of deaths due to COVID-19, and the VIX from December 31, 2019 to April 10, 2020. The data used in this investigation are retrieved from the European Centre for Disease Prevention and Control, and the Yahoo Finance database.

Model Specification

This study analyzed the impact of COVID-19 in the United States, Europe, Asia, Africa, and Arabian nations, and divided the dataset into sub-sections[1], i.e., Italy, Spain, Germany, and the United Kingdom as model A; the United States,

[1]This study excluded the incomplete data of the confirmed number of deaths due to COVID-19 in Pakistan, Saudi Arabia, UAE, Qatar, Egypt, Morocco, Kenya, Tunisia, and Ghana.

Switzerland, the Netherlands, and France as a model B, China, Iran, Japan, and Pakistan as model C, Saudi Arabia, United Arab Emirates (UAE), and Qatar as model D, and Egypt, Morocco, Kenya, Tunisia, and Ghana as model E. All these sections cannot be regressed in one equation due to the degree of freedom's complexity. Hence, these nations were divided into different sections. Moreover, these sections will also help generate a more enhanced nation-wise conclusion about the impact of COVID-19 on the United States' financial stability. The functional form of these sections can be written as follows:

$$VIX = f(ITC, ITD, SPC, SPD, GRC, GRD, UKC, UKD) \quad (1)$$

$$VIX = f(USC, USD, SWC, SWD, NETC, NETD, FRC, FRD) \quad (2)$$

$$VIX = f(CHC, CHD, IRC, IRD, JAPC, JAPD, PAKC) \quad (3)$$

$$VIX = f(SAC, UAEC, QTRC) \quad (4)$$

$$VIX = f(EGPC, MORC, KENC, TUNC, GHNC) \quad (5)$$

Here in Eq. 1, ITC, ITD, SPC, SPD, GRC, GRD, UKC, and UKD represent the confirmed number of patients of COVID-19 in Italy, the confirmed number of deaths due to COVID-19 in Italy, confirmed number of patients in Spain, confirmed number of deaths in Spain, confirmed number of patients in Germany, confirmed number of deaths in Germany, confirmed number of patients in the United Kingdom, and confirmed number of deaths in the United Kingdom, respectively. In Eq. 2, USC denotes the confirmed number of cases in the United States, USD represents the confirmed deaths in the United States, SWC represents confirmed cases in Switzerland, SWD represents the deaths in Switzerland, NETC represents confirmed patients in the Netherlands, NETD represents deaths in the Netherlands, FRC denotes the confirmed cases in France, and FRD denotes the number of deaths in France due to COVID-19. Moreover, Eq. 3 defines model C; here, CHC, CHD, IRC, IRD, JAPC, JAPD, and PAKC denote the confirmed number of patients in China, deaths in China, confirmed patients in Iran, deaths in Iran, confirmed patients in Japan, deaths in Japan, and confirmed cases in Pakistan, respectively; while Eq. 4 denotes the Arabian section. Here, SAC, UAEC, and QTRC denote the confirmed patients of COVID-19 in Saudi Arabia, UAE, and Qatar. At last, Eq. 5 represents section E (African nations); where, EGPC, MORC, KENC, TUNC, and GHNC represent the confirmed number of patients of COVID-19 in Egypt, Morocco, Kenya, Tunisia, and Ghana.

An Autoregressive Distributed Lag Estimation

Our study used an ARDL model introduced by Pesaran et al. (2001) to ascertain the long- and short-run affiliation among variables used in this examination. The ARDL model is suitable for a small number of observations. Moreover, it can be employed to assess the exact parameters; either the variables are stationary at level I(0), at the first difference I(1), or an amalgamation of both. Furthermore, long-run and short-run coefficients can be determined at the same time. The cointegration equations for the above-defined sections can be described through the ARDL bound testing approach as follows:

$$\begin{aligned}\Delta VIX_t = {} & \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta ITC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta ITD_{t-i} \\ & + \zeta_4 \sum_{i=1}^{p} \Delta SPC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta SPD_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta GRC_{t-i} \\ & + \zeta_7 \sum_{i=1}^{p} \Delta GRD_{t-i} + \zeta_8 \sum_{i=1}^{p} \Delta UKC_{t-i} + \zeta_9 \sum_{i=1}^{p} \Delta UKD_{t-i} \\ & + \varphi_1 VIX_{t-1} + \varphi_2 ITC_{t-1} + \varphi_3 ITD_{t-1} + \varphi_4 SPC_{t-1} \\ & + \varphi_5 SPD_{t-1} + \varphi_6 GRC_{t-1} + \varphi_7 GRD_{t-1} \\ & + \varphi_8 UKC_{t-1} + \varphi_9 UKD_{t-1} + \mu_t \end{aligned} \quad (6)$$

$$\begin{aligned}\Delta VIX_t = {} & \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta USC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta USD_{t-i} \\ & + \zeta_4 \sum_{i=1}^{p} \Delta SWC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta SWD_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta NETC_{t-i} \\ & + \zeta_7 \sum_{i=1}^{p} \Delta NETD_{t-i} + \zeta_8 \sum_{i=1}^{p} \Delta FRC_{t-i} + \zeta_9 \sum_{i=1}^{p} \Delta FRD_{t-i} \\ & + \varphi_1 VIX_{t-1} + \varphi_2 USC_{t-1} + \varphi_3 USD_{t-1} + \varphi_4 SWC_{t-1} \\ & + \varphi_5 SWD_{t-1} + \varphi_6 NETC_{t-1} + \varphi_7 NETD_{t-1} \\ & + \varphi_8 FRC_{t-1} + \varphi_9 FRD_{t-1} + \mu_t \end{aligned} \quad (7)$$

$$\begin{aligned}\Delta VIX_t = {} & \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta CHC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta CHD_{t-i} \\ & + \zeta_4 \sum_{i=1}^{p} \Delta IRC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta IRD_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta JAPC_{t-i} \\ & + \zeta_7 \sum_{i=1}^{p} \Delta JAPD_{t-i} + \zeta_8 \sum_{i=1}^{p} \Delta PAKC_{t-i} + \varphi_1 VIX_{t-1} \\ & + \varphi_2 CHC_{t-1} + \varphi_3 CHD_{t-1} + \varphi_4 IRC_{t-1} + \varphi_5 IRD_{t-1} \\ & + \varphi_6 JAPCC_{t-1} + \varphi_7 JAPD_{t-1} + \varphi_8 PAKC_{t-1} + \mu_t \end{aligned} \quad (8)$$

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} SAC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta UAEC_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta QTRC_{t-i} + \varphi_1 VIX_{t-1} + \varphi_2 SAC_{t-1} + \varphi_3 UAEC_{t-1} + \varphi_4 QTRC_{t-1} + \mu_t \quad (9)$$

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta EGPC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta MORC_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta KENC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta TUNC_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta GHNC_{t-i} + \varphi_1 VIX_{t-1} + \varphi_2 EGPC_{t-1} + \varphi_3 MORC_{t-1} + \varphi_4 KENC_{t-1} + \varphi_5 TUNC_{t-1} + \varphi_6 GHNC_{t-1} + \mu_t \quad (10)$$

Where Δ denotes the first difference, and i represents the number of lag values. Further, ζ and φ signify the short- and long-run coefficients, respectively; while, ζ_0 indicates the intercept parameter and $\mu_t$means residual factor. The ARDL model relies on the F-test technique to conclude whether the long-run cointegration between variables exists or not. Pesaran et al. (2001) specified the two bounds, i.e., lower and upper bound. Suppose the computed statistics of the F-test are greater than the upper bound. In that case, the null hypothesis of no cointegration exists is efficaciously rejected, which identifies the long-run affiliation between study variables. However, if the F-test value is less than the lower bound, then the null hypothesis of the ARDL model cannot be rejected. Besides, if the F-test value remains between the upper and lower bound limits, then the model is inconclusive. In order to evaluate the short-run ties between the study variables, an ARDL based error correction model (ECM) can be specified as follows:

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta ITC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta ITD_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta SPC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta SPD_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta GRC_{t-i} + \zeta_7 \sum_{i=1}^{p} \Delta GRD_{t-i} + \zeta_8 \sum_{i=1}^{p} \Delta UKC_{t-i} + \zeta_9 \sum_{i=1}^{p} \Delta UKD_{t-i} + \psi_1 ECT_{t-1} + \mu_t \quad (11)$$

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta USC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta USD_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta SWC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta SWD_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta NETC_{t-i} + \zeta_7 \sum_{i=1}^{p} \Delta NETD_{t-i} + \zeta_8 \sum_{i=1}^{p} \Delta FRC_{t-i} + \zeta_9 \sum_{i=1}^{p} \Delta FRD_{t-i} + \psi_1 ECT_{t-1} + \mu_t \quad (12)$$

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta CHC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta CHD_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta IRC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta IRD_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta JAPC_{t-i} + \zeta_7 \sum_{i=1}^{p} \Delta JAPD_{t-i} + \zeta_8 \sum_{i=1}^{p} \Delta PAKC_{t-i} + \psi_1 ECT_{t-1} + \mu_t \quad (13)$$

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta SAC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta UAEC_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta QTRC_{t-i} + \psi_1 ECT_{t-1} + \mu_t \quad (14)$$

$$\Delta VIX_t = \zeta_0 + \zeta_1 \sum_{i=1}^{p} \Delta VIX_{t-i} + \zeta_2 \sum_{i=1}^{p} \Delta EGPC_{t-i} + \zeta_3 \sum_{i=1}^{p} \Delta MORC_{t-i} + \zeta_4 \sum_{i=1}^{p} \Delta KENC_{t-i} + \zeta_5 \sum_{i=1}^{p} \Delta TUNC_{t-i} + \zeta_6 \sum_{i=1}^{p} \Delta GHNC_{t-i} + \psi_1 ECT_{t-1} + \mu_t \quad (15)$$

Here, the error correction term (ECT_{t-1}) indicates the adjustment speed of VIX to accomplish long-run equilibrium. This examination evaluates the stability of the ARDL model with the use of serial correlation and a heteroskedasticity test. Simultaneously, the cumulative sum of recursive residuals (CUSUM) and the square of the cumulative sum of the recursive residuals (CUSUMSQ) test is also applied.

FINDINGS AND INTERPRETATIONS

Summary Statistics, Unit Root, and Long-Run Cointegration Analysis

The summary statistics given in **Table 1** shows that the average number of confirmed patients was high in the United States and Italy. In contrast, average deaths due to COVID-19 were high

in Italy and Spain. It indicates that the United States and Italy are the two biggest nations affected by COVID-19. The Jarque–Bera values denote that the study variables were not normally distributed; however, this problem can be removed through the ARDL model. **Table 2** exhibits the results of the ADF test (Dickey and Fuller, 1979) and the PP test (Phillips and Perron, 1988). The outcomes declared that the study variables had a mixed stationary level, i.e., I(0) and I(1), but no one variable was stationary at I(2). Hence, the ARDL technique can be exercised to ascertain the cointegration and long- and short-run parameters. The ARDL model has critical capabilities compared to other regression models; first, it is suitable for a small data set. Second, it can be used for a different level of cointegrated factors. Third, it explained the long-and short-run coefficients after considering

TABLE 1 | Descriptive statistics of study variables.

	VIX	UKD	UKC	SPD	SPC	ITD	ITC	GRD
Mean	35.26	14.00	238.79	88.04	1061	142.4	13876	5.95
Skewness	0.614	3.679	2.697	2.45	2.23	1.50	1.218	2.65
Kurtosis	1.884	17.86	9.659	7.88	6.90	3.78	2.836	9.03
Jarque–Bera	5.626	561.5	149.9	98.03	71.8	19.78	12.17	131
Probability	0.06	0.000	0.000	0.00	0.00	0.00	0.002	0.0
	GRC	USD	USC	SWD	SWC	NETD	NETC	FRD
Mean	770.8	28.59	1843	3.122	182.7	10.16	140.9	36.0
Skewness	2.182	2.723	2.56	4.457	1.68	3.085	2.18	2.5
Kurtosis	6.351	9.199	8.428	24.78	4.15	12.51	6.71	8.5
Jarque–Bera	61.84	139.0	113.7	1131.	26.060	262.4	66.9	115
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00
	FRC	CHC	CHD	IRC	IRD	JAPC	JAPD	PAKC
Mean	536.7	1308	51.30	619.2	46.12	27.8	1.00	28.4
Skewness	2.07	3.97	1.715	1.24	0.79	2.13	1.322	1.5
Kurtosis	6.37	21.30	6.60	4.05	1.90	8.88	3.66	3.7
Jarque–Bera	58.48	663.7	41.22	12.1	6.271	88.08	12.39	17.2
Probability	0.000	0.000	0.00	0.00	0.04	0.000	0.00	0.00
	QTRC	SAC	UAEC	EGPC	GHNC	KENC	MORC	TUNC
Mean	27.20	43.0	15.45	23.9	8.93	2.46	23.53	13.2
Skewness	3.431	1.540	1.98	1.20	2.58	1.13	2.085	1.68
Kurtosis	14.23	4.497	6.465	4.25	8.83	2.96	6.803	4.47
Jarque–Bera	144.4	9.782	23.1	4.585	38.0	3.19	19.91	8.45
Probability	0.000	0.007	0.000	0.100	0.00	0.20	0.000	0.01

Author's calculation.

TABLE 2 | Findings of unit root methodology.

	Variables	VIX	EGPC	KENC	TUNC	GHNC	MORC	SAC	UAEC	QTRC	CHC
ADF	Level	−2.45	−2.75	−1.37	−0.92	3.21*	4.8*	−2.12	−3.4*	−3.7*	−2.71
	1st difference	−6***	−5.6***	−3.03*	−4.0***	−9.9***	−2.5	−6***	−3.6*	−6***	6.8***
PP	Level	−3.15	−2.71	−4.69*	−2.891	−2.75	12.0***	−2.10	−3.0*	−3.7*	−3.9*
	1st difference	−5.8**	−9.85***	−15***	−15.3***	−8.2***	−3.74*	−6***	−6.1***	−9***	22***
	Variables	CHD	IRC	IRD	JAPC	JAPD	PAKC	GRC	GRD	ITC	ITD
ADF	Level	−2.64	3.26*	−0.169	0.92	−3.29*	−0.29	1.0	22.9***	1.3	−3.8*
	1st difference	−1.01	−3.99*	−4.61*	−4.156*	−8.5***	−7.4***	−16***	−3.4*	−9***	−5***
PP	Level	−3.48*	3.07*	−0.23	−4.16*	−3.208*	−2.4	−1.34	3.2*	0.05*	2.6
	1st difference	11***	−4.21**	−4.61**	−3.80*	−23***	−11***	−11***	−7.5***	10***	−9***
	Variables	SPC	SPD	UKC	UKD	USC	USD	SWC	SWD	FRC	FRD
ADF	Level	4.42*	12.26***	7.3***	−24***	7.6***	7.2***	4.5*	6.5***	−0.30	4.2**
	1st difference	−3.4*	−3.46*	−1.55	−6.64***	−5***	−2.7***	−13***	−14***	−10***	−3.9*
PP	Level	0.87	4.868**	12.6***	12.7***	5.6***	4.1***	−0.8	−3.9*	−2.24	0.1
	1st difference	−2.87	−8.58***	−4.72*	−4.37*	−5***	−8.4***	−12***	−13***	−15***	−9***

, **, and * denotes the significance level at 10, 5, and 1%, respectively.*
Author's calculation.

TABLE 3 | ARDL bound test results (cointegration).

Equations	Model(lag)	F-statistic	I(0) at 1%	I(1) at 1%
Equation 6	ARDL(1, 3, 3, 3, 2, 1, 3, 1, 3)	19.3	2.62	3.77
Equation 7	ARDL(3, 3, 2, 0, 3, 3, 0, 0, 3)	8.7	2.62	3.77
Equation 8	ARDL(2, 3, 3, 3, 3, 3, 3, 3)	6.1	2.73	3.9
Equation 9	ARDL(4, 2, 1, 1)	8.61	3.65	4.66
Equation 10	ARDL(1, 1, 1, 1, 0, 1)	8.67	3.06	4.15
Decision				

All models are cointegrated at 1% level of significance.
Author's calculation

its previous values and past figures of independent factors as well. After exploring the unit root level of the study variables, the next step was to determine the long-run cointegration between the study variables using the ARDL model.

This study employed lags based on Akaike Information Criterion to adopt the best regression model. **Table 3** displays the consequences of the ARDL bound test for each equation. The F-statistics values, 19.3, 8.7, 6.1, 8.61, and 8.67 for Eq. 6, Eq. 7, Eq. 8, Eq. 9, and Eq. 10 are higher than the upper bound limit of Pesaran et al. (2001) at 1% level of significance, respectively. It implies that long-run affiliation exists between patients and deaths due to COVID-19 and the VIX.

The ARDL Model Considerations

The long- and short-run upshots of model A are demonstrated in **Table 4**. The short-run parameters showed that ITC had a positive impact on the VIX. At the same time, ITD showed a negative influence on the VIX, but the first and second lag of ITD rendered a positive influence on the VIX. These findings implied that the lockdown condition and health crisis in Italy, because of COVID-19, played a significant role in expanding the United States' financial instability. The SPC and first lag value of SPC expressed a positive association with the United States markets' financial volatility. Still, the second lag value of SPC had a negative relationship with financial stability. The health crisis in Spain (SPD) confirmed negative linkage with the uncertainty, although the first lag value of SPD directly affected the financial vulnerability in the United States. Shehzad et al. (2020a) elaborated that increasing COVID-19 cases and deaths have greatly damaged the market value of the S&P 500 and Nasdaq composite index.

Moreover, GRC reported a negative association with the VIX, and GERD revealed a positive impact on the VIX. Further, UKC and UKD had an encouraging impact on the VIX. ITC, SPC, GERD, and UKD made a positive and significant impression on the VIX in the long-run. It signifies that the economic crisis and health crisis in Italy and Spain negatively effected the United States' financial uncertainty for the long-run period. Furthermore, the health crisis in Germany and the United Kingdom substantially destabilized the financial stability of the United States. However, ITD, SPD, GRC, and UKC pointed out a distinct effect on financial volatility in the United States. These statistics imply that an intensification in lockdown circumstances and health crisis owing to COVID-19 occupy a substantial part in escalating the United States' financial instability.

Besides, the negative and significant coefficient of ECT_{t-1} indicated that aberration in the financial stability today will move back to equilibrium with the adjustment speed of 23% tomorrow. Alola and Olowu (2020) analyzed the impact of COVID-19 on pharmaceutical product inflation. The study revealed that uncertainty arising from the pandemic was more remarkable than economic uncertainty in the United States. The study also

TABLE 4 | Long-run and short-run parameters of model A.

Variable	Coefficient	Standard error	*t*-Statistic	Probability	Variable	Coefficient	Standard error	*t*-Statistic	Probability
Short-run					D(GRC)	−0.437052	0.025498	−17.140	0
D(ITC)	0.108358	0.0062	17.314	0	D(GRD)	110.3016	6.229438	17.706	0
D[ITC(−1)]	0.084353	0.0046	18.138	0	D[GRD(−1)]	−342.3545	19.53159	−17.528	0
D[ITC(−2)]	0.096149	0.0060	15.872	0	D[GRD(−2)]	−333.8304	19.44324	−17.169	0
D(ITD)	−0.501345	0.0415	−12.062	0	D(UKC)	0.268873	0.051735	5.1971	0
D[ITD(−1)]	2.778611	0.1868	14.868	0	D(UKD)	47.12621	2.722459	17.310	0
D[ITD(−2)]	7.120248	0.4008	17.764	0	D[UKD(−1)]	30.7398	1.783848	17.232	0
D(SPC)	−0.160196	0.0116	−13.773	0	D[UKD(−2)]	24.69249	1.607525	15.360	0
D[SPC(−1)]	−2.20266	0.1252	−17.591	0	ECT_{t-1}	−0.232007	0.013497	−17.189	0
D[SPC(−2)]	1.841172	0.1022	18.003	0	R-squared	0.986419			
D(SPD)	−0.980326	0.0797	−12.298	0	Adjusted R-squared	0.976495			
D[SPD(−1)]	46.90714	2.6982	17.384	0	Durbin-Watson	2.238767			
Long-run									
ITC	0.126448	0.0523	2.4173	0.02	GRD	1414.319	551.7185	2.5634	0.02
ITD	−19.5492	8.5399	−2.2891	0.03	UKC	−3.907005	1.392093	−2.8065	0.01
SPC	5.587578	2.4497	2.2809	0.03	UKD	632.6026	214.79	2.94521	0.00
SPD	−199.8744	78.205	−2.5557	0.02	C	19.53222	1.409447	13.8580	0
GRC	−3.192454	1.0700	−2.9834	0.00					

Author's calculation.

documented that total spillover had been increased from 34.2 to 47.6% due to COVID-19 uncertainty. Alola and Bekun (2020) stated that disposable income per capita (DIC), crude oil (WTI), the electric power sector (EEM), and industrial sector (IEM) faced a net spillover shock of 25.90, 63.80, 26.10, and 48.80%, respectively, out of the total spillover index.

The regression parameters of model B are available in **Table 5**. These parameters illustrated that an expanding number of patients of USC performed a crucial role in building the financial volatility of their markets. However, the death rate in the United States (USD) and the Netherlands (NETD) showed a reverse impact on financial volatility. Moreover, the abundance of confirmed cases in France (FRC) positively and severely impacted the fear gage. The results of long-run coefficients designated that lockdown condition and health crisis in Switzerland (SWC and SWD) expressively upsurged the uncertainty level of the United States financial markets.

Further, USD, NETD, and FRAD also raised the financial uncertainty of the United States markets considerably. However, USC, NETC, and FRC displayed negative bonding with the VIX, which means lockdown and economic crisis in the United States, the Netherlands, and France had a domineering role in changing

TABLE 5 | Long-run and short-run parameters of model B.

Variable	Coefficient	Standard error	*t*-Statistic	Probability	Variable	Coefficient	Standard error	*t*-Statistic	Probability
Short-run									
D[VIX(−1)]	0.320184	0.071133	4.5012	0.00	D(NETD)	−37.1194	3.477211	−10.67	0
D[VIX(−2)]	0.433447	0.091629	4.7304	0.00	D[NETD(−1)]	−154.4663	13.54778	−11.40	0
D(USD)	−6.027666	0.455287	−13.239	0	D[NETD(−2)]	−128.413	10.72135	−11.97	0
D[USD(−1)]	−15.10811	1.35129	−11.180	0	D(FRC)	0.581531	0.049238	11.810	0
D[USD(−2)]	−10.79734	1.108114	−9.7438	0	D[FRC(−1)]	1.182217	0.104662	11.295	0
D(USC)	0.152815	0.013592	11.2426	0	D[FRC(−2)]	0.785776	0.069238	11.348	0
D[USC(−1)]	0.192244	0.015738	12.2155	0	ECTt-1	−0.337813	0.029974	−11.27	0
D(SWC)	−0.633202	0.056824	−11.143	0	R-squared				
D[SWC(−1)]	−3.696133	0.32525	−11.363	0	Adjusted R-squared				
D[SWC(−2)]	−2.134	0.189695	−11.249	0	Durbin-Watson				
Long-run					NETD	19.85601	61.55645	0.3225	0.75
USD	40.38965	17.49182	2.3090	0.0317	NETC	−12.63964	6.054786	−2.087	0.05
USC	−0.439103	0.143477	−3.060	0.0062	FRD	39.32385	17.16386	2.291	0.03
SWD	63.43783	31.56593	2.0096	0.0581	FRC	−0.952051	0.427182	−2.228	0.03
SWC	11.93463	4.233947	2.8187	0.0106	C	17.22974	1.53559	11.220	0

Author's calculation.

TABLE 6 | Long-run and short-run parameters of ARDL model C.

Variable	Coefficient	Standard error	*t*-Statistic	Probability	Variable	Coefficient	Standard error	*t*-Statistic	Probability
Short-run									
D[VIX(−1)]	−0.121317	0.07492	−1.61	0.15	D(IRC)	0.025592	0.00486	5.265	0.00
D(CHNC)	−0.000835	0.00029	−2.84	0.02	D[IRC(−1)]	0.047561	0.007196	−6.609	0.00
D[CHNC(−1)]	0.002225	0.00036	6.085	0.00	D[IRC(−2)]	0.041762	0.00475	−8.791	0.00
D[CHNC(−2)]	0.002097	0.00039	5.338	0.00	D(IRD)	0.220182	0.055997	3.932	0.00
D(CHND)	0.025387	0.02166	1.171	0.28	D[IRD(−1)]	0.323953	0.080449	4.026	0.00
D[CHND(−1)]	−0.049799	0.02089	−2.38	0.05	D[IRD(−2)]	0.353056	0.118423	−2.981	0.02
D[CHND(−2)]	−0.074943	0.01340	−5.59	0.00	D(PAKC)	0.123498	0.024374	5.066	0.00
D(JAPC)	0.126562	0.03972	3.185	0.01	D[PAKC(−1)]	0.086263	0.03167	2.723	0.03
D[JAPC(−1)]	0.215088	0.04080	5.271	0.00	D[PAKC(−2)]	0.104221	0.028715	3.629	0.01
D[JAPC(−2)]	0.141362	0.04823	2.93	0.02	ECTt-1	−0.718286	0.0633	−11.34	0.00
D(JAPD)	1.042896	0.53948	1.933	0.10	R-squared	0.970102			
D[JAPD(−1)]	−3.581338	0.80170	−4.46	0.00	Adjusted R-squared	0.923118			
D[JAPD(−2)]	−4.013693	0.78239	−5.13	0.00	Durbin-Watson	2.052251			
Long-run									
CHNC	−0.00502	0.00062	−8.00	0.00	IRC	0.048397	0.008973	5.393	0.00
CHND	0.078293	0.03507	2.232	0.06	IRD	−0.416392	0.171506	0.427	0.51
JAPC	−0.292012	0.17807	−1.63	0.15	PAKC	0.051902	0.125891	0.412	0.69
JAPD	15.83017	3.28179	4.823	0.00	C	26.98563	2.103817	12.82	0.00

Author's calculation.

the financial stability in the United States. The negative and significant value of ECT_{t-1} reported that the disequilibrium of the VIX would be rectified with a speed of 33% each day. Alola et al. (2020) analyzed the impact of COVID-19 deaths and recovery on financial stress in the United States. The study used the Markov switching method and found that recovery from COVID-19 significantly reduced financial stress, while an increase in deaths due to COVID-19 fettered the United States' financial stress.

The verdicts of the Asian nations are shown in **Table 6**. These results showed that the first and second lag values of confirmed China cases (CHC) had an absolute sway on the financial instability index. Moreover, the first and second lag of CHD publicized a negative impression on the VIX. The lockdown due to COVID-19 in Japan (JAPC) ominously raised the financial markets' impulsiveness, but JAPD pointedly supported the United States' financial stability. Nonetheless, confirmed COVID-19 cases and deaths in Iran (IRC and IRD) conveyed a significant and positive nexus with variance in the United States' financial markets. Besides, confirmed cases of COVID-19 in Pakistan (PAKC) also meaningfully amplified the uncertainty of financial markets in the United States. The long-run coefficients of Asian nations intimated that CHC limited VIX, but CHD and JAPD significantly enlarged the financial system's shakiness in the United States.

TABLE 7 | Long-run and short-run parameters of ARDL model D.

Variable	Coefficient	Standard error	*t*-Statistic	Probability	Variable	Coefficient	Standard error	*t*-Statistic	Probability
Short-run					D(SAC)	−0.129345	0.019802	−6.53185	0.00
D[CLOSE(−1)]	−0.541458	0.11249	−4.8	0.00	D(UAEC)	0.170104	0.030372	5.600676	0.00
D[CLOSE(−2)]	−0.806096	0.14811	−5.4	0.00	ECTt-1	−0.428924	0.046235	−9.27712	0.00
D[CLOSE(−3)]	−0.328253	0.09702	−3.3	0.00	R-squared	0.971788			
D(QTRC)	0.064296	0.01081	5.94	0.00	Adjusted R-squared	0.947102			
D[QTRC(−1)]	0.1299	0.01793	7.2	0.00	Durbin-Watson	2.2658567			
Long-run									
QTRC	0.422218	0.11500	3.67	0.02	UAEC	1.091373	0.461971	2.362427	0.07
SAC	−0.503365	0.21419	−2.3	0.07	C	65.61467	5.787498	11.33731	0.00

Author's calculation.

TABLE 8 | Long-run and short-run parameters of ARDL model E.

Variable	Coefficient	Standard error	t-Statistic	Probability	Variable	Coefficient
Short-run						
D(EGPC)	0.164266	0.099597	1.649304	0.1976	R-squared	0.893278
D(GHNC)	1.943076	0.253809	7.65567	0.0046	Adjusted R-squared	0.845846
D(KENC)	6.838584	0.964837	7.087815	0.0058	Durbin-Watson	2.691855
D(TUNC)	0.059362	0.134444	0.441533	0.6887		
ECTt-1	−0.729633	0.090354	−8.075309	0.004		
Long-run						
EGPC	−0.218354	0.285338	−0.765248	0.4998		
GHNC	−8.523562	2.784284	−3.061312	0.0549		
KENC	21.09007	6.97338	3.024368	0.0566		
MORC	4.011221	1.323988	3.029651	0.0563		
TUNC	2.428482	1.048609	2.315907	0.1035		
C	73.65115	4.75252	15.49728	0.0006		

Author's calculation.

TABLE 9 | Findings of diagnostic techniques.

	Heteroskedasticity		Serial correlation		Ramsey test	
Model A	F-statistic	0.308853	F-statistic	0.454049	F-statistic	0.37281
Model B	F-statistic	0.091074	F-statistic	0.023862	F-statistic	0.025706
Model C	F-statistic	0.362872	F-statistic	1.266271	F-statistic	2.254878
Model D	F-statistic	1.097822	F-statistic	0.241042	F-statistic	0.56118
Model E	F-statistic	0.642662	F-statistic	0.433606	F-statistic	0.257286

Author's calculation.

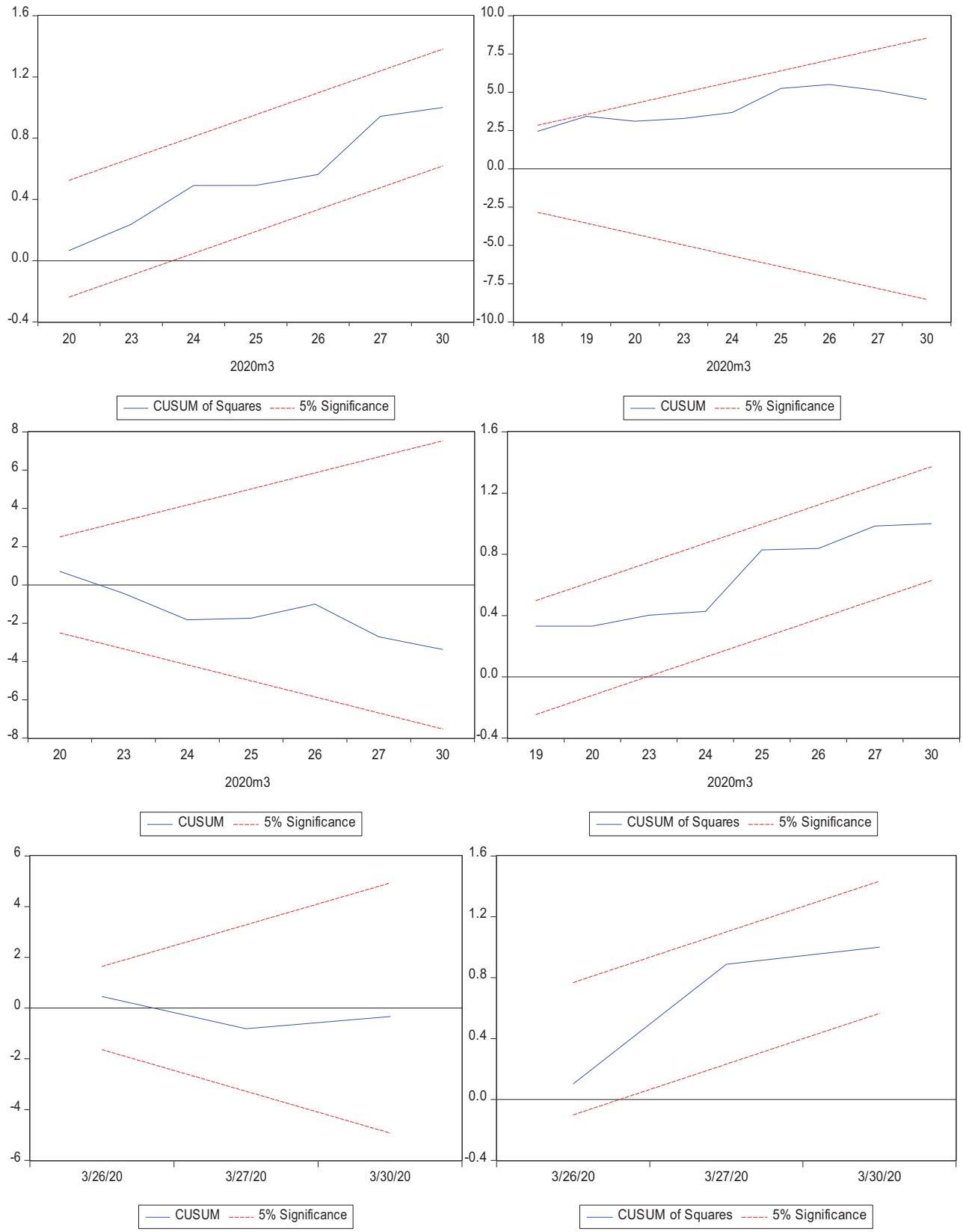

FIGURE 3 | Continued

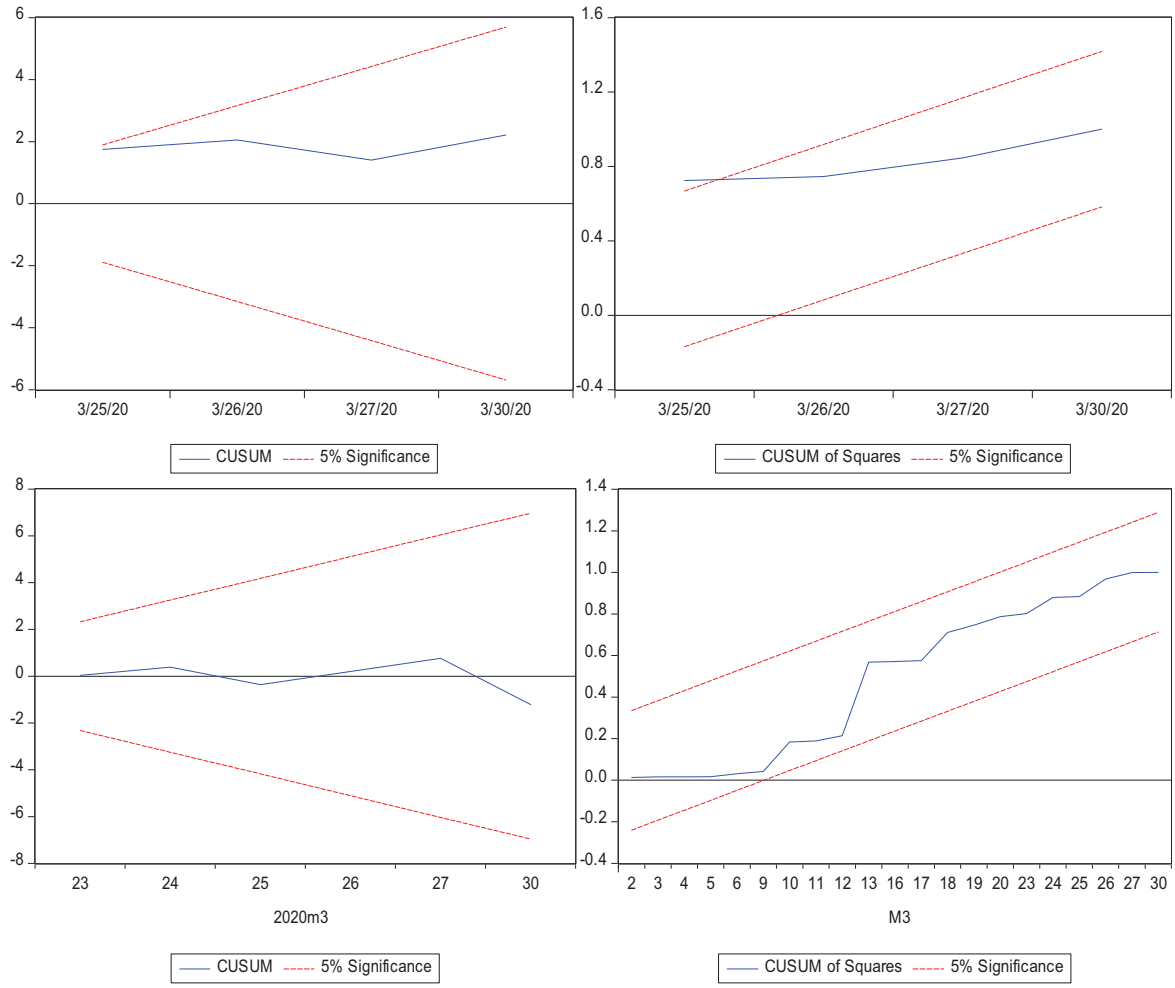

FIGURE 3 | CUSUM and CUSUMSQ plots.

Also, IRC ameliorated VIX; however, IRD had an insignificant impact on VIX. These statistics implied that the amplification of the lockdown situation in Asian nations due to COVID-19 had a more significant impact on the United States financial market's volatility. The ECT_{t-1} coefficient pronounced that disequilibrium ensued in the VIX today, due to COVID-19 in Asian nations, would move back to equilibrium tomorrow, with an adjustment speed of 71%, meaning that Asian crises due to COVID-19 would rapidly off-set the United States financial market's volatility. Balsalobre-lorente (2020) argued that in spite of the isolation of China from the world, there was an increase in its economic growth.

Table 7 manifests the results of COVID-19 in Arabian nations. The findings discovered that the economic crisis in Qatar (QTRC) owned an immediate position in mounting the volatility of financial markets, for both long-run and short-run periods. Also, UAEC had a positive and significant dominance on the VIX. On the other hand, lockdown in Saudi Arabia (SAC) enhanced instability in the long-run. The significant value of ECT_{t-1} signified that the unbalance of the VIX, due to COVID-19's impact in Arabian nations, would become stable with an adjustment speed of 42.8%. The consequences related to the COVID-19 effect in African nations are given in **Table 8**. These factors showed that the economic crisis in Ghana (GHNC) and Kenya (KENC), due to COVID-19, significantly affected the United States financial markets' volatility.

Nevertheless, GHNC showed a cynical alliance with VIX in the long-run. Besides, MORC and TUNC had a positive correlation with the VIX. The negative value of ECT_{t-1} suggested that disequilibrium in the VIX today, because of COVID-19 in African nations, would be balanced tomorrow with an adjustment speed of 72.9%. Shehzad et al. (2020b) analyzed and compared the impact of COVID-19 and the global financial crisis (2007–2009) for Europe, the United States, and Asia. The investigation revealed that the COVID-19 crisis has had more of an impact on these economies than the global financial crisis. Additionally, the investigation documented that the trade war between China and the United States remained insignificant in returns spillover.

Diagnostic Measures

This investigation employed the Breusch–Godfrey (Breusch and Pagan, 2006a,b) model to assess the serial correlation and heteroskedasticity in the residuals in each model. Moreover, to verify the accuracy of the coefficients of each model, the CUSUM and CUSUMSQ tests (Brown et al., 1975) were used. Further, functional misspecification in each model was determined through the Ramsey analysis. The results of these diagnostic measures, shown in **Table 9**, clarify no serial correlation, heteroskedasticity, or functional misspecification in the models. Also, the parameters of each model were correct as the plots of CUSUM and CUSUMSQ, presented in **Figure 3**, were within the 5% critical limit.

CONCLUSION

The novel coronavirus pandemic (COVID-19) has significantly affected the economy of the world. Moreover, the world's stock markets faced collapse in their market values, and crude oil prices in the United States become negative due to lockdown. The principal aim of this project was to determine the impact of the economic and health crisis generated by USC on its financial stability. This study also evaluated the spillover effects of the economic and health crisis, transpired because of COVID-19 in the European, African, Asian, and Arabian nations, on the United States' financial stability. For the said purpose, this investigation utilized the ARDL model. The investigation observed that economic crisis occurring because of COVID-19 in Italy and Spain expressively affects the United States' financial instability for the short-run period. However, in the long-run, it improves the financial stability of the United States markets.

Furthermore, lockdown in the United Kingdom and Germany negatively affects the financial stability of the United States markets. The analysis signified that the health crisis in the United States due to COVID-19 meaningfully escalated the instability of the United States financial markets for the long-run period. Also, the health crisis in France and the Netherlands due to COVID-19 showed a harmful impact on the United States' financial stability. Conversely, the economic crisis in France and the Netherlands limited the instability of the United States markets. The model of Asian nations implied that the economic crisis of China, Japan, Iran, and Pakistan significantly and positively contributed to the United States' financial instability.

Nonetheless, lockdown in Qatar and UAE indicated a destructive influence on the financial stability of the United States. Still, lockdown in Saudi Arabia denoted an insignificant impact on the United States financial system instability. Additionally, in the short-run, the economic crisis of Ghana, Kenya, Morocco, and Tunisia tremendously raised the financial instability of the United States markets, but, in the long-run, Ghana's economic crisis improved the financial stability of the United States. This study argued that disequilibrium occurred in the United States' financial VIX due to COVID-19's impact in Europe, and the United States adjusted deliberately as opposed to other evaluated nations. Moreover, the deviation transpired in the United States' financial stability, due to COVID-19 effects in Asian and African nations, achieved its equilibrium rapidly. The investigation findings confirmed that the economic crisis that occurred in the world significantly distressed the financial stability of the United States markets. The health crisis that occurred in the United States affected the United States markets' financial stability compared to the health crisis that occurred in other nations of the world. Hence, additional resources must be allocated to the health sector to mitigate such epidemic or pandemic situations in the future. The study inferred that lockdown due to COVID-19 had damaged the supply and demand cycle; thus, economic conditions had become uncertain all around the globe. Hence, it had dramatically affected all kinds of business activities, specifically, small businesses. The government should build novel policies to support small businesses, such as reducing taxes and other duties. The investigation suggests that the United States and other nations should build strategies of smart lockdown to begin the economic cycle. Likewise, online business and home delivery services should be permitted. Additionally, the use of digital currency can play an imperative role in smart lockdown. Further, there should be a cut on the central banks' interest rates and such policies should mainly focus on small investors.

Finally, this article aimed to contribute to the literature by examining the role of the economic crisis and health emergencies caused by USC, Europe, Arabian, African, and Asian countries in the United States' financial crisis. However, the article has some limitations. We focused on the impact of the COVID-19 pandemic on the financial system. Future research may examine the impact of the pandemic on the real economy. The nexus between health shock and supply-demand mechanisms can be discussed. For instance, the dynamic effects of the COVID-19 outbreak on tourism, energy, and food demands can be explained. To fight COVID-19, this type of research focusing on the socio-economic effects of the pandemic and vaccination and treatment options is desperately needed.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

LX: conceptualization, data curation, formal analysis, investigation, writing – original draft, and supervision. FB: conceptualization, data curation, writing – original draft, and writing – review and editing. EK: data curation, methodology, formal analysis, and writing – original draft. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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BRIEF RESEARCH REPORT
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Abilities, Motivations, and Opportunities of Furloughed Employees in the Context of Covid-19: Preliminary Evidence From the UK

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The Covid-19 global pandemic is a crisis like no other, forcing governments to implement prolonged national lockdowns in an effort to limit the spread of the disease. As organizations aim to adapt and remain operational, employers can suspend or reduce work activity for events related to Covid-19 and claim government support to subsidize employee wages. In this way, some employees are placed on furlough (i.e., temporary unemployment) as opposed to being made redundant. While the impact of such schemes on global economy attracted much attention, their micro-level impact on individual employees is still unknown. Building on the *ability-motivation-opportunity* (AMO) framework, this pilot study explores how employees' perceptions of abilities, motivation, and opportunities are affected as a result of furlough. Rapid ethnography including interviews, observations, and document analysis in a British organization provided insights into the perceptions and experiences of employees put on furlough and highlighted that all three elements of AMO are affected by the current situation, either positively or negatively. We identify theoretical contributions and suggest a number of AMO enhancing practices in the context of furlough.

Keywords: COVID-19, furlough, ability, motivation, opportunity, cutback management, HR management

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INTRODUCTION

Furloughs have been used by governments as a job saving tool since the 2012 economic recession (Lee and Sanders, 2013). They allow employers to place individuals on temporary leave and act as a cost-saving exercise. As a relatively new concept in the United Kingdom (UK), furlough was suggested by the government to assist the economy by limiting the number of redundancies that occurred as a result of a Covid-19 pandemic. Organizations that were unable to maintain their workforce were encouraged to furlough employees rather than make redundancies and apply for the Coronavirus Job Retention Scheme, which reimbursed employers with 80% of workers' wages.

Furlough may influence many aspects of life on a personal and organizational level, as employees aim to retain employment whilst adapting to changes to working conditions such as reduced pay and hours. Although research exists to examine how individuals deal with the job insecurity resulting from national crises (Adkins et al., 2001) and how such crisis management affects organizational and management levels (James et al., 2011; Stoker et al., 2019), our knowledge of its

effect on individual employees is scant (Perrewé et al., 2012). While this is inevitably linked to the recency of this unprecedented event and its unique circumstances (Shoss et al., 2021), greater understanding of the impact of furlough on employees would enable organizations to develop practices and processes encouraging development and increasing motivation and commitment in such difficult times.

The aim of this research is therefore to explore the impact of furlough on employee's perceptions of ability, motivation, and opportunity through the lens of the AMO theoretical framework (Boxall and Purcell, 2003). According to the theory, individual functioning is largely dependent upon one's ability, motivation, and opportunity to participate in an organizational life. By exploring how these three aspects are affected by a decision to be sent on furlough, our study contributes to the existing literature in a number of ways.

First, the reported study enhances our knowledge of employee behaviors during times of crisis. As organizations over the decades have adapted in times of crises including the Asian Financial Crisis or the Global Financial Crisis, it is the Covid-19 crisis, in particular, that had a revolutionary effect on business-as-usual. However, the evidence on its impact is only in its infancy (El Keshky et al., 2020; Teng et al., 2020). Second, we adopt a well-established AMO framework in a novel context of furloughed employees. In doing so we enhance existing understanding of the abilities, motivations, and opportunities of furloughed employees and their potential impact on organizationally-relevant outcomes. Third, this paper explains how perceptions of, and reactions to the same Human Resources (HR) practices may differ for furloughed employees. Hence, it addresses the call by Cafferkey et al. (2019) to move away from universal HR as a route to positive employee outcomes. By exploring the impact of furlough on the work experiences of affected individuals, we facilitate a more accurate reflection of organizational reality (see also Kinnie et al., 2005) particularly in an unstable and dangerous business environment (Shehzad et al., 2020).

LITERATURE REVIEW

In light of the significant gap in the existing literature regarding the effects of furlough in the times of Covid-19, we can build on some of the existing research investigating employee behaviors during times of crisis (e.g., Adkins et al., 2001; Stoker et al., 2019) or cutbacks (Robinson and Rousseau, 1994). For instance, Lee and Sanders (2013) argued that cutback policies challenge employees' perceptions of positive self-worth by reducing confidence in own abilities and that they decrease opportunities for self-advancement. Additionally, it was found that such reductions in organizational spending will often lead to significant decreases in employee morale (Cameron, 1994; Tselikis, 2001) and trust in their organization (Feldheim, 2007).

Despite furloughs being a cost-saving exercise that can save jobs in the long-run, they are regularly perceived as a unique form of job insecurity (Halbesleben et al., 2013). The threat of a loss of resources is often associated with higher levels of emotional exhaustion experienced by employees (Bellairs et al., 2014) which could be further strengthened when individuals are isolated from social and emotional interactions at work (Bentein et al., 2017). Such severe affective experiences negatively impact motivation and job satisfaction (Carlson et al., 2011).

Alternatively, Halbesleben et al. (2013) explains how furloughed employees may be motivated to seek resources that mitigate their experienced losses. They suggest that certain recovery experiences may mitigate the overly negative impact of furlough. However, we still do not know what exactly the impact of furlough following the Covid-19 outbreak is on individuals beyond the figures demonstrating that furloughed employees are three times more concerned about the likelihood of losing their jobs than those unaffected by furlough (Chartered Institute of Personnel Development, 2020a). Consistently, more research is needed to explore the effects of furlough on individuals to mitigate the potential damage it may bring.

Our approach to examining the impact of furlough on individual employees is based on the AMO model which implies that HR practices should improve our abilities, boost motivation, and provide opportunities to meet organizational objectives (Jiang et al., 2012). In fact, the specific HR practices focused on the abilities, motivation and opportunities have been reported as an organizational tool to best endure furloughs in the past (Bellairs et al., 2014; Baranik et al., 2019). We do not know, however, how the specific components within a model have been impacted in the wake of the current global pandemic.

METHOD

To provide a reasonable understanding of furloughed employees and their perceptions on their abilities, motivations, and opportunities and to understand how these matter to the design of the company's HR strategies, a qualitative rapid ethnography methodology was employed (Tate, 2020). The core elements included constraining the research focus and scope to one organization were furlough was introduced and using key informants. Since the logic of theoretical sampling lies in the selection of information-rich cases studied in depth (Morse and Clark, 2019), the choice of an organization currently undergoing furloughs enabled the authors to impute the theoretical aspects of the research. The second author was an HR manager in a leading air technology organization in Northern England tasked with the planning and coordination of furlough.

The methods within a rapid ethnography included onsite observations, document analysis, and 15 in-depth semi-structured interviews with furloughed employees. All participants sent on furlough were purposefully included in the sample with the exception of the four participants whose furlough was shorter than 3 weeks and who were consequently made redundant. Since the whole population of employed furloughed individuals was included in the sample, our research design facilitated the provision of comprehensive perspectives. Of the respondents, 11 were male and four were female. The average tenure was 4.5 years (shortest 1 year; longest 18.5 years). All furloughs were mandatory and resulted in 20% reduction in

salary. The average length of furlough was 5.5 months (shortest 2 months; longest 9 months).

The data collection process started in March 2020 when furlough was introduced and was complete in November 2020. The project gained ethical approval in March when the observations commenced. These observations were performed as part of the second author's everyday work. Most interviews took place between August and September. The second author contacted individual employees sent on furlough directly by email with the information about the project and an interview invitation. Potential participants were assured of confidentiality and a voluntary nature of the study. All 15 contacted individuals expressed interest in taking part. Interviews were conducted online via Teams software and lasted on average 30 min (shortest 20 min; longest 50 min). Interview questions were designed to find information on individuals' experiences of furlough with special emphasis being given to its perceived impact on their abilities, motivation, and opportunities. Each interview was recorded and transcribed verbatim. The process resulted in 225 pages of transcripts accompanied by the second author's reflexive notes.

Aligned with the rapid ethnography approach, the informal analysis commenced during the observations. Observation field notes were critically reflected on by both authors as part of an iterative process. The formal analysis of the interview material was conducted collaboratively by the two authors using Template Analysis (King, 2012). Transcripts were first inspected to account for possible mistakes by both authors. Themes were developed independently and then cross-checked ensuring inter-coder-reliability (O'Connor and Joffe, 2020). While the second author was assigned primary responsibility for creating, updating, and revising the codes (Guest and MacQueen, 2008), both authors engaged in intensive discussions to reach a consensus on the final coding template during documented team meetings to increase the reliability of the study (Saldaña, 2021). Since the second author had a pre-understanding and own assumptions about the research context, she maintained a reflexive diary which is generally associated with higher quality research (Maxwell, 2012). In fact, the insider's position and prolonged engagement with the case study organization, increased the sense of an overall embeddedness and awareness of the studied context and thus increased the validity of the study (Morse et al., 2002). To minimize the potential negative impact of the first author's position and further improve the validity of the study, we engaged in peer debriefing (Maxwell, 2013) and conducted member checks with a fifth of respondents (Caretta, 2016).

RESULTS

Effect of Furlough on Employee Perceptions of Abilities

One's skillset was perceived as a determining factor when selecting employees to be furloughed. For instance, Participant I suggested "*X worked a lot quicker than me and knew more than me when it came down to customer queries so they chose her to stay in work*." It was commonly reported that colleagues who were not sent on furlough had more skills and abilities ("*I knew the admin side but he also knew how to build the KITS in the warehouse*," Employee J) and were therefore more "*needed*" (Employee F).

A further theme that emerged within the study suggested that personal circumstances such as health or childcare provisions can affect the way in which one's abilities to complete work are perceived by employees themselves:

> "*Because I had nowhere for the kids as the schools closed I was stressed about how I was going to manage juggling it all, especially if I would have been working from home*"—Employee M

Lack of childcare as a result of Covid-19 lockdown restrictions, affected employee M's ability to carry out her day to day role. This, in fact, was a common theme in the UK, where 67% of keyworkers were forced to reduce working hours due to lack of childcare (Office for National Statistics, 2020). Indeed, working mothers were described as the "sacrificial lambs of the coronavirus pandemic" (Topping, 2020). Struggling with the increased demands of working from home alongside childcare may negatively impact on one's abilities to complete the job in contrast to those without caring responsibilities and thus further enhances the gap between those two groups (Kelly and Senior, 2020). Indeed, 52% of working mothers surveyed in July 2020 perceived they were treated negatively by their employer, due to lack of childcare during Covid-19 (Howlett, 2020).

Another theme that emerged along with the interview progress was participants undertaking proactive forms of learning and development whilst furloughed. For instance, Employee A said he "*read up on a few manuals to kill time and make sure I was up-to-date when it was time to come back*" and Employee O suggested that "*our industry is always changing so it was a chance to make sure I was up to date*."

Interestingly, some participants admitted that they self-sought training and development whilst furloughed to enhance their skillset should they need to seek alternative employment ("*it is something extra on my CV should things get worse here and we have job cuts*," Employee A). Employee N, for instance, diversified his skillset by completing training in alternative field as a response to upcoming potential lockdowns or redundancies:

> "*I have done CAD training already but if we go into a full lockdown again it's something you can do from home, or if I needed to change career completely I have it as a back-up*"—Employee N

Existing literature promotes the benefits of learning and development opportunities for both employers and employees (Chartered Institute of Personnel Development, 2020b) and it was apparent that participants within the study recognized the importance of obtaining new qualifications in an attempt to increase their human capital within their organization but also to increase employability externally.

Effect of Furlough on Employee Perceptions of Motivation

The effect of furlough on individuals' perceived motivation was reported to be mixed. On the one hand, several

participants suggested that their perceptions of job security had been negatively affected due to furlough. For instance, in comparison to non-furloughed employees, research participants "*felt replaceable*" (Employee L) and indicated that the risk of redundancy had increased for them as a result of being furloughed:

> *"I did think that if I stayed off too long you might have coped without me so if it came down to it, I would be the one to go (redundancy) rather than one of the other lads"*—Employee A

In addition to the above comment, participants regularly highlighted that the risk of redundancy was increased as furloughed employees would not have the required knowledge or opportunities that employees remaining within the workplace had gained during this time. This suggests that furlough may negatively impact *abilities, opportunities, and motivation* simultaneously. This is in line with the existing literature pointing out to the interactive and overlapping nature of the three elements of AMO (Kellner et al., 2016).

Increased feelings of job insecurity resulting from being furloughed link back to the existing literature which suggests that job insecurity is a stressor which negatively impacts behaviors and motivation of employees displayed through decreased job satisfaction and increased intention to leave the organization (Blyton and Bacon, 2001). Consistently, the sense of powerlessness and uncertainty as a result of Covid-19 pandemic and furlough could have enhanced the threat of job insecurity with these furloughed participants.

The salary reduction associated with furlough was a further theme that emerged in the data analysis. While individuals who were furloughed incurred a 20% loss of earnings, only participants considered to be in lower-paid roles commented how severely they were impacted by the salary reduction. For instance, Employee C commented:

> *"I did start to worry about how long I could manage (financially) or when I was going to be coming back in, I think one of the hardest parts is when you don't know if you will be back in this month or not"*—Employee C

Existing research suggests that salary reductions will be particularly demotivating for individuals in lower-paid roles (Kahneman and Deaton, 2010). In line with this line of inquiry, we found that for those in higher-skilled and better paid roles, reduction in pay did not appear to affect them as much as they anticipated. In fact, participants with health problems and on statutory sick leave, ended up with higher payments when furloughed. This was reported to make them feel "*extremely relieved*" (Employee A) and pointed out to the positive effect of furlough.

A potential lack of a negative impact on participants' perceived motivation may be further related to all interviewees being clear on the reasons for furloughing staff and perceiving this more positively than job cuts: "*A lot of places were just laying off. So I was glad that furlough was even an option*" (Employee F). Employee G provided a more detailed explanation where he suggested that being sent on furlough was presented by an organization as an opportunity to contribute to organizational cost-saving activities and to protect the roles of others:

> *"I took it that it was a good thing as when I was told about me being furloughed it was like I was doing a good thing for the company, helping out (…) I was helping because I was in a role where I could be furloughed so they could make those cost savings, I was protecting people in roles that couldn't (be furloughed)"*—Employee G

Participants who did not raise concerns regarding job security due to furlough further revealed that they were communicated the financial position of the organization either during their initial consultation or whilst furloughed:

> *"When I was told that we had won this contract, it made me less worried as financially that was good for us, for the organization. There was also a note from a managing director appreciating everyone's contributions to winning this project, including the furloughed staff"—Employee K*

It appears that framing the decision to send a specific individual on furlough by emphasizing their important role in what is seen as a cost-saving exercise and clearly communicating the financial position of the business could have reduced the perceived threat of redundancies and thus positively impacted the participants' views of job security and their motivation.

Effect of Furlough on Employee Perceptions of Opportunity

Participants reported that while on furlough they had opportunities to voice their views through informal discussions with colleagues and approaching line managers. They all confirmed they remained in contact with at least one other employee. Most of the participants stated they received at least two telephone updates from their line manager with updates on the likelihood of furlough continuing. Employee K commented:

> *"I knew what was going on from my team. I then got updates about potential return dates from my manager. Also, because I received the newsletter, I felt more included as I knew what was going on"*—Employee K

Adequate opportunities to participate in organizational life and take an active role raising concerns or providing suggestions were further found to have a positive impact on participants' commitment to the organization during times of uncertainty. While four participants acknowledged they had searched for employment while on furlough to evaluate the current labor market and to assess what type of industry vacancies were available, the majority of participants did not look at alternative employment options despite insecure job environment. It is these employees who emphasized how satisfied they were with the level of contact they received whilst furloughed.

Participants' commitment to the organization during times of uncertainty could be explained through the lens of the social exchange theory (Cropanzano et al., 2017). It suggests

that providing employees with the opportunities to participate in organizational life through increased communication results in increased organizational commitment due to perceptions of favorable treatment (Morales-Sánchez and Pasamar, 2019). This appears particularly relevant in the times when "the routine" (Employee L) and "people side and interaction" (Employee K) were generally reported to be lost as a result of furlough. As succinctly illustrated below, the most direct effect on furlough appears to be the lost opportunity to engage in every-day work and the social element of this:

> *"I miss working, getting on sites, and the fun bits like seeing people at work. I can't come into the office so I'm losing social time too"*—Employee G

DISCUSSION

The aim of this study was to explore the impact of furlough on employee's perceptions of their abilities, motivations, and opportunities. In line with the existing literature that presents furloughs as a job saving action (Lee and Sanders, 2013) superior to other cutback options (Green, 2010), this study revealed furlough was relatively positively received as a cost-saving exercise. It was reported that furlough opened up new opportunities for proactive up-skilling and exploring new employment opportunities. This is in contrast to most recent statistics suggesting that, in the times of pandemics, nearly a third of UK workers lack confidence in their abilities and how these can be transferred to different sectors (Donnelly, 2021). Importantly, furlough was still reported by our research participants as a threat to job security and concerns of being at an increased risk of redundancy as a direct result of being furloughed were raised. This finding aligns with the existing research suggesting that the threat of furlough and associated risks of losing one's job creates demands of employees that can result in increased feelings of strain (Halbesleben et al., 2013; El Keshky et al., 2020). We also found that absence from workplace as a result of being furloughed may lead to perceptions of missing out on opportunities to develop oneself and one's abilities. This finding should be considered in the light of research suggesting that individuals can mitigate the experienced resource loss through recovery experiences (Sonnentag, 2001). Finally, we found that potentially negative effects of furlough on employees' perceptions of ability, motivation and opportunity were at least partly alleviated when employers maintained regular communication with those on furlough and assured them of the value they bring to the organization. This is aligned with the existing research suggesting that when employees view the process of furlough as egalitarian and appropriate, they feel fortunate to preserve their positions and remain loyal to the organization (see Lee and Sanders, 2013).

Theoretically, the reported research contributed toward the existing lacuna of knowledge on the factors that influence employee perceptions of their abilities, motivations, and opportunities as a result of furlough and in the times of uncertainty (Davies, 2020). More specifically, existing limited research in this area focused on unpaid mandatory furlough of varied duration and more *ad-hoc* nature to combat the effects of global financial crisis (Halbesleben et al., 2013; Lee and Sanders, 2013). We extend this line of research to include furlough and its effects in a novel context. Secondly, since furloughs are considered as time away from work (Halbesleben et al., 2013), our research further extends the existing line of inquiry that suggests such time alleviates workplace stressors and enhances employee well-being (Sonnentag, 2005). Contrary to these common assumptions, our findings suggest that furlough is an exceptional time away from work–while it brings opportunities to develop oneself, it is also perceived more negatively as a threat to one's job security.

Practically, our findings suggest that an effective consultation clarifying the rationale for furlough and why employees had been selected will positively impact perceptions of fairness. Additionally, clarifying the financial position and length of expected furlough is likely to alleviate the potentially negative impact of furlough on one's motivation through the decreased feelings of uncertainty. We further recommend flexible furlough utilization, i.e., encouraging employers to rotate employees on furlough. This flexibility not only provides benefits to mental health and decreases the time spent away from the organization, but it also alleviates concerns regarding the negative impact on employee opportunities. As the impact of reduction in pay was found to negatively impact low paid workers disproportionally to their colleagues, organizations can discuss furlough with employees and, where possible, request furlough volunteers who would perceive the decision positively. Circumstances which are likely to negatively impact employees such as lack of childcare or those who would otherwise be required to self-isolate should also be considered. Finally, we found that furloughed individuals often considered their skills to be inferior to the skills of their non-furloughed colleagues. This may lead to low self-esteem and confidence problems (Shack et al., 2018) which, if not addressed, may influence overall organizational climate by diving the workforce and negatively affecting their relationships (Szulc, 2020). Consistently, employers may consider implementing return-to-work interviews where employee's value and contribution to the organization is emphasized.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Our research was limited to a small sample and the UK context and does not allow for generalizations. However, qualitative approach provided us with some in-depth contextual information that moved beyond a simple set of variables and emphasized the importance of context when proposing explanations. This research can therefore act as a pilot, preliminary study to future research testing the proposed findings in larger scale samples, across industries and geographic countries. Additionally, since a second author is an HR professional in the studied company, issues of neutrality in the data collection process may arise. To minimize the risk, we engaged in a number of strategies including maintaining a

reflexive diary, peer debriefing, and member checks (described in detail in a Method section). We hope that such strategies, in fact, increased the sense of an overall embeddedness and awareness of the studied context and eventually improved the validity of the study. Further research activity in this area should considerably contribute toward preventing long-lasting emotional trauma and disturbance to the psychological well-being of employees and toward creating sustainable development for well-being in organizations (see Safraz et al., 2020).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Huddersfield, Business School Research Ethics Committee (BSREC). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JS: introduction, analysis, methodology, discussion, revising work, and proofreading. RS: data collection, analysis, and results. All authors contributed to the article and approved the submitted version.

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Assessing the Importance of Psychosocial Factors Associated With Sustainable Organizational Development During COVID-19

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Involvement in sustainable development is a voluntary activity. Organizations apply the principles of sustainable development only when they identify several benefits. These benefits are identified, especially with the financial ones. The involvement of organizations in sustainable organizations has different intensity levels. These intensity levels are influenced by psychosocial factors (PF), attitudes toward organizational risks, and organizational and urban policies. The present paper identifies the key psychological factors involved in applying organizational sustainability principles within organizations. For this research, five groups were created for in-depth interviews with key people from Romania's innovative companies. To identify the importance of the framework analysis factors, the Delphi method was used, in which 20 experts from different fields of activity were involved. Following the rounds involved in the Delphi method, the ranking of PF on four levels of importance was accepted, based on planned behavior and reasoned action theory. These levels were correlated with the intensity levels of involvement in sustainable development. The entire market study was conducted during COVID-19, which significantly impacted specific directions. As a result, it could be observed that motivation, learning attitude, behavior, and intention to take precedence are essential in the organizational sustainability approach.

Keywords: sustainability, innovation, shareholder, theory of planned behavior, motivation, attitude, behavior, COVID-19

INTRODUCTION

Sustainability means that a company can secure its long-term resources, anticipate its future needs, and use resources efficiently and fairly in organizational activities. This is a reference definition, developed in 1987 by Norwegian Prime Minister Gro Harlem Brundtland in the report entitled "Our Common Future," prepared by the United Nations World Commission on Environment and Development. Sustainability does not only mean ecology, it also means achieving a balance between the three responsibilities: economic, social, and environmental. These responsibilities are

embedded in most existing definitions in the literature, where there are several concerns for social equity and economic development (Horn et al., 2012; Noone et al., 2018; Pislaru et al., 2019).

Involvement in sustainable development differs from one company to another. Some of the companies are heavily involved, with several benefits. Other companies get involved for specific criteria they want to achieve (requiring employees to report their sustainability or have an adequate environmental footprint). It can be seen that in the manufacturing industry (Labuschagne et al., 2005; Jayal et al., 2010; Hesselbach and Herrmann, 2011; Mani et al., 2014; Ford and Despeisse, 2016; Kayikci, 2018), the implications are numerous. Over the years, this industry has shown an increasing evolution from involvement. The construction sector (Naik, 2008; Abidin, 2009; Marhani et al., 2012; Yılmaz and Bakı, 2015; Molavi and Barral, 2016; Kamali and Hewage, 2017) has many implications. Within this sector, the implications refer to buildings' energy efficiency and the use of adequate construction materials. The electricity and heat sector, gas, hot water, and air conditioning are making considerable progress in sustainability principles (Oparaocha and Dutta, 2011; Sinclair et al., 2015; Dincer and Acar, 2017; Kveselis et al., 2017). Here, steps are being taken to reduce greenhouse gasses generated in the atmosphere. They began to use innovative technologies that consider consumer-dependent factors (Blevis, 2007; Barquet et al., 2016; Lal, 2016; Arfini et al., 2019). Studies conducted in the machine-building industry have highlighted the need to investigate psychosocial factors (PF) to increase the level of involvement in OS. Factors are mentioned as motivation and attitude (Cioca et al., 2015). The transport sector is also making progress due to new technologies used in vehicle manufacturing (Richardson, 2005; Steg and Gifford, 2005; Anderton, 2010; Yigitcanlar and Dur, 2010). Pollution norms contribute to reducing the level of greenhouse gasses and fuel efficiency. In this way, combined with driver-dependent factors, efficient use of resources in the field of transport (Steg and Gifford, 2005; Anderton, 2010; Cruijssen, 2020). It can be seen that the implications of organizations in different fields are numerous (Al-Mulali and Ozturk, 2015; Apergis and Ozturk, 2015; Farhani and Ozturk, 2015; Ozturk, 2017). The involvement of organizations in this voluntary approach depends on several factors. These factors include psychological factors, social factors, economic factors, technological factors, and other factors. Psychological factors are considered some of the most important, especially when it comes to the entry barrier. Among the social factors that contribute to the success of adopting approaches for sustainability are perception, motivation, learning, attitudes, beliefs, self-efficacy, culture, and others (Abdullah et al., 2017, 2018; Sarfraz et al., 2018a,b). Being a voluntary approach, the social factors' approach presents a necessity in successfully implementing the principles of sustainability (Bocken et al., 2014; Eccles et al., 2014; Adloff, 2019).

The benefits involved in the organizational sustainability are diverse and multiple. First of all, there can be an improvement in financial results. These benefits are most attractive to organizations. Also, the following can be achieved: efficiency of processes and activities, increasing the level of innovation, reducing the carbon footprint and water, waste management, growing capacity of globalization, improving employee skills, strengthening work teams, aligning with global requirements, attracting new business partners, identifying new organizational opportunities, fulfilling an international vision, improving the image, and others (Apergis and Ozturk, 2015; Ivascu, 2020).

Several studies emphasize the need to identify PF. Identifying these factors can contribute to an accentuation of their treatment to intensify the involvement of organizations in organizational sustainability (Ivascu, 2020). There are several studies on organizational sustainability in Romania, but studies on PF are very few. These existing studies target the industry with a few limitations. Therefore, we have identified a need for a national study to help organizations identify and improve their PF for OS. In this variant, the organizational implications in sustainability can be intensified, and the organizations can increase their level of innovation (Cioca et al., 2015; Ivascu, 2020).

This research aims to identify PF at the level of organizations in Romania and improve the level of intensity of organizations for involvement in organizational sustainability. These intensity levels are influenced by PF, attitudes toward organizational risks, and organizational and urban policies. This study can be customized for specific activity fields or branches of activity. This study can be customized for specific activity fields or branches of activity and represents a pillar in intensifying the levels of the organization. Based on a transdisciplinary approach, the applied methodology allows the generation of a nuanced interpretation of problematic implications. It addresses the gaps in psychology that apply to sustainable organizational development. It enhances organizations' innovation. In-depth interviews were analyzed with framework analyses. The paper begins with the presentation of the essential research in sustainability. It continues with the importance of innovation and involvement in OS, matrix presentation of factors identified in interviews, and developing the logic of intensity levels developed due to applying the Delphi method. Finally, the main elements found are presented. The conclusions refer to the practical and academic contributions within this organizational sustainability field.

LITERATURE REVIEW

Involvement in sustainability involves innovative approaches that develop several benefits for the organization. One cannot discuss sustainability without innovation and vice versa. It is a two-way relationship that supports PF for organizational involvement. Given this relationship, the chapter is structured on the following directions: the presentation of organizational sustainability, the importance of innovation for sustainability, and organizational theories applicable in companies (Linnenluecke and Griffiths, 2010; Liu et al., 2015).

Sustainable Organization

Sustainability and sustainable development as concepts have gone through different development stages since their introduction. The historical development of the concept has taken place at various conferences, within organizations and institutions,

which are currently concerned with implementing the principles, goals, and objectives of sustainable development. The concept of sustainable development has known various criticisms and interpretations over time, being accepted in various activity fields (Sadiq et al., 2020). In its development, the concept has adapted to a complex global environment's contemporary requirements. Still, the basic principles and objectives, as well as the problems of their implementation, have remained almost unchanged. However, some goals have been updated, and new goals have been set since 2015. These goals are united in the 2030 Agenda, which outlines the challenges that humanity must meet for sustainable development, but also to survive on the planet (Choong and McKay, 2014; Erdmann Hilty et al., 2004; Ma et al., 2014; Honda, 2020).

In the 18th century, economic theorists, such as Adam Smith, pointed out organizational development problems. In the 19th century, Karl Marx and the classical economists Malthus, Ricardo, and Mill argued for certain sustainable development elements. In contrast, economic theory Neoclassical stressed the importance of pure air, water, and renewable resources (fossil fuels, ores), as well as the need for government intervention in extraordinary cases. Previous periods have dominated economic doctrine dominance, emphasizing human capital as a natural resource pilot (Smith et al., 2010; Tainter, 2011; Strathern and Stewart, 2018).

The term "sustainable development" was initially introduced in forestry and included afforestation measures for interconnected forests, which should not undermine forests' biological renewal. This term was first mentioned in the International Union for Conservation of Nature (IUCN) Strategy for Nature and Natural Resources (IUCN), published [International Union for Conservation of Nature (IUCN) (2020)].

Sustainable development actions target 17 objectives (SDGs) and 169 targets (Lim et al., 2016; Pradhan et al., 2017; Schroeder et al., 2019). The companies partially aim at these objectives included in the 2030 Agenda. By evaluating the 17 objectives and the PF that influence the organizational implications, the authors perform an analysis presented in **Table 1**.

The Importance of Innovation for Organizational Sustainability

Innovation has a vital role in the current dynamics of the business environment. Innovative organizations aim at a series of objectives and targets of sustainable development. At the level of Romania, innovative enterprises' situation is presented in **Table 2** (National Institute of Statistics, 2020). It can be seen that the manufacturing industry and services present innovative enterprises for the analyzed period.

From the perspective of innovators in the analyzed period 2015–2019, in Romania, the situation is presented in **Table 3**. Product and process innovators are among the first to innovate. At the same time, innovative business processes innovate and are in a favorable position. The number of innovators has increased to 4,198 in 2020 (National Institute of Statistics, 2020).

From the perspective of size, the situation is presented in **Table 4**. It can be seen that small enterprises register the most crucial level of innovation. Medium-sized enterprises follow them. The industry has an essential impact on innovation's perspective (National Institute of Statistics, 2020).

Table 5 presents the share of enterprises with organizational innovation in the main activity fields. The manufacturing industry holds a vital percentage, followed by the production and supply of electricity and heat, gas, hot water, air conditioning, and services. The whole situation is presented below (National Institute of Statistics, 2020).

Organizational Theories Applicable to the Present Research

The theory of Reasoned Action (TRA or ToRA) was developed by Martin Fishbein and Icek Ajzen, an improvement in information integration theory (Fishbein and Ajzen, 1975, 2010; Hill et al., 1977), a cognitive theory that presents a conceptual framework for understanding human behavior in different situations. This theory helps explain individuals' behavior and involvement in various activities or decision-making situations. Behavioral intention (BI) is created or caused by two factors: attitudes (what is expected to be done and motivation) and subjective norms (SN) (strengthening the normative faith and persuasive objectives) (Madden et al., 1992; Lada et al., 2009; Trafimow, 2009; Rossmann, 2011; Hale et al., 2002). It is an extension of TRA, and the main component of this model is behavioral intent. Individual attitudes and subjective risk assessment influence these BIs. TPB consists of six constructions: attitudes, BI, SN, social norms, perceived power, and perceived behavioral control (Ajzen, 1985, 1991, 2012; Rizzo and Columna, 2020).

METHODOLOGY

The research methodology is qualitative and transdisciplinary based on the experts' empirical experience in sustainability. Below are the details of each step applied in the research presented. The entire research was carried out during (and has faced the impact of) the COVID-19 period, March–November 2020, when most of the organizational activities were carried out through telework. The companies involved in the present research are in categories A–S (presented in **Appendix 1**). The methods selected for this research have several advantages based on research. During this period of applying this study's methods, a large part of the subjects involved in the study worked in telework. For each method used, the advantages are presented.

In-Depth Interviews

This research method is a qualitative one and involves direct contact with each participant. In-depth interviews are used to collect data because they have several advantages, especially during the COVID-19 period. These advantages include the following: sensitive topics can record complex and clear answers, subjects will feel comfortable and answer all questions, key topics can be researched and can be returned to at any time, it is a superior quality for sampling, the number of respondents does not have to

TABLE 1 | Evaluation of the 17 SDGs and psychosocial factors.

Goal	Short description	Implications of psychosocial factors
SDG 1	Eradicate poverty in all its forms	Perception (P), motivation (M), learning (L), perceived behavior control (CPB), attitude (A), belief (B), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 2	Food safety and sustainable agriculture	subjective norms (SN), the perceived power of the approach (PPA), behavioral intention (BI), norms especially applicable to the field (NSAF), perceived power of approach (PPA), and subjective norms (SN)
SDG 3	Healthy life at all ages	Perception (P), motivation (M), learning (L), perceived behavior control (CPB), attitude (A), belief (B), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 4	Lifelong learning	Perception (P), motivation (M), learning (L), perceived behavior control (CPB), attitude (A), belief (B), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 5	Equality between women and men	Subjective norms (SN), the perceived power of the approach (PPA), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 6	Sustainable water management and sanitation for all	Perception (P), motivation (M), learning (L), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 7	Affordable prices and sustainable resources	Subjective norms (SN), the perceived power of the approach (PPA), attitude (A), belief (B), and norms applicable to the field (NSAF)
SDG 8	Promoting economic growth, productive and decent work	Norms applicable to the field (NSAF), behavioral intent (BI), attitude (A), and belief (B)
SDG 9	Promoting industrialization and stimulating innovation	Perception (P), motivation (M), learning (L), perceived behavior control (CPB), attitude (A), belief (B), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 10	Reducing inequalities between countries	norms applicable to the field (NSAF) and behavioral intent (BI)
SDG 11	Developing secure living environments	Attitude (A), belief (B), and norms applicable to the field (NSAF)
SDG 12	Sustainable consumption and efficient production	Perception (P), motivation (M), learning (L), and behavioral intent (BI)
SDG 13	Urgent action to combat climate change	Subjective norms (SN), the perceived power of the approach (PPA), perception (P), motivation (M), and learning (L)
SDG 14	Sustainable use of marine resources	Perception (P), motivation (M), learning (L), and behavioral intent (BI)
SDG 15	Restoration of terrestrial ecosystems	Subjective norms (SN), the perceived power of the approach (PPA), perception (P), motivation (M), learning (L), norms applicable to the field (NSAF), and behavioral intent (BI)
SDG 16	Responsibility of society and equity of institutional levels	Behavioral intent (BI), subjective norms (SN), the perceived power of the approach (PPA), perception (P), motivation (M), and learning (L)
SDG 17	Partnerships for the goals	Subjective norms (SN), the perceived power of the approach (PPA), norms applicable to the field (NSAF), and behavioral intent (BI)

TABLE 2 | The situation of innovative enterprises in Romania (National Institute of Statistics, 2020).

Activities	Year				
	2015	2016	2017	2018	2019
	Number	Number	Number	Number	Number
Total	8,116	5,968	3,645	2,925	4,198
Industry	4,439	3,415	1,843	1,493	2,298
Extractive industry	61	45	21	2	13
Manufacturing industry	4,143	3,200	1,754	1,455	2,176
Production and supply of electricity and heat, gas, hot water, and air conditioning	71	58	26	11	37
Water distribution, sanitation, waste management, decontamination activities	164	112	42	25	72
Services	3,677	2,553	1,802	1,432	1,900

be very large to obtain remarkable and relevant results, there is no possibility of pressure from participants, interviewers can monitor the tone and words used by participants, and the degree of focus on the topics is higher (Guest et al., 2006; Longhurst, 2009; Campbell et al., 2013; Adams and Cox, 2016).

To conclude this initial research, five working groups were set up. In the five working groups, 150 interviewees from Romanian organizations apply sustainability principles in their operations. An expert in organizational sustainability interviewed each working group. This helped to avoid the loss of essential data. Among the advantages of this method are the following: collecting a large amount of data, the information obtained is qualified and conclusive, and coordinating the interviews in the intended direction. For in-depth interviews, 10 common questions and five different questions were established for each working group. The structure of these questions is presented in **Table 6**. The five different questions were established by the experts used in the application of the Delphi method. These questions were developed according

TABLE 3 | Types of innovators in Romania (National Institute of Statistics, 2020).

Types of innovators	Year						
	2015	2016	2017	2018	2019	2020	2020
	Number	Number	Number	Number	Number	Number	Procent
Total	3,983	3,763	1,806	1,840	1,556	4,198	100
Product innovators only	582	635	351	313	430	486	11.58
Process innovators only	413	955	706	511	478	600	14.30
Only business process innovators	–	–	–	–	–	1,281	30.51
Product and process innovators	2,968	2,041	634	705	518	1,250	29.78
Only product innovators and business processes	–	–	–	–	–	507	12.08
Innovators with unfinished and or abandoned activities	20	132	115	311	130	68	1.62
Enterprises without innovation, but with abandoned/suspended or ongoing innovation activities	–	–	–	–	–	6	0.14

TABLE 4 | The situation of innovative enterprises by size classes (National Institute of Statistics, 2020).

Size classes and economic activities	Year					
	2015	2016	2017	2018	2019	2015
	Number	Number	Number	Number	Number	Number
Total	3,983	3,763	1,806	1,840	1,556	4,198
Small	2,137	2,386	1,034	1,258	1,030	3,022
Medium sized	1,183	936	506	371	373	825
Big sized	663	441	266	211	153	351
Industry	2,907	2,381	1,141	937	858	2,298
Services	1,076	1,382	665	903	698	1,900

TABLE 5 | Percentage of enterprises with organizational innovation by activities (National Institute of Statistics, 2020).

Activities	Year				
	2015	2016	2017	2018	2019
	Percent	Percent	Percent	Percent	Percent
Total	20.8	18.4	14.1	6.7	5.8
Industry	20.5	17	15.3	6.7	6.2
Extractive industry	18.5	12.7	10	4.9	0.6
Manufacturing industry	20.5	16.9	15.6	6.9	6.7
Production and supply of electricity and heat, gas, hot water, and air conditioning	23.8	32.1	20.9	8.3	2.4
Water distribution, sanitation, waste management, and decontamination activities	20.4	16.9	11.3	3.2	1.2
Services	21.2	20.1	12.8	6.7	5.3

to the companies' particularities of activity that constitute each working group.

Delphi Method

The Delphi method involves a structured communication method that applies to a group of experts through the synchronous communication method. These experts evaluate the reports generated in several rounds of decisions until all experts agree with the variant generated. The method generates a final report of the decisions accepted by all experts. The Delphi method has several advantages, given in the present study. These advantages include the following: participants can be found anywhere in the world, a quick consensus of those discussed is obtained, it covers a wide range of expertise, avoids long interpretations and discussions, the predicted questions are specific and have predetermined answers, and you get a final report agreed by all experts during the study (Linstone and Turoff et al., 1976; Gordon and Pease, 2006; Botterill and Platenkamp, 2014; Chalmers and Armour, 2019; Humphrey-Murto et al., 2020). Find involved

TABLE 6 | The structure of in-depth interviews.

Workgroup	Questions used
Groups 1, 2, 3, 4, and 5 (common questions)	General questions regarding SO (implications on the Economic, Social, and Environmental Dimensions). Examples: When was the last sustainability report? What are the SDGs targeted by the organization?
Group 1	Fundamental concepts in innovation Example: What are the latest technologies implemented?
Group 2	Fundamental concepts related to behavioral theories (TPB and TRA) Example: How important is the person's temperament in charge of OS?
Group 3	Questions regarding product innovation by industry categories in the fields of activity A–S Examples: Do you appreciate the level of innovation in the industry? What are the national factors that contribute to increasing the industry's level of innovation?
Group 4	Questions regarding process innovation in the fields of activity A–S Examples: Do you appreciate the level of innovation in the field? Characterize the field with a sentence.
Group 5	Questions regarding the innovation of business processes in the fields of activity A–S Example: Define the organization's business processes in terms of innovation.

TABLE 7 | The structure of the experts involved in the application of the Delphi method.

Expert typology	Field of activity and action
Expert group 1	Experts with knowledge in innovation and sustainability in the industry Fields of activity: automotive, textiles, metallurgy, electrical appliances, furniture, waste recovery, etc.
Expert group 2	Experts with knowledge in innovation and sustainability from medium-sized enterprises Field of activity: textiles, furniture, commerce, education, transport, and others.
Expert group 3	Experts with knowledge of innovation and sustainability in small businesses Field of activity: textiles, furniture, commerce, small production, and others.
Expert group 4	Experts with knowledge in innovation and sustainability from large enterprises Field of activity: automotive, textiles, metallurgy, waste management, transport, and others.
Expert group 5	Experts with knowledge in innovation and sustainability in services Field of activity: distribution, consulting, event organization, provision of information technology services, programming, and others.

experts who consider that the final report is an adequate one and contains vital information for the targeted field. In the present research, 20 experts from the critical sustainability and innovation fields were involved. The expertise and their fields of action are presented in **Table 7**. The division of experts into groups was made according to the enterprises' size involved in innovation.

The scheme of applying the Delphi method is presented in **Figure 1**. It can be seen in the proposed logical scheme that five rounds of in-depth discussions were held with experts in the field of SD and innovation to assess the levels of importance of PF identified and to achieve hierarchy and their correlation.

Market Research and the Investigated Sample

The market research was conducted during COVID-19, March–November 2020. Given this period's specifics, the study was conducted by the asynchronous method using online video conferencing platforms.

The investigated sample consisted of 150 representatives of companies with solid knowledge of innovation and sustainable development. The sampling was randomly applied to a group of 500 possible participants (organizations identified participants). The companies' fields of activity are in the fields of A–S (presented in **Appendix 1**). The five working groups were formed by random sampling, presented in **Table 8**. In each group, 30 individuals were involved with solid knowledge in organizational sustainability. The five groups' structure emphasizes that Romania's essential fields of activity have been covered. The working groups' structure was established based on the types of innovators evaluated for 2015–2019 and following the fields of activity presented in **Appendix 1**. These classifications are provided by the Romanian legislation, called nomenclature of activities. The working groups were correlated with the associated questions' structure because for each working group, five personalized questions were used. Each group presents the percentages of the five most essential activity fields present.

RESULTS

Below are the PF identified in the market research and contribute to organizational involvement in sustainable development.

Identifying Psychosocial Factors for Sustainable Development

Following in-depth interviews with the five groups of interviewees, the following data were obtained to identify PF that contribute to addressing sustainability in various activity fields. Each group was interviewed using the 10 general questions and the five personalized ones. Following these factors' application, a series of PF were identified based on the framework analyses, following the analysis of the obtained data and the correlation with the framework analyses. The percent of the innovators obtained from the tabular situation of the types of innovators in the period 2015–2019 in Romania and the situation presented in **Table 9** highlight the following factors: learning (L), perceived behavior control (CPB), attitude (A), belief (B), norms applicable to the field (NSAF), behavioral intent (BI), SN, the perceived power of the approach (PPA), BI, and SN.

For innovative products in the fields of activity A–S, dimensions of the identified PF that contribute to the increase of involvement in organizational sustainability are perception, motivation, learning, CPB, attitude, belief, and rules specifically applicable to the field. Indeed, innovative

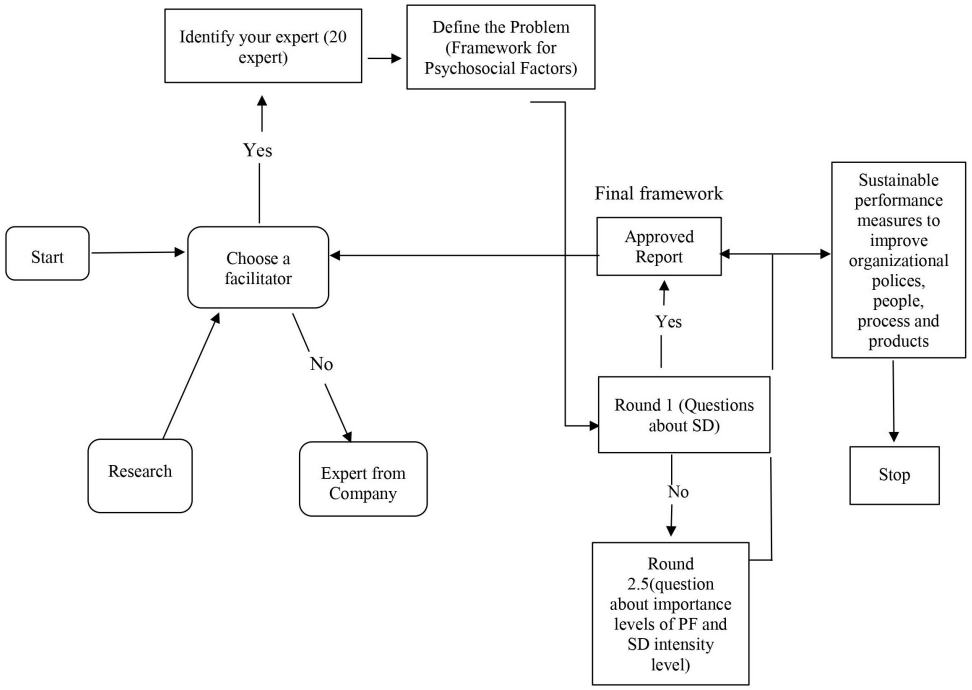

FIGURE 1 | Application of the Delphi method in the present research.

TABLE 8 | Working group structure.

Working groups	Field of activity
Group 1	Product innovators only in the fields of activity A–S (25% C, 15% D, 10% E, 10 % J, 8% S, and others)
Group 2	Process innovators only in the fields of activity A–S (35% C, 30% F, 25% E, 10% J, 10% E, and others)
Group 3	Innovators only of business processes in the fields of activity A–S (30% T, 10% L, 10% N, 10% P, 10% P, and others)
Group 4	Product and process innovators in the fields of activity A–S (25% C, 20% E, 10% D, 10% B, 10% T, and others)
Group 5	Innovators developing in the fields of activity A–S (40% C, 30% E, 20% B, 10% J, 10% D, and others)

TABLE 9 | The situation of the identified psychosocial factors.

Psychosocial factors identified	Dimensions of the identified psychosocial factors (PF)	Percentage of innovators (PI)
Product innovators in the fields of activity A–S	Perception (P), motivation (M), learning (L), perceived behavior control (CPB), attitude (A), belief (B), and rules specifically applicable to the field (NSAF)	11.58 (PI1)
Process innovators only in the fields of activity A–S	Attitudes (A), behavioral intention (BI), subjective norms (SN), and perceived power of action (PPA)	14.30 (PI2)
Innovators only of business processes in the fields of activity A–S	motivation (M), learning (L), and belief (B)	30.51 (PI3)
Product and process innovators in the fields of activity A–S	Attitudes (A), behavioral intent (BI), subjective norms (SN), and norms especially applicable to the field (NSAF)	29.78 (PI4)
Product innovators only in the fields of activity A–S	Perceived power of approach (PPA), motivation (M), learning (L), subjective norms (SN), and conviction (B).	12.08 (PI5)

products require certain aspects of marketing. Here also intervenes the individual's behavior, which is well defined by the level factors. For process innovators only in activity A–S, the following factors were obtained: attitudes, BI, SN, and perceived power of action. Innovative processes require an adequate interpretation of SN, and PPA must have a certain intensity. A creative and new attitude defines process innovators. For innovators only of business processes in activity A–S, the dimensions identified are motivation, learning, and belief. Business processes are dynamic due to the constantly changing economic conditions. As a result, lifelong learning and motivation are essential elements. All this is corroborated with belief. For product and process innovators in activity A–S, the dimensions obtained are attitudes, behavioral intent, SN, and norms especially applicable to the field (NSAF). Process and product innovators are directed toward the business environment's dynamics, adopt the new norms, and have adequate behavior for innovative principles. Product innovators are defined by a desire for lifelong learning and increased motivation. All these

TABLE 10 | Rules established by experts involved in the Delphi method.

Level	Rules set by experts
Level I	If TPS_i 50 then $PS_i \in$ *Level*1
Level II	If TPS_i 30 and TPS_i < 50 then $PS_i \in$ *Level*2
Level III	If $TPS_i > 20$ and TPS_i < 30 then $PS_i \in$ *Level*3
Level IV	If TPS_i 12 then $PS_i \in$ *Level*4

aspects are correlated with the dynamics of activity and the power of action.

Importance Levels

The following rules agreed and developed by experts in the field were used to establish the importance of PF. The rules are presented in **Table 10**. The following assessment accepted in the Delphi rounds with experts was used to calculate importance. These levels are essential for defining the framework for improving organizational sustainability involvement's intensity. It can be seen that five important levels were obtained, which are calculated according to the total score of psychosocial factors (TPS).

$$TPS_i = \sum_{5}^{i=1} PI_i$$

where I 1…5.

THE TRANSDISCIPLINARY APPROACH OF CORRELATING THE LEVELS OF IMPORTANCE WITH THE LEVELS OF INTENSITY

Based on the multilevel approach presented previously and agreed upon by the experts of the existing fields of activity in Romania, the following pyramidal representation can be developed. The levels of importance are presented in **Table 11**.

TABLE 11 | Levels of the importance of the identified psychosocial factors.

Level	Psychosocial factors associated with the levels set by experts	Significant levels of sustainability
Level I	M, A, L, B, and BI	Complete involvement covering the three dimensions: economic, social, and environmental
Level II	SN	Above-average involvement in sustainability reporting
Level III	PPA	Partial involvement on certain dimensions
Level IV	P and CPB	Covering a dimension with an economic or environmental predominance

The logical simulation of PF' improvement is presented in **Figure 2**.

DISCUSSION AND CONCLUSION

Following the research, an image is outlined on the PF that contribute to applying the principles of sustainability within the organization. The following discussions and future directions can be outlined. The research period was COVID-19, and the participants in the investigation stressed the importance of a strong motivation for adoption and involvement in further efforts. The COVID-19 period emphasized the need for a positive attitude to identifying new organizational opportunities. For the investigation, working groups were set up according to the organization's level of innovation. The methods used in the present research, in-depth interviews, and the Delphi method were selected because they were considered effective methods for the research objectives. In-depth interviews provide concise, complex, and unambiguous results due to an expert who interviews each group.

Moreover, at the interviewed groups' level, there were no deviations from the subject of tensions. These results were input for the Delphi method, with which experts in the field were

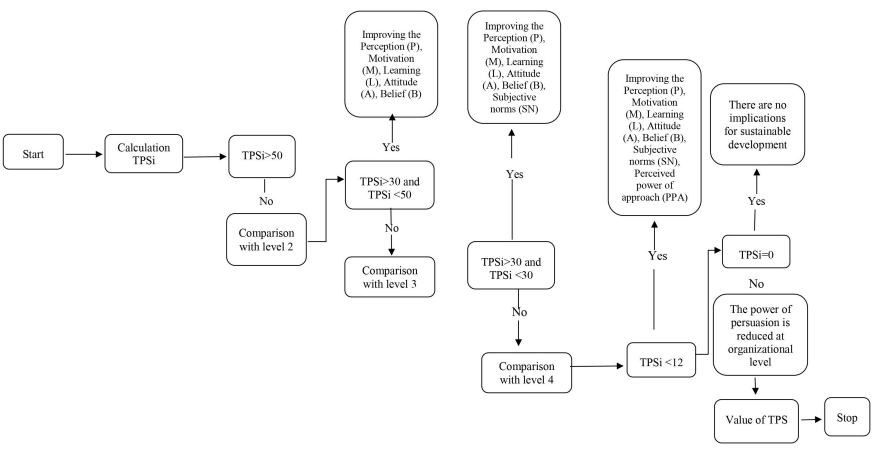

FIGURE 2 | Simulating the improvement of psychosocial factors that contribute to organizational involvement in sustainable development.

able to generate a final report on PF involved in sustainable development. The Delphi method is a method that contributes to obtaining complex results in a short time with existing participants anywhere in the world.

In Romania, product and process innovations are numerous. Small and medium-sized organizations also have a high level of innovation. Simultaneously, the industry is involved in innovation, reaching a significant percentage. These working groups answered the 10 general questions, to which 5 personalized questions were added. The 20 experts outlined the PF that contribute to applying the principles of sustainability. Existing framework analyses were used. Following the identification, the four levels of importance were defined.

All experts have agreed on these levels. Level 1 includes perception (P), motivation (M), learning (L), attitude (A), belief (B), and BI. The second level comprises SN. The third level includes the PPA. The fourth level includes control of perceived behavior (CPB) and perception (P). Improving these factors contributes to improving organizational implications in SD. Stakeholders have an important role to play in applying innovative concepts. During the COVID-19 period, stakeholders showed some restraint, and certain negative attitudes were accentuated.

Correlating the level of importance of PF with the level of intensity of involvement in organizational sustainability contributes to identifying directions that need to be improved to increase the organization's capacity to innovate and be involved in sustainability. This research covers certain gaps at the national level regarding a clear and objective identification of psychosocial factors.

The research's future directions aimed at developing customized analysis frameworks for each field of activity. These frameworks will be correlated with important levels of sustainability.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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APPENDIX 1

TABLE A1 | Active enterprises, by activities of the national economy (National Institute of Statistics, 2020).

	Year						
	2015	2016	2017	2018	2019	2020	2020
	Number	Number	Number	Number	Number	Number	Percent
Total	554,967	507,440	513,850	527,792	553,796	576,545	100
Agriculture, forestry, and fishing (A)	13,602	17,471	18,396	19,139	19,916	20,514	3.56
Extractive industry (B)	1,083	1,112	1,107	1,076	1,014	1,033	0.18
Manufacturing industry (C)	57,305	48,090	48,404	48,347	49,837	52,451	9.10
Production and supply of electricity and heat, gas, hot water, and air conditioning (D)	506	1,503	1,460	1,350	1,206	1,200	0.21
Water distribution; sanitation, waste management, decontamination activities (E)	2,366	3,160	3,049	2,968	3,022	3,074	0.53
Construction (F)	59,389	47,814	48,341	49,716	52,792	55,978	9.71
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	214,137	176,202	171,959	169,712	172,435	172,856	29.98
Transport and storage (H)	34,489	39,666	41,746	44,504	48,382	51,944	9.01
Hotels and restaurants (I)	23,653	25,111	25,497	25,612	26,414	27,182	4.71
Information and communications (J)	20,049	19,499	20,619	22,012	23,837	25,452	4.41
Financial intermediation and insurance (K)	6,840	6,903	7,244	8,225	8,220	8,461	1.47
Real estate transactions (L)	14,767	13,844	14,472	15,349	167,04	17,867	3.10
Professional, scientific, and technical activities (M)	59,181	56,886	57,812	60,324	63,350	66,739	11.58
Administrative and support service activities (N)	19,480	19,406	19,965	20,802	22,285	22,848	3.96
Education (P)	2,681	3,772	4,252	4,942	5,811	6,393	1.11
Health and social work (Q)	8,677	10,093	10,959	13,188	15,251	17,114	2.97
Entertainment, cultural, and recreational activities (R)	4,990	5,758	6,778	7,740	9,003	9,945	1.72
Other service activities (S)	11,772	11,150	11,790	12,786	14,317	15,494	2.69

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Positive Psychological Impacts of Cooking During the COVID-19 Lockdown Period: A Qualitative Study

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This study aims to explore the positive psychological effects of culinary experiences during the COVID-19 lockdown days. Qualitative research methods adopted to provide a deeper understanding. Data was collected through a structured online survey from 30 participants in Turkey. This occurred between April 10th and June 3rd, 2020 when the strict confinement measures were applied. Content analysis was deductively applied according to the Stebbins's Theory of Casual vs. Serious Leisure which classifies the well-being according to characteristics of leisure experiences. The results revealed that at the first stage people went into the kitchen with the motivation of pure happiness and relaxation indicating hedonic well-being. However, people who intended to spend time with culinary activities with the expectations of pure happiness left the kitchen with eudaimonic outcomes by gaining special skills and knowledge, self-actualization and self-enrichment. When these outcomes are evaluated based on the Stebbins's theoretical framework, culinary activities have both casual and serious leisure experience characteristics in terms of psychological well-being. It is understood that culinary activities have versatile leisure characteristics. Thanks to the culinary activities, people do not only obtain pure happiness and relaxation but can draw wider inferences about their life by realizing their own potential during the psychologically challenging COVID-19 lockdown days.

Keywords: COVID-19, psychological impact, hedonic well-being, eudaimonic well-being, leisure characteristics, cooking

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INTRODUCTION

The 21st century has already been faced with several outbreaks of viral diseases [e.g., Severe Acute Respiratory Syndrome (SARS-CoV), Middle East Respiratory Syndrome (MERS-CoV), and Ebola Hemorrhagic Fever (EHF)]; however, none of them have resulted in a collective war to save the entire human civilization. The last one emerged in late December of 2019 (Ahmed et al., 2020). A case of unknown cause was detected in Wuhan, China, which first reported to the WHO Country Office in China on December 31, 2019 (Ahmed et al., 2020; Gössling et al., 2020; Rodríguez-Rey et al., 2020). In a short time, the cases kept on rising and later confirmed to be affected by a new type

of coronavirus called COVID-19 (SARS-CoV-2) by the World Health Organization (Meng et al., 2020). By mid-March, global air travel had already transported the virus from Wuhan to all continents and was formed in 146 countries (Ahmed et al., 2020; Gössling et al., 2020). On March 11, 2020, the WHO upgraded the status of the COVID-19 outbreak which turned from an epidemic to a pandemic (Ahmed et al., 2020; Gössling et al., 2020; Rodríguez-Rey et al., 2020). The infection rate accelerated through community transmission and by the end of April confirmed cases reached approximately two million in over 200 countries. From December 31, 2019 to November 9, 2021, reported cases of COVID-19 exceeded 103 million including 2,236,453 deaths [European Centre for Disease Prevention and Control (ECDC), 2021]. Turkey, which is the sample of this research, is one of the countries to be most severely affected by the COVID-19 pandemic. Turkey is the 9th ranking in terms of the number of total cases and 18th ranking in terms of the number of total deaths among the 221 countries. As of February 08, 2021, reported cases of COVID-19 exceeded 2.5 million including 26,900 deaths and over 63,000 active cases in Turkey (Worldometers, 2021). Therefore, this unprecedented epidemic has become the top priority problem to be tackled by Turkey as well. The lack of an effective vaccine to prevent the disease and/or limited medical interventions to treat it caused countries to respond to the pandemic with some non-pharmaceutical interventions. (NPIs) including lockdown, home isolation, voluntary/required/mandatory quarantine, social distancing including vulnerable or whole populations, closing of almost all locations such as schools/universities and non-essential businesses/workplaces. This caused the canceling or postponing of events and bans on gatherings of people over specific numbers (Gössling et al., 2020; Kaplan et al., 2020). In 2020 as well as many countries in the world, Turkey applied to the partial and full-time lockdown measures involving the large part of the society between the dates of April 11, 2020 and June 3, 2020.

While this unexpected disease has caused people from all over the world to become infected with the virus and even die, it has also started to create psychological pressure on them (Rodríguez-Rey et al., 2020). It is quite understandable that such a sudden outbreak causes severe damages to the mental health of both the infected people and those who are in a close contact with them (Ahmed et al., 2020). Previous epidemiological studies about the effect of SARS and MERS epidemics revealed that the survivors have suffered depression, anxiety, negative psychological effects, panic attack, psychomotor excitement, psychotic symptoms, delirium and even suicidal tendency (Ahmed et al., 2020; Rodríguez-Rey et al., 2020). These findings are remarkably close to the COVID-19 pandemic as well. Studies on the psychological effects of COVID-19 have been conducted in many countries. These countries include China, Italy, and Spain, where the pandemic is present with the highest numbers. Of those reported some negative psychological effects ranging from moderate to severe levels such as stress, fear, anxiety, emotional reactions, depression, insomnia, vulnerability to excessive harmful alcohol use, inadequate supplies, inadequate information, financial loss, and other associated with psychological problems (Ahmed et al., 2020; Bodrud-Doza et al., 2020; Brooks et al., 2020; Cerami et al., 2020; Duan and Zhu, 2020; Meng et al., 2020; Ozamiz-Etxebarria et al., 2020; Rodríguez-Rey et al., 2020; Qiu et al., 2020; Parlapani et al., 2020; Rossi et al., 2020; Wang et al., 2020). Some of the studies conducted on people living in China explored the prevalence and risk factors of acute posttraumatic stress symptoms in participants (Liu et al., 2020; Sun et al., 2020). As a result, the anxiety and worry increasing during the process has started to turn the emotion felt as psychological pressure into psychological trauma. These mental and psychological difficulties experienced by people have visibly led to a severe psychological disorder on everyone, regardless of children, youngsters, adults, and elders. COVID-19 has resulted in self-isolation and physical distancing for millions of people (Giles and Oncescu, 2020).

The unexpected isolation due to coronavirus disease showed that leisure is important, and people can still find ways to be together (Lashua et al., 2020; Samdahl, 2020). People who had to stay at home have started to spend time with a series of daily leisure activities to keep their psychology healthy and to deal with their fear and feelings of restriction of freedom (Bond et al., 2020; Cheval et al., 2020; Easterbrook-Smith, 2020; Gammon and Ramshaw, 2020; Giles and Oncescu, 2020; Rodríguez-Rey et al., 2020; Son et al., 2020; Su et al., 2020). According to the research conducted by Rodríguez-Rey et al. (2020) in the Spanish sample, talking to someone on the phone, instant messaging or video calls, browsing or sharing social network contents, watching films or shows, watching TV, reading and practicing sports or physical exercise (48,7%) were the most frequent leisure activities. Su et al. (2020), in their study comparing Wuhan and Lombardy samples, found that the stress of individuals living in Lombardy decreased as they increased their domestic leisure recreation. Based on increasing leisure time and decreasing leisure activity opportunities, Bond et al. (2020) stated that people have been turning to generating makeshift leisure opportunities and made the "Toilet Roll Challenge" activity, which has been a trend in Twitter, their research topic. At this point, culinary activities have begun to be seen as an opportunity for many people to get away from a problem they have never encountered before. Since shopping resources are restricted, dining out is limited to only take away, people over and under a certain age are completely forbidden to go out, and hygiene is the top priority. People have started to do many things that they bought before at home. Gammon and Ramshaw (2020) stated that in the period of enforced lockdowns and social distancing, people resort to nostalgia-based leisure activities such as baking bread and making fresh pasta. Easterbrook-Smith (2020) affected by the "bake your own bread" trend on social media, prepared a publication on how bread-baking became an efficient leisure recreation activity when the coronavirus cases were getting worse. The return of these activities is classified as providing sustenance, filling newly available leisure time and offering a way to demonstrate one's skill and activities on social media.

The culinary activities, which were considered as a necessity at the beginning of COVID-19 lockdown days in the world, turned into a leisure/recreational activity over time and began to function as a tool in improving people's psychological well-being. Photos of dishes shared on social media and often tried for the first time to illustrate this fact in particular. From this

point of view, the positive effects of in-door culinary activities on the psychology of people during the mandatory COVID-19 quarantine days were investigated within the scope of well-being and leisure experience characteristics concepts. As a result, the purpose of this study is mainly twofold; (i) explore the positive psychological impacts (hedonic/eudaimonic) of culinary activities during the COVID-19 lockdown days and (ii) to discover the leisure experience characteristics (casual/serious) of culinary activities.

LITERATURE REVIEW

Well-Being and Stebbins's Theory of Casual Versus Serious Leisure

Current research on psychological well-being based on two philosophical approaches to the good life. On one hand, there is the "hedonic" approach, which expresses good life as the pursuit of "pure happiness." On the other hand, there is the "eudaimonic" approach that explains good life with concepts such as meaning, personal growth, identity building (Voigt et al., 2010). Hedonic well-being, also considered as subjective well-being, is generally measured in three dimensions as "frequent positive feeling," "infrequent negative feeling" and "life satisfaction" (Diener, 1984, 1994). On the other hand, eudaimonic well-being claims that reaching pure happiness is possible with psychological emotions that will help people reach their real capacity and make life more meaningful, rather than short-term emotions such as pleasure (Ryff, 1989). Eudaimonic well-being is mostly measured by variables such as "purpose in life," "personal growth," "self-acceptance," "environmental mastery," "autonomy" and "positive relations with others" (Ryff and Keyes, 1995; Ryff and Singer, 2008). Waterman (2005) argued that hedonic well-being will not be sufficient for the effects people perceive from activities, and that the eudaimonic perspective with outcomes such as self-determination, balance of challenge and skills, effort, and self-realization values should be considered. According to Waterman (2005), hedonic and eudaimonic well-being outputs together constitute "hedonic enjoyment" and the eudaimonic contribution of an activity alone does not make sense. Ryan and Deci's (2001) conceptualization could be more helpful to clarify the discussion of two-dimensional well-being (see **Table 1**.).

Whereas psychology in the second half of the 20th century was mainly about repairing damage and curing diseases, we nowadays find a considerable number of studies on human flourishing and developing positive qualities (Meyers et al., 2013). Few researchers explored the concepts of hedonic and eudaimonia at the activity level (Voigt et al., 2010), however, leisure and recreational experiences are considered as a valuable research topic as one of the domains that create common well-being (Uysal et al., 2016). Previous research has indicated that participation to the leisure activities is positively linked to both physical health and psychological wellbeing (Caldwell, 2005). There has been a number of precious researches done on the importance of leisure activity as a prerequisite for a healthy and happy life (Shin and You, 2013). The vast majority of the studies show that leisure vacation experiences and activities have a significant effect on both tourists' (Hunter-Jones, 2003; Gilbert and Abdullah, 2004; Pesonen and Komppula, 2010; Voigt et al., 2010; Kim et al., 2015) and residents' (Boukas and Ziakas, 2016; Rivera et al., 2016; Suess et al., 2018) life satisfaction and wellbeing (Uysal et al., 2016). Studies revealed that these significant and positive effects come into prominences in a variety of life domains such as family life, social life, leisure life, cultural life, among others (Uysal et al., 2016).

When the subject of well-being is investigated based on the leisure activities, Stebbins's "theory of casual vs. serious leisure" is one of the very first theoretical concepts that comes to mind. This theory provides a conceptual framework for leisure types based on the hedonic and eudaimonic well-being outputs. Serious leisure and casual leisure have served as two contrasting concepts for describing leisure experiences. Stebbins (1997a,b) states that the hedonic outcomes of an activity indicate casual characteristics. Accordingly, active or passive leisure activities that provide casual experience include short-term and momentary happiness, pleasure, relaxation, socialization and sensory stimulations in terms of the well-being outputs (Stebbins, 1997a, 2008). Contrary to casual leisure, serious leisure activities may provide long-term and enduring psychological benefits such as obtaining special knowledge or skills, self-actualism, self-enrichment, feeling of accomplishment, belongingness to a special world, identity building and career development (Stebbins, 1997a,b, 2008). Although Stebbins never associated the serious leisure with the concept of eudaimonic well-being directly, the characteristic of the serious leisure is in the way he describes it is quite similar with the outcomes of eudaimonic well-being of Voigt et al. (2010). This theoretical framework put forward by Stebbins has formed the basis for research in the following years. In particular, the concept of serious leisure has been the major focus of the following studies. When the studies are examined it has been shown that some research focused on the development of serious leisure scales (Gould et al., 2008; Munusturlar-Akyıldız and Argan, 2016), some studies took the elder people into the sample within the context of hobby and sports competitions (Brown et al., 2008; Heo et al., 2012, 2013; Cheng et al., 2017) and some others delved into exploring serious characteristics of sports competitions, adventure events, dance events, and sport tourism (Jones, 2000; Gibson et al., 2002;

TABLE 1 | Hedonic and eudaimonic well-being.

Hedonic well-being (Subjective well-being)	Eudaimonic well-being (Psychological well-being)
• Presence of positive mood	• Sense of control or autonomy
• Absence of negative mood	• Feeling of meaning and purpose
• Satisfaction with various domains of life	• Feeling of belongingness
• Global life satisfaction	• Social contribution
	• Competence
	• Personal expressiveness
	• Personal growth
	• Self-acceptance

Source: Ryan and Deci (2001).

Kane and Zink, 2004; Green and Jones, 2005; Brown, 2007; Dilley and Scraton, 2010).

Culinary Activities as a Tool for Well-Being

It is not possible for every leisure or recreational activity to produce useful outcomes for positive psychological well-being (Caldwell and Smith, 2006). However, "anecdotal evidence suggests that the act of cooking encourages creativity, engages the senses, provides a way to nurture others, and is immediately gratifying" (Black, 2009). Some clinicians believe that cooking can help to relieve depression by promoting positive activity, increasing goal-oriented actions, and motivating clients to take an active role in their rehabilitation (Whalen, 2014). The literature mostly benefited from the evidence-based cooking interventions to promote change in various areas of physical health, such as weight, BMI, blood pressure, diabetes prevention, or increased vegetable consumption (Reicks et al., 2014, 2018). Cooking activities have been discussed in the psychology and health literature with the aim of investigating their positive effects on the psychological, psychosocial and physical wellness of the disabled, sick, elderly, and disadvantaged individuals, mostly through cooking interventions (Marquis et al., 2001; Fitzsimmons and Buettner, 2003; Hill et al., 2007; Huang et al., 2009; Bier et al., 2011; Lock et al., 2012; Jyväkorpi et al., 2014; Barak-Nahum et al., 2016; Foloppe et al., 2018).

There have been quite limited efforts to handle recreative culinary activities based on its' psychological effect on well-being through psychological theories (Mosko and Delach, 2020). In the literature, there is limited number of studies conducted for the psychological effects of cooking in ordinary times without any intervention (Daniel et al., 2011; Mosko and Delach, 2020) and in the COVID-19 pandemic period (Easterbrook-Smith, 2020; Gammon and Ramshaw, 2020). While Daniel et al. (2011) examined therapeutic benefits of cooking through the eyes of amateur kitchen chefs, regardless of well-being, Mosko and Delach (2020), in their research they used qualitative and quantitative methods together; they examined the effects of university students' cooking behaviors on their well-beings. As a result, both studies have demonstrated that cooking has the potential to offer much more than meeting physiological needs, most particularly at the point of improving mood and emotions, promoting social and familial connections, and enhancing the individual creativity and awareness. Gammon and Ramshaw's (2020) research in the context of "baking bread" and "making fresh pasta" and Easterbrook-Smith's (2020) in the context of "baking bread" put forward some positive psychological effects such as coping with negative emotions, relieving from boredom with an enjoyable leisure activity and offering a way to demonstrate one's skill and activities.

MATERIALS AND METHODS

Study Design

This study adopted a qualitative research approach in order to get a deeper understanding of the psychological effect of cooking activities during the COVID-19 lockdown days. This descriptive and exploratory aim of the study required qualitative research design. When it comes to understanding a person's life, story or behavior, qualitative research becomes a valuable technique. Qualitative methods can be used to uncover and understand what lies behind any phenomenon about which little is yet known. Besides, it can be used to gain new and fresh knowledge about an issue which is lesser known (Strauss and Corbin, 1990: 19). As a result, the main reasons for preferring qualitative research design were both the direct aim of the research to learn about the individual experiences of the people and collecting the answers in a compelling period (under home lockdown) that had never been experienced before.

Sample

Based on the purpose of the research, the heterogeneous purposive sampling method (maximum variation sampling) (Saunders, 2012) was used. To provide the maximum variation during the data collection, heterogeneity was emphasized in terms of criteria such as marital status, gender, profession, age, educational status and place of residence. The first condition to provide this heterogeneous sample is that the participants should have turned to cooking at home during the lockdown period. Therefore, those who are necessarily engaged in cooking (e.g., housewives and cooks) and those who do not enter the kitchen volunteer excluded from the study sample. In order to include the right people in the sample, (i) people personally known by the researchers based on their social media posts, (ii) people the researchers knew by asking their surroundings and (iii) snowballing from previous contacts were consulted. As it is known, a sample size of 12–30 people for qualitative research is thought to be sufficient to explain the phenomenon of a research (Creswell, 2007; Lee J. Y. et al., 2010; Saunders, 2012). The sample size was determined as 30, which is the upper limit. Before being interviewed, participants were individually checked *via* telephone whether they met the eligibility criteria or not. As a criterion for inclusion in the study, the questions "Have you prepared any meals or drinks that you tried to make for the first time during the coronavirus pandemic days? Can you tell them with their names and stories?" questions were asked to the participants. Those who answered "No" to this question were not included in the study. When the demographic characteristics of the individuals participating in the study are examined, it is known that 20 of the 30 participants are female, 17 are single, and 18 of them have undergraduate and graduate education. The youngest participant is 20 years old while the oldest one is 53. The overall average age of the whole is 30,9. The participants live in 14 different cities in Turkey.

Data Collection and Procedure

A structured qualitative online survey consisting of closed and open-ended questions was used as a data collection tool. Interviews can be realized with respondents on a one-to-one basis by an exchange of e-mails (Rodham and Gavin, 2006). In qualitative research, the traditional method is based on collecting data by asking questions prepared before they were face to face and under record (Neville et al., 2016). However, in some cases,

it may not be possible to reach the sample face to face. This may be due to some situational reasons or the vulnerable nature of the sample (Henrickson, 2007). For those respondents who need greater reassurance of confidentiality and privacy, or who feel threatened by the electronic presence of others in focus groups. This form of interview may offer an acceptable alternative. The online interview approach also offers greater space for in-depth investigation of the perspectives of the respondents, thereby allowing the nuanced feelings and attitudes inherent in an emotionally charged subject to be explored (Rodham and Gavin, 2006). The two mandatory practices of the COVID-19 period, such as lockdown and social distancing, have made the online survey technique almost indispensable, as many researchers use. In Turkey, the curfew announced for the elders (65+) on March 21, 2020, enforced on specific days and times. This includes all segments of society until June 6, 2020. For this reason, the data in this study were collected with the internet-based approach and online interview form. The access link of the interview form was sent to the e-mail addresses of the people who met the criteria for participation in the study. Before answering the questions, the participants were informed about the purpose of the research and they were reminded that participation in the study was voluntary.

The structured online surveys were conducted over "Google Forms" between April 10th and June 3, 2020. People from different cities of Turkey participated in the interviews. It took approximately 15–30 min for the participants to answer the questions. The Online survey consisted of two parts. While there are six demographic questions in the first part, there are four open-ended questions in the second part. Participants were asked not to give short answers as "yes" or "no" to the open-ended questions, and it was stated that they could answer the questions in any length they want. The online interview form included the following four open-ended questions; (1) How many hours on average did you spend a day in the kitchen during the quarantine period? If you think you have spent more time than in the past, could you please share with us the factors that motivate you to do so? and (2) What kind of benefits do you think spending time in the kitchen during the quarantine period brings you? All the answers obtained from these four questions were used in the research findings. As it can be understood from the questions, the participants were not directly asked about the psychological effects of their culinary experiences and technical expressions that could manipulate them were avoided.

Data Analysis

All qualitative methods have a common purpose in that they aim to explain a complex phenomenon from the viewpoint of those who encounter it (Vaismoradi et al., 2013). For researchers who prefer to use a relatively low level of interpretation, the use of qualitative descriptive methods such as descriptive phenomenology, content analysis, and thematic analysis are acceptable compared to grounded theory or hermeneutic phenomenology, where a higher level of interpretive complexity is needed (Vaismoradi et al., 2013). It is a systematic coding and categorizing technique used to explore vast volumes of textual information in a discreet manner in order to determine trends and patterns of terms used, their frequency, relationships, and contact structures and discourses (Mayring, 2000). Content analysis may be sufficient for simple reporting of common issues found in the data. In the data analysis process, a five-step process that consists of "description and interpretation," "modalities of approaches," "consideration of context of data," "data analysis process," and "evaluation of the analysis" was operated (Vaismoradi et al., 2013). The 30 electronically recorded interviews were transcribed verbatim by the first researcher and then subjected to the qualitative content analysis. Within the scope of the purpose of the research, the deductive approach was used in determining the themes (Voigt et al., 2010). A deductive approach is useful when the aim of content analysis is to test a previous theory or to compare categories in a different situation (Hsieh and Shannon, 2005; Elo and Kyngäs, 2008). As mentioned before the theoretical background of the study is based on "Stebbins's Theory of Casual vs. Serious Leisure Experience." The existing main themes are "hedonic/casual leisure experience" and "eudaimonic/serious leisure experience." Hedonic/casual leisure experience involved the pleasure, relaxation, and sensory stimulation whereas eudaimonic/serious leisure experience included special knowledge or skills, fulfilling and identity-building, belongingness to a special world, career development and effort/perseverance (Voigt et al., 2010). Firstly, participants' answers to unstructured questions were interpreted and converted into codes. Only the frequency of codes is not applied due to danger of missing the context (Morgan, 1993). In addition, based on the general meaning of the comments of the participants, inferences were made regarding the theme of the comments. These codes were then placed under sub-themes that they belonged to. In the last stage, sub-themes are placed under the hedonic/casual and eudaimonic/serious main themes to which they belong. The researchers involved in the study made the interpretation of the codes in regard to themes separately. The resulting disputes and uncertainties were sent to two separate field experts who were not involved in the study. The evaluation of the analysis process was then done.

RESULTS

Motivational Effects of Cooking on Well-Being

Findings obtained as a result of online interviews with 30 participants were presented in two tables. The first question is "How many hours on average did you spend a day in the kitchen during the lockdown period? Could you please share the factors motivating you to do so with us?" Based on this, in the context of well-being, the expectations of the participants from spending time in the kitchen during the COVID-19 period were understood. According to the answers, it was understood that the average time the participants spend in the kitchen is 3.5 h. The least amount of time spent in the kitchen stated as 2 h, while the one spending the most time stated about 8 h. The most common time was 3 h. All the participants stated that these times they spend in the kitchen are longer than before the lockdown. **Table 2** reports the factors that motivate participants to engage in cooking during the lockdown period. Since some

participants stated more than one motivation factor, the total number of statements is over 30, which is the total number of participants. When 51 codes obtained from 30 participants are placed in the relevant themes, casual/hedonic characteristics of well-being in the kitchen are dominant, as it is clearly seen in **Table 2**. Among the answers given to the question "What are the factors motivating you to spend time in the kitchen?" no item in the serious/eudaimonic characteristics category was encountered. Therefore, it can be said that the basic psychological expectation that directs individuals to spend time in the kitchen during the COVID-19 quarantine days is hedonic well-being and, from Stebbins' point of view, engaging in culinary activities is initially perceived as a casual leisure.

From the **Table 2**, it is seen that the major factor of casual/hedonic motivation is having "Pleasure and Fun." Based on the 25 statements, people motivated to engage in culinary activities as a kind of tool for relieving their boredom, spending time with a quality event, spending pleasant time with the people living with them, gaining their appreciation with what they prepare and doing physical activities. These motivations, which are included in the "active entertainment" group in Stebbins' approach, can be supported by the verbatim quotes from the different participants.

> *"I spend at least 2–3 h a day in the kitchen. I want to relieve my boredom and cooking makes me happy" (Participant 7).*

> *"The main reason I spend more time in the kitchen is my son. Having my son with us during this period and his desire to taste different flavors is the biggest share. Being with him in the kitchen is the biggest motivation for me" (Participant 1).*

> *"Spending time in the kitchen with my daughter becomes a supportive program along with her activities at other times of the day. While we motivate her by doing culinary activities during the day, we are all motivated by her laughing" (Participant 29).*

> *"It has been a means of finding peace for me. Trying new recipes has become a way to forget the bad thoughts in my mind" (Participant 26).*

TABLE 2 | Hedonic/casual vs. eudaimonic/serious characteristics of cooking motivations (n = 30).

Casual/hedonic characteristic ($\Sigma_{i=}$ 51)	Σ_i
Pleasure ($\Sigma_{i=}$ 27)	
Relief from boredom	13
Spending time with a quality event	5
Spending pleasant time with loved ones	4
Gain admiration/appreciation	4
Physical Activity	1
Sensory stimulation ($\Sigma_{i=}$ 24)	
Desire to taste new flavors	17
Desire to prepare clean and hygienic meals	5
Constant desire to eat	2

Since some participants stated more than one motivation factor, the total number of statements is above the total number of participants.

> *"We do many activities at home. But it is certain that we spend the best and most productive time in the kitchen" (Participant 22).*

Apart from the "Pleasure and Fun" expectations of the participants, the other dimension that creates casual/hedonic motivations is "Sensory Stimulation." Expressions under this factor are related to eating, and the main motivation has been "cooking novel foods." For people, cooking dishes, appetizers and desserts that they have never tried to cook at home or have never tasted before but wondered about their taste were in the top priority to be in the kitchen. In addition, people who do not want to eat outside or refrain from shopping due to the COVID-19 pandemic stated that they spend time in the kitchen due to their cleanliness and hygiene expectations. Lastly, two participants stated that the source of their motivation to spend time in the kitchen is to have a "constant desire to eat":

> *"We are in the period of fasting right now. Since I don't normally have enough time to be in the kitchen to make new products, I wanted to prepare some new and different menus. I used to prefer to prepare fast and easy meals before the quarantine days" (Participant 8).*

> *"The fact that we cook everything ourselves and pay more attention to hygiene in this period naturally increased the time spent in the kitchen. What leads us to this is our avoidance of all kinds of ready-to-eat food in terms of hygiene and attention to cleanliness" (Participant).*

> *"The feeling of being locked in the house increased my desire to eat something during the quarantine. Therefore, timelessly, I found myself preparing something in the kitchen" (Participant 28).*

Psychological Effects of Cooking on Well-Being

The second question asked to the participants in the context of the purpose of the study was "What kind of benefits do you think spending time in the kitchen during the lockdown brings you?" Based on this, it was aimed to classify the positive psychological effects perceived by the participants in the context of "well-being." **Table 2** shows the effects of culinary activities perceived by the participants as hedonic/casual versus eudaimonic/serious well-being. Just like the situation examined in terms of motivation, the total number of statements is over 30, which is the total number of participants, since some participant stated more than one positive psychological return. When 86 codes obtained from 30 participants are placed in the relevant themes, as it is clearly seen in **Table 3**, there emerges a quite different situation from **Table 2**. Participants perceived very closely hedonic (53.5%) and eudaimonic well-being (47.5%) from culinary activities. Therefore, based on Stebbins' classification, it can be said that culinary activities are leisure activities with both casual and serious characteristics.

When the hedonic well-being perception is examined, it is understood that "pleasure" and "relaxation" dimensions are repeated in a similar number of times. Many participants used expressions indicating both pleasure and relaxation in the same comment. Participants' comments show that dealing with culinary activities in quarantine is a joyful activity and provides

a great opportunity to produce something by having fun with family members with whom they could not spend time before. On the basis of Stebbins' approach, the pleasure characteristic of culinary activities that provide "active entertainment" can be supported by the verbatim quotes from the different participants:

"The pandemic period is a boring time away from our school and when we cannot leave home. It was quite fun to spend this period in the kitchen. You don't even understand how time passes" (Participant 6).

"It was emotionally pleasing to cook everything at home. But it is also a backbreaking work." (Participant 12).

"I think cooking is a stress-relieving activity, and in this process, making dishes that I had previously consumed as ready-made but never tried to cook made me happy and encouraged" (Participant 20).

"At the end of a very entertaining and dynamic period, I felt the happiness of succeeding with the emergence of those beautiful products" (Participant 22).

"Trying new things and cooking my own food made me a little bit happy during these troubled times" (Participant 30).

Some of the participants stated that engaging in culinary activities helped overcome the psychological challenge of the lockdown. They also said that the time spent in the kitchen was flowing, making them forget the bad atmosphere a little bit and bringing peace. On the basis of Stebbins' approach, the relaxation characteristic of culinary activities that provide "passive entertainment" can be supported by the verbatim quotes from the different participants:

TABLE 3 | Hedonic/casual vs. eudaimonic/serious characteristics of cooking experience (n = 30).

Casual/hedonic characteristic ($\Sigma_{i=}$ 46)	**Σ_i**
Pleasure ($\Sigma_{i=}$ 23)	
Happiness	14
Fun	8
Taking a stroll down memory lane	1
Relaxation ($\Sigma_{i=}$ 23)	
Psychological relief/Staying strong	12
Getting away from bad thoughts	7
Calmness	4
Eudaimonic/Serious Characteristic ($\Sigma_{i=}$ 40)	
Knowledge, training and skills ($\Sigma_{i=}$ 24)	
Development of creativity	20
Learning to be patient	1
Learning to work more diligently	1
Increase of ability to observe	1
Development of health awareness	1
Fulfilling and identity building ($\Sigma_{i=}$ 16)	
Belief in doing things better	12
Realizing self- sufficiency	4

Since some participants stated more than one motivation factor, the total number of statements is above the total number of participants.

"I can clearly say that you don't understand how time passes. The kitchen makes people relax. Instead of thinking unnecessary things and feeling anxious, you feel relaxed" (Participant 1).

"I think being in the kitchen in such a period takes all my stress away, this process goes easier" (Participant 16).

"It really provided an emotional relief. I can say that it eliminates the bad psychological effects caused by constantly dealing with mobile phones and television" (Participant 3).

"Instead of distracting adverse situations, I feel peaceful as I bring out new products that will make me and the people around me happy. Also, it feels so good not to think of anything else" (Participant 11).

When the eudaimonic/serious characteristics perceived by the participants from their culinary activities were examined, it was understood that positive effects are perceived at the point of gaining special skills and knowledge (Knowledge, Training, and Skills) and self-actualization and self-enrichment (**Table 3**). These positive psychological effects also reveal the serious leisure feature of the kitchen activities, based on Stebbins' classification. When the participants' comments are analyzed in terms of their content, the most frequently expressed positive eudaimonic effect is the belief that the individuals' creativity improved. Participants who did not spend such a long time in the kitchen before, stated that their knowledge and skills improved while applying what they learned from each other, from social media, or from sources such as TV programs. In addition, some of the participants stated that spending time in the kitchen made them more patient, taught them to work more diligently, and increased their observation skills and health awareness. These findings can be supported by the verbatim quotes from the different participants.

"I can clearly say that you don't understand how time passes. The kitchen makes people relax. Instead of thinking unnecessary things and feeling anxious, you feel relaxed" (Participant 1).

"I think being in the kitchen in such a period takes all my stress away, this process goes easier" (Participant 16).

"It really provided an emotional relief. I can say that it eliminates the bad psychological effects caused by constantly dealing with mobile phones and television" (Participant 3).

"Instead of distracting adverse situations, I feel peaceful as I bring out new products that will make me and the people around me happy. Also, it feels so good not to think of anything else" (Participant 11).

"Being always at home encouraged me to try to cook novel foods. Seeing that I can do it has encouraged me even more. I'm constantly learning and trying to cook novel foods" (Participant 24).

"I started to observe better. I had the opportunity to focus more on things that I hadn't noticed. In this way, I started to have a lot of ideas on how to produce more reliable food in a better, healthier and more hygienic environment." (Participant 23).

"More experiences and tastes that increase with experience. Practicing, working fast and taking control of the kitchen. My ability to cook two or three meals at the same time has improved" (Participant 12).

"While cooking in the kitchen, depending on the situation, I learned to be fast, to wait, and to be patient" (Participant 5).

As mentioned above, other positive eudaimonic effects of cooking are about self-actualization and self-enrichment (Fulfilling and Identity Building). Individuals who spent more time in the kitchen during the quarantine period have refreshed their belief that they can do a job better whenever they want and improve their skills. In addition, it was observed that in a period when life is limited in many respects, individuals' belief in self-sufficiency have increased thanks to culinary activities.

"I understood the belief of 'I cannot cook that dish or dessert was a prejudice. It turns out that when I want to do something, I can do it just fine as long as I can spare time" (Participant 28).

"In this period, I understood more clearly that there is no limit to what I can do" (Participant 14).

"During the lockdown period, I needed things I never needed before (like baking bread). It made me feel safe to see that we could meet our own needs under any circumstances" (Participant 18).

"I noticed the fact that I was speeding up in my work when I focused or had enough time. Kitchen taught me this" (Participant 8).

DISCUSSION

The purpose of this study was mainly twofold; (i) explore the positive psychological impacts (hedonic/eudaimonic) of culinary activities during the COVID-19 lockdown days and (ii) to discover the leisure experience characteristics (casual/serious) of culinary activities. The participants' culinary experiences were classified in terms of hedonic and eudaimonic well-being by combining with the Stebbins's "Casual vs. Serious Leisure" theoretical framework. Thus, how participants perceived the time they spent in the kitchen during the pandemic lockdown period as a leisure recreation experience (casual vs. serious) and as a psychological well-being tool (hedonic vs. eudaimonic) was revealed. These perceptions were resolved as a result of the answers obtained from two open-ended questions. Based on qualitative analysis, positive psychological effects perceived by the participants were reported as (i) motivational well-being and (ii) experience well-being. In a simpler term, it was examined what the participants expected from being busy with culinary activities during the COVID-19 lockdown period and what they gained at the end of the period. Based on the answers, it was also revealed the leisure experience characteristic of culinary activities with reference to acquired psychological well-being.

The findings show that the well-being expectations (before) of people from culinary activities are quite different from the well-being outcomes (after) they get as a result of the time they spent in the kitchen. Participants' answers showed that spending time in the kitchen in the first place was a casual experience and carried out with the aim of obtaining hedonic outcomes. The statements in the answers to the questions revealed that people were in a difficult psychological situation due to staying closed in at home during the COVID-19 outbreak. Therefore, the answers people gave to the question of "What were the expectations that pushed you to engage in culinary activities?" are gathered under the dimensions of "pleasure" and "sensory stimulation" referring to people's endless pursuit of "happiness." It has been observed that people, who started to spend time in the kitchen to be relieved from their boredom caused by staying closed in at home, turned to cook the dishes they have not tried to cook before due to the abundance of free time and perceive this activity as a quality time spent with their loved ones. In addition, the situational health and hygiene expectation arising from the pandemic also directed people to the kitchen. As a result, people perceived dealing with culinary activities during the quarantine period as a casual leisure activity expected to generate hedonic expectations. No answer showing eudaimonic well-being expectation was obtained from the answers given to the first question asked in the context of motivation.

The answers obtained from the question "What kind of benefits did spending time in the kitchen during the lockdown bring you?" It showed that there is a distinct difference between the participants' expectations from spending time in the kitchen and what really happened at the end. While the participants basically had the aim of "happiness" (pleasure and relaxation) in their minds before dealing with culinary activities, it is obvious that they had long-lived positive psychological growths in addition to short-lived happiness. Although hedonic impacts are proportionally higher than eudaimonic effects, there is actually a remarkably close ratio to each other. In other words, the participants perceive the culinary activities during the COVID-19 quarantine as both casual and serious leisure activities, just as Stebbins (1997b) stated serious leisure experiences could produce hedonic beneficial outcomes as well. It is also clear that performing culinary activities produces more output in terms of overall psychological well-being compared to the motivation to start culinary activities. Culinary activities, which produced 51 codes in terms of motivational well-being expectation, produced 86 codes in the context of conclusive well-being effects. In this respect, it can be said that the culinary activities should be actualized in order to reveal the versatile effectiveness of these activities. In other words, intending to be in the kitchen and experiencing it in practice reveal differences in terms of psychological well-being outcomes.

When the answers to the second question are examined in terms of hedonic outputs, it is seen that the positive effects are concentrated in the feelings of happiness, psychological relief, fun, and steering away from bad thoughts, just as they are in motivational returns. In this sense, "positive effect" and "infrequent negative effect," two of the three dimensions that Diener (1984, 1994) used in hedonic well-being measurement, emerged as a result of their activities, as well. When the answers were examined in terms of eudaimonic well-being outcomes, the two factors that emerged were named as "Knowledge, Training, and Skills" and "Fulfilling and Identity Building" based on the Stebbins' serious leisure theoretical background (Stebbins, 1997b; Stebbins, 2008). Participants came out with eudaimonic well-being by gaining special

skills and knowledge from the kitchen in which they entered with a hedonic motivation to experience new tastes. This, in the words of Stebbins (1997b), is extremely critical in understanding the casual and serious characteristics of an activity. Another eudaimonic perception of the participants who entered the kitchen with the motivation of "pleasure" and "relaxation" appeared at the "Fulfilling and Identity Building" point. The answers to this factor, which can be summarized as "self-actualization" and "self-enrichment" with Stebbins (2008) approach and as factors that "make one's life fulfilling and worthwhile" in Ryff (1989) and Waterman et al.'s (2003) words, highlight the nature of culinary activities that provide more outcomes than "pure happiness." It is understood that during the COVID-19 quarantine process, which is a psychologically challenging period, people have learned to draw wider inferences about life by realizing their own potential thanks to culinary activities.

Leisure cooking activities discussed considering that they will contribute positively to the psychological well-being of people during the COVID-19 lockdown period are of course not a new topic for the literature. Cooking activities have been discussed in the literatures of psychology, public health, and leisure with the aim of examining their positive effects on the psychological, psychosocial and physical well-being. Systematic review of Farmer et al. (2018) reveals the fact that most of the research focused on the psychological, psychosocial and physical benefits of cooking activities on disabled, sick, elderly, and disadvantaged individuals (Tarasuk and Reynolds, 1999; Marquis et al., 2001; Fitzsimmons and Buettner, 2003; Hill et al., 2007; Jyväkorpi et al., 2014; Barak-Nahum et al., 2016) and social benefits of community based cooking programs on public (Engler-Stringer and Berenbaum, 2007; Lee J. H. et al., 2010; Herbert et al., 2014). All these studies had a use of cooking and intervention settings. The findings of those studies revealed that both inpatient and community-based cooking interventions yielded positive influences on improvement of socialization (Tarasuk and Reynolds, 1999; Marquis et al., 2001; Engler-Stringer and Berenbaum, 2007; Lee J. H. et al., 2010), a decrease in negative feelings (e.g., Fitzsimmons and Buettner, 2003; Hill et al., 2007; Barak-Nahum et al., 2016) and an increase in psychological well-being (e.g., Jyväkorpi et al., 2014; Barak-Nahum et al., 2016). These priceless findings highlight the hedonic well-being impact of cooking activities in different samples through a variety of intervention settings.

Although the psychological atmosphere experienced by the individuals in the sample of this study is different than others, it should not be forgotten that the COVID-19 pandemic has been a disease that affects all segments of the society. In particular, the unpredictability of the negative impacts of the virus created great anxiety and fear in all. Therefore, it is a particularly important result that the effects of cooking interventions in patients, elderly or disadvantaged individuals in the above research are similar to the hedonic characteristics of the effects of this study, which was carried out without any intervention. Reicks et al. (2018), who analyzed studies that investigated the topic of "impact of cooking and home food preparation" again through interventions, showed that among 34 studies, seven studies conducted with samples of healthy (Condrasky et al., 2013; Flego et al., 2014; Garcia et al., 2014), disadvantaged (May et al., 2014), and diabetic (Dasgupta et al., 2012; Hossain et al., 2015) adults had significant gains in cooking skills and knowledge. From this point of view, it is understood that cooking activities carried out through interventions, although it is limited to "Knowledge, Training and Skills" reveal eudaimonic effects as well. Even the eudaimonic outcomes revealed by cooking activities in this study is similar to those realized through interventions in the literature, this study promotes a useful contribution to the literature through the "Fulfilling and Identity Building" characteristics of eudaimonic well-being. As aforementioned, there are limited number of studies on the psychological effects of cooking without any intervention in the pre-COVID-19 period (Daniel et al., 2011; Mosko and Delach, 2020) and during the COVID-19 pandemic period (Easterbrook-Smith, 2020; Gammon and Ramshaw, 2020). When the findings of this study are compared with those four valuable research's results, it seemed that emerged hedonic and eudaimonic outcomes are similar, although more comprehensive outcomes emerge in this study. On the other hand, aforementioned four studies did not take the culinary activities in terms of well-being classifications and leisure experience characteristics.

CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

Consequently, it is possible to say that culinary activities were considered as an important "escape" activity during the COVID-19 period, especially for people who suddenly faced a lockdown almost no one is accustomed to. Individuals who entered the kitchen with expectations of pure happiness and relaxation, left from the kitchen by getting informed, improved skills and knowledge and identity building outcomes in addition to pleasure and relaxation. Therefore, it could be asserted that culinary activities outweigh even people's expectations from themselves. Consequently, these findings reveal an apparent view on the hedonic and eudaimonic nature of culinary experiences during the COVID-19 lockdown period. Stebbins (2004) suggested that the most optimum expectation from a leisure activity is the ability to present hedonic and eudaimonic outcomes together. Hence, it is possible to say that culinary activities provide a suitable leisure experience to meet these expectations. On the other hand, the emerged findings that culinary activities have not just casual but also serious experience characteristics, blur the common belief regarding serious leisure experience could be produced through "*competitive or non-competitive sport activities and highly social activities*" (Voigt et al., 2010). Prominently, the interviewees' responses addressing the theme of "Fulfilling and Identity Building" highlight the serious experience characteristics of culinary experience. Therefore, well-being impacts of culinary activities could be discussed more comprehensively in cooperation with leisure, recreation and psychology researchers. For example, this study showed the

serious/eudaimonic experience characteristics of the culinary activities during the COVID-19 lockdown period with two themes: "Knowledge, Training, and Skills" and "Fulfilling and Identity Building." However, serious/eudaimonic experience characteristics of a leisure involves; "Belongingness to Special Social World," "Career Development," "Effort and Perseverance as well." Through the additional studies these factors could be explored or new factors that shape serious characteristics of culinary activities could be discovered.

As of December 2020, when this article was written, a variety of clinical vaccine development processes to end the coronavirus pandemic are ongoing all over the world. Although there are great efforts to implement these vaccines in the first quarter of 2021 as the earliest date, it is clear that the issue of efficiency and distribution of the vaccines remain as major problems. In addition, while new records are broken in terms of both the number of cases and deaths all over the world every day, new lockdown, closing and social distancing measures are being taken in many countries throughout the winter months. Therefore, it seems that culinary activities will maintain its importance as a way for people to keep their psychology strong in their struggle with this difficult and invisible enemy for a while. At this point, a suggestion can be presented to the practitioners. Research results show that culinary activities can provide people with outcomes that are entertaining, informative and additionally that will enable them to know themselves better and realize its' true potential. Therefore, in this period that the negative effects of COVID-19 still affect the social life of the all human-beings all over the world, both private and non-profit institutions and organizations should carefully emphasize the hedonic and eudaimonic outputs of culinary activities in their marketing communications while trying to attract people to cooking classes whether online or face to face. On the other hand, culinary activities can be recommended by psychologists as a versatile remedy in order to reduce or eliminate psychological traumas experienced in almost all demographic segments of society.

Like many studies, this study has number of important limitations. The first limitation of the study is the process of data collection and procedure. Due to the circumstances of the COVID-19 lockdown, the method used in the study is "qualitative online survey" instead of the traditional method based on collecting data face to face and voice recording. Although this choice was an obligation for this study, it is necessary to say that semi-structured or unstructured face to face interviews is the most accurate method for the most comprehensive inferences in accordance with the nature of qualitative research. Another limitation of the research arises from the sampling technique. To reach the maximum variation in the sample, heterogeneous purposive sampling method was used. This let the researchers take advantage of referring to convenience and snowball samplings, as well. As a result, the minimum age was 20 while the oldest was 53. However, the people under the age of 20 and over the age of 60 are the most significantly affected ones by quarantine measures. Additional studies could add these groups into the samples. Another limitation arises from the analysis method used in the study. The five-stage content analysis, independent from a statistical software package, was carried out using Microsoft Office programs "Word" and "Excel." Analyzes can be made with different qualitative statistical analysis programs in future research.

In parallel with the aim of the study, solely people who involved in culinary activities during the lockdown days were included into the study. Nevertheless, it would have been great to use a control group that does not engage in cooking during the pandemic to better demonstrate how cooking helps individuals more learn about themselves. Future researchers could fill this gap with experimental designs. The findings obtained in the study were not classified and interpreted according to categorical characteristics such as certain age groups, gender, marital status, and medical record. Although the psychological impact of COVID-19 on people concerns every segment of the society, from children to the elders, it will be useful to understand whether the culinary experiences that offer a positive psychological effect show significant differences according to demographic characteristics. Besides, in this study the data collected were from the people who live in Turkey. Further studies could collect data from different countries and compare the findings to reveal how the positive psychological well-being outputs and Stebbins's serious leisure experience framework are perceived differently. This study focused on positive impacts of unique activity (cooking) on human well-being. This helped individuals cope with psychological distress during the lockdown due to COVID-19. Future research could explore the negative impacts of cooking on psychological well-being, notably from the viewpoint of whom is the responsible from cooking at home. Finally, since this study designed with qualitative methods, statistical relationships between variables were not considered. If it is intended to investigate the effects of perceived hedonic and eudemonic well-being from in-door culinary activities on variables such as life quality and life satisfaction, quantitative research methods can be used.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Mersin University, Social Sciences Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

OG and MH co-designed the study. OG and MH collected the data together, while OG analyzed the data and reported the findings. Sections of discussion and conclusion were written collectively. At the end, all sections of the manuscript checked collectively.

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Examining the Psychological State Analysis Relationship Between Bitcoin Prices and COVID-19

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The rapid worldwide spread of COVID-19 forced many countries to enforce complete lockdown and strict quarantine policies. The strict lockdown and quarantine affect the psychological state of people toward cryptocurrency. The current research aims to examine the effect of COVID-19 on Bitcoin prices concerning cumulative deaths and confirmed cases. The research comprises daily data from January 20, 2020, to April 30, 2020, during the initial worldwide breakout of COVID-19. This research employed the augmented Dickey-Fuller test to check the stationarity of data, the co-integration test for the interdependency of variables, and the vector error correction model for identifying the direction and long or short-run relationship between Bitcoin prices and COVID-19. The research results show that Bitcoin prices are negatively significant and related to COVID-19 in the short-run. A unidirectional relationship between Bitcoin prices and cumulative deaths is also observed. Investors and the public's psychological state were positively significant to Bitcoin prices in the long-term because of cashless transactions, unbanked, and less risky virus traveling. The second reason behind the positive psychological relation is un-centralization and easy-to-make payments by Bitcoin. This study's finding provides timely evidence to decision-makers on Bitcoin price volatility and its impacts on the public's psychological states regarding COVID-19.

Keywords: COVID-19, Bitcoin prices, psychological state, financial development, business sustainability

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INTRODUCTION

A new type of financial asset named "cryptocurrency" has been introduced recently. Bitcoin is the dominant element of the cryptocurrency market, a growing and highly volatile market (Bariviera, 2017). The pseudonymous author Satoshi Nakamoto introduced this virtual currency in 2008, and it was traded openly in 2009 (Nakamoto, 2008). Cryptocurrency is a revolutionary addition to electronic trade and exchange. The number of cryptocurrencies is increasing daily, and at present, it is over 5500. Bitcoin is vital in all cryptocurrencies, as it provides a fast, secure, and inexpensive exchange medium to its users.

Bitcoin is destroying the scarcity, which is a prerequisite for ascribing value to any form of money and protects the money from counterfeiting (Buchholz et al., 2012; Böhme et al., 2015). The money's feature scarcity preserved the legal rules and regulations and ensured the transactions' accountability records were correct. The central bank controls the money circulation and adjusts the quantity of money in circulation to control its inflation and deflation. Against the backdrop of fiat money, Bitcoin is un-centralized and only tracks the coin holder, which is more complex

than the classical bookkeeping system. As peer-to-peer money, Bitcoin issues new currency to the holder of the coin (main private party) as an incentive to maintain the record of transactions, bookkeeping, and verification of the transaction. With all its disadvantages, Bitcoin occupies a huge part of every economy. The price formation of Bitcoin is not up to standard theories of economics like conventional money based on the future cash-flow model, purchasing power parity, and demand-supply featuring (Kristoufek, 2013). The speculative bubble behavior and detachment from macroeconomic determinants are observed in Bitcoin supportive contents. The demand and supply market forces played Bitcoin price dominators (Bouoiyour and Selmi, 2015). As the global financial market got influenced by stock exchange indices, interest rate, exchange rate, inflation, and oil prices, the long-run Bitcoin prices fluctuated due to the volatility of the Dow Jones index and the euro-dollar exchange rate (Van Wijk, 2013; Stavroyiannis, 2018; Su et al., 2018; Li et al., 2019; Sarfraz et al., 2020a).

Bitcoin Volatility and Psychological Impact of COVID-19

COVID-19 affected all aspects of life, Bitcoin being one of them. The investors' psychological state has been affected by the pandemic breakout. Bitcoin prices were positively impacted by the coronavirus breakout initially and then increased again. The strict quarantine policies caused an upsurge in online shopping and technology-based life (Azam et al., 2020; Su et al., 2020). Su et al. (2020) examined the Chinese and Italians' psychological state using the Weibo users sample in Wuhan, China, and the Twitter users in Lombardy, Italy, for two weeks after lockdown. Their psycholinguistic behavior was examined using simplified Chinese and Italian language inquiry, word count, and a Wilcoxon test. The results of Su et al. (2020) revealed that people stayed at home, and due to the shopping applications and other options, they were significantly less stressed. Bitcoin also boosts its exchange rate and effortless shopping during COVID-19 as available online money. Bitcoin positively influenced social encouragement, cybersecurity, and government regulations, and infrastructural quality support on behavioral intentions. This positive relation was observed by utilizing the Bitcoin qualitative trading data of Indonesia with the implication of inner model, outer model, and hypothesis assessment. Moreover, the improvement and enhancement of Bitcoin trade's quality with developed and more secure transaction process are discussed (Van Wijk, 2013; Vidal-Tomás and Ibañez, 2018; Putra and Darma, 2019; Sarfraz et al., 2020b). Large firms prefer to adopt corporate social responsibility activities' (Sarfraz et al., 2020c).

Bitcoin is a payment mode with two types of constituencies, i.e., the user of Bitcoin and the quick profit-seekers (Miner) or infrastructure's maintainer. By employing a simple economic model, the Bitcoin payment system is captured. The limited system output is generated by the congestion queuing game, while the system's equilibrium is derived by transaction fee and infrastructure level (Huberman et al., 2017). The modern era also demonstrated the rapid increase in Bitcoin usage as the electrical vehicle (EV). The divergent applications are designed during COVID-19 to avoid cash payments. These applications are concentrated on payment security issues as privacy-preserving transactions among suppliers and customers. The Bitcoin payments are considered a more secure payment that eliminated all security issues by the Bitcoin holder's permission and signature (Erdin et al., 2018).

According to economists, Bitcoin plays a positive role during the pandemic. The pandemic's nature declared that the virus could be transmitted from person to person. The government enforced cashless money after it was apparent that conventional money was one way the virus was transmitted. The shortage of conventional money, its circulation inefficiencies, and the worsened cashless transactions dilemma attracted cryptocurrency under specific situations. Approximately 1.7 billion non-banking adults faced the fee transfer problem, while more than half of the issues were resolved through a crypto-asset during the pandemic. The sense of safety changes people's psychological behavior towards Bitcoin. Social media plays a vital role in observing individuals' reactions, opinions, and mental health who use divergent social media platforms for information (Lima and De Castro, 2014; Liu et al., 2018). Bitcoin is commonly prevalent in developed and developing countries. Social media marketize the cryptocurrency and convey information about it to every social media user. Social trends also affect human psychology, whether positively or negatively; it is up to trending information (Tausczik and Pennebaker, 2010; Zhang et al., 2014; De Choudhury et al., 2016). Cultural factors can influence employees' attitudes in implementing environment risk policies (Sarfraz et al., 2018).

The aspiring Bitcoin investors checked the cryptocurrency's returns and decided to save them. A Bitcoin user might receive good incentives by using this virtual currency for various payments and investments. The investors, users, and researchers are required to know about the financial models and tools that measure Bitcoin. A comprehensive understanding of cryptocurrencies' statistical properties will help them set the peculiarities and limitations of Bitcoin. This research analyzed dependent and independent variables and the long or short-run relationship between Bitcoin prices and COVID-19. The COVID-19 is used as a spreading pandemic, helping investors perceive Bitcoin prices' behavior under any toxic disease breakout. The price trajectories of Bitcoin be influenced by economic and political events, government regulations, speculation of exchange, mutual influence, global news, and hacking threat, and these all areas explored by the researchers. This research will be interlinked with the relationship between Bitcoin price volatility and COVID-19. The nature of Bitcoin and COVID-19's relationship will be explored, whether long-run or short-run. This research basically address three research questions which are mentioned below:

Is the COVID-19 affected the Bitcoin prices?
What is investor psychology's impact on Bitcoin volatility during the initial era of COVID-19?
Is the COVID-19 affect the Bitcoin prices for a short or long period?

MATERIALS AND METHODS

The primary model of this research is given below:

$$\Delta BTP_t = \beta_0 + \beta_1 CD + \beta_2 CC + \varepsilon_t$$

In the above equation, the sign of delta Δ used for the first difference while β_0, β_1, β_2 are demonstrated the independent parameters. The BTP is Bitcoin prices, the CD is daily-confirmed deaths, and CC is daily-confirmed cases of COVID-19. The ε_t is an error term with respect to time.

Data Description

This research analyzed Bitcoin prices' daily data, cumulative confirmed cases, and deaths caused by COVID-19. The data set covers the initial period from January 20, 2020, to April 30, 2020. The Bitcoin prices are taken against the United States dollar. The data sets were extracted from different cites, i.e., the COVID-19 data was from the World Health Organization (WHO), and the Bitcoin data was from the coin desk official. This research was based on the initial period of COVID-19 breakout because it was an unexpected situation fly Bitcoin. After 30 April 2020, the executives have understood the situation and established their working technologies in their homes and restrictive offices working with the following SOPs.

Methods

Unit-Root Test

The unit-root test verifies the variables' integration order. The existing literature also supported the augmented Dickey–Fuller (ADF) test as the well-known test to check the variables' integration order.

This research has also employed the ADF test for unit root through the following equation:

$$\Delta Y_t = \alpha + \beta_t + \rho Y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta Y_{t-1} + e_t$$

$$H_0 = \textit{The existence of Unit} - \textit{Root in variables}$$

$$H_1 = \textit{The variables are stationary}$$

Where $\Delta Y_t = Y_t - Y_{t-1}$; $Y_{t-1} = Y_{t-1} - Y_{t-2}$; Δ is the difference operator; α is the constant; β is the coefficient on-time trend t; ρ represents the number of lag, empirically determined using the Schwarz information criterion (SIC); and e_t is the error term with zero mean and variance. The coefficient term Y_{t-1} is later included in testing the coefficient's significance (MacKinnon et al., 1999; Ntshangase et al., 2016; Naseem et al., 2019). The augmenting process is completed with the possible removal of autocorrelation among error terms. The null hypothesis of ADF states that the unit root exists in the data series, and the alternative hypothesis rejects the null by declaring the data series' stationarity.

Co-integration Test

The co-integration test is employed after checking the data series' stationarity or order of integration between variables. The co-integration test measures the long-run relationship or equilibrium through many time series datasets with a linear combination of variables. This research employed the Johansen co-integration test to check the stability and long-term equilibrium relationship between the variables by the following equation:

$$\Delta \boldsymbol{Y_t} = \Pi_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta \boldsymbol{Y_{t-1}} + \boldsymbol{Bx_t} + \mu_t$$

$$\Pi = \sum_{i=1}^{p} \boldsymbol{A_i} - \boldsymbol{I}, \Gamma_i = -\sum_{i=t+1}^{p} \boldsymbol{A_j}$$

The above equation expresses Π as an indicator of the adjusted disequilibrium matrix. The stacking coefficient A boosted the endogenous factor's speed of change in counter to disequilibrium. The sign Γ is used to capture the short-term dynamic adjustment (Otero and Smith, 2000; Yavuz, 2014; Naseem et al., 2019). This test progression can declare the association of variables with their positions in the matrix and featuring roots. The co-integration test's null hypothesis is that the cointegration exists in the data series, and the alternative hypothesis is opposed.

Vector Error Correction Model

The vector error correction model (VECM) is used to determine the causality direction of variables after the confirmation of a cointegration relation (Sulaiman and Abdul-Rahim, 2018; Ren et al., 2020). The VECM framework was structured as follows:

$$\begin{bmatrix} \Delta lnCD - 1_t \\ \Delta lnCC - 2_t \end{bmatrix} = \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} + \begin{bmatrix} d_{11m} d_{12m} \\ d_{21m} d_{22m} \end{bmatrix} \times \begin{bmatrix} \Delta lnCD - 1_{t-1} \\ \Delta lnCC - 2_{t-1} \end{bmatrix} + \cdots + \begin{bmatrix} d_{11n} d_{12n} \\ d_{21n} d_{22n} \end{bmatrix} \times \begin{bmatrix} \Delta lnCD - 1_{t-1} \\ \Delta lnCC - 2_{t-1} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \end{bmatrix} (ECM_{t-1}) + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

Where the coefficients $\lambda_1 - \lambda_2$ indicate the error correction term and the homoscedastic disturbance term denoted by $\varepsilon_{1t} - \varepsilon_{2t}$, and ECM_{t-1} represents the long-run equilibrium and speed of adjustment. In the equation, CD represents cumulative deaths, and CC represents cumulative confirmed cases of COVID-19.

Granger Causality Test

The following equation estimates the Granger causality test:

$$X_t = \alpha_0 + \sum_{j=1}^{k} \alpha_{1s} X_{t-s} + \sum_{i=1}^{m} \alpha_{2i} Y_{t-m} + \varepsilon_{1t}$$

$$Y_t = \beta_0 + \sum_{j=1}^{n} \beta_{1j} Y_{t-j} + \sum_{h=1}^{p} \beta_{2h} X_{t-h} + \varepsilon_{2t}$$

In the above equation, it is assumed that the terms ε_{1t} and ε_{2t} are not correlated, as $E(\varepsilon_{1t}, \varepsilon_{2t}) = 0 = E(\varepsilon_{2t}\varepsilon_{2s}) \ldots s \neq t$. The unidirectional causality from Bitcoin prices to death and confirmed cases of COVID-19 is expressed in this equation.

The significance of α_{2i} and β_{2h} is confirmed by the mutual dependency of two specific variables and vice versa. The term Y and X will be independent if the α_{2i} and β_{2h} are not zero.

RESULTS

In **Table 1**, the ADF test results for integrating Bitcoin prices and COVID-19 are presented. The null hypothesis of a unit root in the series could not be rejected at a 10% level of significance, except for cumulative deaths. The dependent and independent variables are significant at a 1 and 5% level of significance. The Bitcoin prices and cumulative deaths are significant at a 1% level of significance, while cumulative confirmed cases are significant at a 5% level. After taking the first differences, both conditional series have shown a 1 and 5% level of significance for all variables. The last column has contained the order of integration in which I represent the integrated order of variables (Johansen, 1992; Cheung and Lai, 1995; Mohsin et al., 2020a; Salamat et al., 2020). The numeric values 0 and 1 are used for level and first difference. The table below shows I (1) in front of all causes because the results support the significance of the first difference, which is a fundamental requirement to run the cointegration test.

Table 2 contains the second step results in which the appropriate lag length is selected. Based on the Vector Autoregression lag order selection criteria, lag three is chosen for Bitcoin prices by three information criteria, i.e., the Akaike information criterion (AIC), SIC, and Hannan–Quinn information criterion (HQC). In contrast, in fatal accidents, AIC and HQC have chosen lag three (Mohsin et al., 2020b).

TABLE 1 | Augmented Dickey-Fuller unit-root test.

Stationarity test				Order of co-integration
Variables	**Unit Root Test**	**Augmented Dickey-Fuller Test (Constant)**		**ADF**
		ADF *t*-Stat.	***P*-value**	
BTC	Level data	−0.8913	0.7855	I (1)
	1st difference data	−9.4972	0.0000	
CD	Level data	−2.8088	0.0630	I (1)
	1st difference data	−12.8842	0.0000	
CC	level data	3.8711	1.0000	I (1)
	1st difference data	−3.4710	0.0123	

TABLE 2 | VAR Lag order selection criteria.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	−1723.89	NA	2.30E+18	50.79091	50.88883	50.82971
1	−1448.13	519.0892	8.98E+14	42.94485	43.33653	43.10005
2	−1435.03	23.49738	7.98E+14	42.82435	43.50979	43.09594
3	−1381.96	90.53527*	2.19e+14*	41.52811*	42.50730*	41.91609*

**Shows 1% level of significance.*

After selecting the appropriate lag length, the next step is to check the long-run relationships among the variables used in this research. The Johansen cointegration test was employed to check the long-run relationship among variables, and the results are presented in **Table 3**. The results are in two sections, i.e., the Johansen max test and trace eigenvalue. The results indicated that the variables are co-integrated at 1 and 5% level of significance with values 140.4974 (None) and 14.87688 (At most 1), respectively, for maximum eigenvalue. The maximum eigenvalue value (trace) for Bitcoin is 155.5734, which shows the significance at a 1% level of significance. This research used the first equation of maximum eigenvalue and trace value because of commonalities. The first equation of both tests is significant at a 1% level of significance. The cointegration results confirmed the long-run relationship between Bitcoin prices and COVID-19. In the next step, the trace and Max-Eigenvalues test results generated a cointegration equation based on the log-likelihood ratio.

A linear combination of Bitcoin prices and COVID-19 could be scrutinized from the cointegration equation. This cointegration equation is also used to verify long-run relationships, and it is confirmed for this research. The results of the cointegration equation are presented in **Table 4**. The normalized equation of Bitcoin prices expresses a significant positive relationship.

In **Table 5**, the VECM's results are presented with multiple time series' long-run and short-run relationships between dependent Bitcoin prices and COVID-19. A bidirectional relationship was observed between cumulative death cases and cumulative confirmed cases ($CD_{-1} \Leftrightarrow CC_{-1}$), with a difference at a 1% level of significance and unidirectional causality with a difference ($CD_{-2} => CC_{-2} \neq CD_{-2}$) also significant at a 1% level. The speed of adjustment from short-term equilibrium to long-term equilibrium for Bitcoin price is 2.09%, which

TABLE 3 | Unrestricted co-integration rank test (Maximum Eigenvalue).

Hypothesized No. of CE(s)	Max-Eigen Statistic	Critical value (0.05)	Prob.
None*	140.4974	21.13162	0.0001
At most 1	14.87688	14.2646	0.04
At most 2	0.199096	3.841466	0.6554
Unrestricted Co-integration Rank Test (Trace)			
Hypothesized No. of CE(s)	Trace Statistic	Critical value (0.05)	Prob.
None*	155.5734	29.79707	0.0001
At most 1	15.07598	15.49471	0.0577
At most 2	0.199096	3.841466	0.6554

**Shows 1% level of significance.*

TABLE 4 | Co-integration test.

1 Co-integrating equation(s)		Log-likelihood -511.2092
BTC	Cumulative Deaths	Cumulative Cases
1.000	180.8510	−2.158967
Standard Error	(−12.0147)	(−0.16688)

TABLE 5 | Vector error correction estimates test.

Error correction	Price	CD	CC	ECT_{t-1}
D(PRICE(−1))		−0.0068	−0.1814	−0.0209
D(PRICE(−2))		−0.0180	−1.1179	
D(CD (−1))	6.6845		−171.8432*	0.0148*
D(CD(−2))	2.6652		−10.0428*	
D(CC(−1))	−0.0708	0.0491*		0.5549*
D(CC(−2))	−0.0272	0.0315		
C	−86.2452	−8.8489*	−612.879*	

Shows 1% level of significance.

TABLE 6 | Granger causality test.

Direction of causality	Observations	F-Statistics	Prob.
Cumulative deaths does not granger cause price	69	0.6469	0.6922
Price does not granger cause cumulative deaths		2.9497**	0.0149
Cumulative cases does not granger cause price	69	0.7078	0.6447
Price does not granger cause cumulative cases		2.3919**	0.0408
Cumulative cases does not granger cause cumulative deaths	69	87.7901*	2.00E-25
Cumulative deaths does not granger cause cumulative cases		73.4563*	1.00E-23

, **, * shows 1, 5, and 10% level of significance, respectively.*

is negatively insignificant. COVID-19 does not influence the Bitcoin prices for the long-term because conventional money is replaced by cryptocurrency. According to scientists and paramedical staff, the virus's source is human beings. When it was declared that the exchange of conventional money is also a reason for the spread of the virus, governments suggested cashless transactions to avoid spreading it. The businessmen, students, and investors needed to pay for different trade, fees, and exchange purposes. So, Bitcoin came to use for every payment kind. The business moved to homes, and everything was stuck during the lockdown. Online payment is the best solution to avoid difficulties during a pandemic. At the beginning of the pandemic breakout, Bitcoin prices have shown a downward trend, but as people started the transactions online or Bitcoin, the upward trend is observed in Bitcoin prices.

Table 6 is a summary of **Table 5** and a crosscheck of directional causality. The VECM declared the long-run relationship among variables and the speed of variables' adjustment from the short-run to the long-run equilibrium level. The total observations of the research are 69. The Granger causality test summary shows the Bitcoin price and cumulative death cases are unidirectional at a 5% level of significance. In comparison, the Bitcoin price and cumulative confirmed cases are bound in a unidirectional relation at the rate of 5% level of significance. The unidirectional positive significant relationship of Bitcoin price with cumulative death cases and confirmed cases declared that Bitcoin was affected by the pandemic but positively. The cumulative confirmed cases and deaths are interdependently related to each other. An increase in cumulative confirmed cases is why there is an increase in the cumulative death cases and vice versa. The ECT_{t-1} is negative but insignificant. The negative sign of ECT_{t-1} confirms the long-run relationship of variables with a positive effect.

DISCUSSION

Under the state theory of money, fiat money can spend on another good that the money holder must require. Money is a mode of exchange so that the state theory claims the worth of legal money. The cryptocurrency, i.e., Bitcoin is a form of fiat money in a finite economy. Additionally, Bitcoin is decentralized and without backed reserve money. It solely exists without the control of any single government or big financial company. At the starting period of Bitcoin, the investors and general public believed that it would vanish suddenly from the market same as its entrance. Nowadays, Bitcoin drives its worth due to the rapid increase in investment and other buying agents' trust. The increasing value and trading transactions of Bitcoin declared that Bitcoin retains its value and never ends up with a so-called hot potato. The authenticity and trust-ability of Bitcoin were observed in the COVID-19 period. The virus used human beings as a transmitter resource, so the government banned conventional money, banking transactions, and automatic teller machine (ATM) transactions to avoid spreading viruses. The pandemic restricted people in the home but not activities of life. All payments, receipts, and trading activities needed a safe, decentralized, and quick payment mode for pending transactions. Bitcoin served as online, quick, safer, and decentralized money that eased the businesspersons, traders, and even the public. In the COVID-19 period, the graph of Bitcoin is shown an upward trend in both senses, i.e., prices and trading transactions. This research also supported the increasing trend of Bitcoin and the positive relationship between COVID-19 and Bitcoin returns. As a virtual currency, Bitcoin plays a crucial role in having the feature of online, virtual, cashless, and un-centralized currency. The stability of Bitcoin increases investors' confidence and the users' trust.

CONCLUSION

This research's primary focus was to examine Bitcoin prices' volatility due to COVID-19 and people's psychological behavior under strenuous circumstances. COVID-19 has further been categorized into two parts, i.e., cumulative deaths and cumulative confirmed cases. In this research, daily data were used from January 20, 2020, to April 30, 2020. The daily data set was used for accuracy, the impact of investors' prices, and the changing of Bitcoin prices and investment decisions. The unwanted data has covered the initial period of COVID-19 due to checking the sudden effects of the pandemic on Bitcoin prices. The econometric methodology was used to measure the relationship between Bitcoin prices and COVID-19. The ADF test checked the data stationarity and confirmed that all data series were unit-root free at a 1% level of significance.

The Johansen cointegration technique confirmed a positive and significant long-run relationship between Bitcoin prices and COVID-19. The VECM confirmed the directional causalities for the short-term.

The short-term negative significance relationship shows the negative impact of COVID-19 on Bitcoin prices. At the inception of COVID-19, the graph of Bitcoin prices showed a downward trend in every field of life. The positive long-run relationship between Bitcoin prices and COVID-19 has an interesting impact on the growth. Conventional money was banned due to the spread of the virus through conventional money, so people had trouble with different kinds of payments. As a virtual currency, Bitcoin plays a crucial role in having the feature of online, virtual, cashless, and un-centralized currency. The stability of Bitcoin increases investors' confidence and the users' trust. People's psychological state has changed by using Bitcoin for payments and safely done their exchanges. This research declares pandemic (COVID-19) relationship and Bitcoin prices for decision-makers, the public, and practitioners, and the contribution of virtual currencies in psychological behavior. This research shows the path for a specific pandemic breakout, i.e., COVID-19 and the communicably spread epidemics. This research suggests that investors should fully aware of the international monetary market and policies because they are trading uncontrolled and decentralized assets. The digital, fiat or online money depends on the internet, and investors' unavailability becomes the cause of loss. Bitcoin has a bundle of benefits, but at the same time unpredictability, it becomes the reason for bankruptcy. The possible policies and measures that might be influenced the prices and returns of Bitcoin can be explored in future research. This research is limited to the initial period of COVID-19. It can be comprehended with current data, and future research may be explored pre, during, and post era of COVID-19.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: https://covid19.who.int/ and https://www.coindesk.com/.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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REVIEW
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The Effect of COVID-19 Pandemic on Service Sector Sustainability and Growth

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Coronavirus disease (COVID-19) is having an unprecedented and unpredictable impact on the world's economy. The pandemic has driven the world toward adapting to the current circumstances regardless of the business, sector, or industry. The coronavirus epidemic (COVID19) has affected the global economy and service sector. The purpose of the current study is to assess the effect of COVID-19 on service sector growth and sustainability. Global sectors and industries are trying to anchor themselves amidst the pandemic. The study focuses on the sectors that are badly hit by the outbreak and discussed the strategies and responses different countries are taking to sustain their economies. This study concludes that the vital role of Information Technology and digitization supports the economies in their fight against the pandemic and helps them sustain themselves amid crises. This study also contributes to the body of literature by suggesting IT-based solutions for various industries to elevate effective responsiveness and avoid significant losses.

Keywords: COVID-19 pandemic, business sustainability, economic growth, service sector, information technology

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INTRODUCTION

Technology has allowed for extensive growth in almost every human interactive field in the last few decades. Information communication technology has allowed the world to become globally connected. This has left a lasting impression on the global market, especially with regards to the trade between developed and developing countries. The global market is within reach for most people, strengthening the economy and individual living standards both. The use of information sharing and communication technology by customers is very significant in today's era of the global market.

The COVID-19 epidemic has hit the world economy very hard, leaving no industry unaffected. In this study, we discuss the gaps in the literature surrounding the economy and economic environments and encourage future research to focus on the stress and well-being explanation, particularly in response to the pandemic decline. Rising protectionism and chauvinism have worsened during this pandemic, accelerating the weakening of the economy. It affects the economy and whole standards and values, altering them to produce an entirely new chain of values. Social

distancing and security become more critical than immediacy and good organization. Relocation and shut down of businesses and supply chains are experienced in almost every sector, and even governments have put the economies aside and are hoarding basic necessities. This situation has brought about not only practical social distancing but also economic distancing and has put the world economy in danger.

In such a devastating situation, technology is the only hope to keep the economy on track. Technological instruments are vital resources for the efficient monitoring and control of disease outbreaks since people cannot operate and balance the magnitude and speed of AI devices. Thus, where every country is in the race to develop a COVID-19 vaccine, each country is looking at its technical experts to come forth and play their part in keeping the economy on track. The downfall of the various sectors during this pandemic shows discomforting fallout in which health care is on top. During this pandemic, the healthcare system collapses in many countries, and the overwhelming influx of patients to the hospitals has been disastrous. The global lockdown has reduced supplies to almost zero, and even the mobility of necessities was cut down by more than a quarter. Other than the healthcare system, key industries that are hit harder by lockdown are manufacturing, retail, public services, entertainment, media, the transport industry, and tourism. Information technology plays a vital role in providing accumulative, accurate, and reliable communication. Information technology offers medical and economic benefits of the right to information access; moreover, IT seems to be the only way out during lockdown and social distancing, compensating for economic and business losses. Its economic benefits in such a situation are widespread, including fast communication and novel compensating methods. AI-assisted virtual assistants, chatbots, and information centers help the health sector diagnose and test for COVID-19 and play a vital role in facilitating the maintenance of social distancing to stop the spread. The cryptocurrency trade significantly influenced environmental sustainability, which is econometrically confirmed by the vector error correction model (Mohsin et al., 2020a). The banking sector is symmetrically and asymmetrically affected by the volatility of market risk. Simultaneously, interest rates and exchange rates show minor participation in the fluctuation of banks' returns (Mohsin et al., 2020b). The pandemic outbreak influenced the daily activities of life, and the stock market is negatively affected by it because of the alteration of investor psychology (Naseem et al., 2021).

This study aims to investigate the economic effect of COVID 19 on service sector firms. During this global pandemic, the economic losses are so devastating that global economies are looking at a future recession. Unemployment and poverty are at an all-time low, and IT help is needed to eradicate the catastrophic consequences. This study also established what sectors are badly affected during this pandemic and need thorough rehabilitation. Only a few sectors show fewer losses or are doing well during the current pandemic. The vital question is how information technology can help people and businesses cope with worsening situations worldwide. The study objective is to highlight the impact of COVID-19 on various sectors while determining the worst-hit industry. The current study also emphasizes the role of information technology during COVID-19.

In such a situation, technology is the first and foremost foundation upon which economies are dependent and mitigates the impact of COVID-19. Information communication technology in this digital world plays a key role in combating the pandemic. Technological areas like artificial intelligence, cloud computing, and data science are evidenced to be the only players that have kept working at their full pace during this emergency. The COVID-19 pandemic has hit almost every sector of the economy in every corner of the world. So, these technologies are implemented when allocating resources, treating patients, preventing the spread of the virus, tracking carriers, and monitoring the daily situation of a pandemic, and they are also implemented by various economies to support their businesses in tackling their problems and social activities during the lockdown. Digital technology seems to support companies with IT infrastructures, duly operating online and offline.

In contrast, businesses that are lagging in incorporating IT technology have faced many problems. Social distancing and stay-home restrictions have meant offline businesses suffer the most. However, many businesses that were not operating online before the pandemic have somehow managed to shift their businesses online to fight against the pandemic's economic disaster. Schools and other offline businesses were put on lockdown to prevent the spread of the virus, and many continue to operate though online. This also brings a surge in the demand for online learning applications and work from home office solutions.

Moreover, there are two sectors that have been affected the most during this pandemic: health and tourism. Many countries' healthcare systems have been partly or entirely interrupted. Besides the high-tech climate, the healthcare industry has taken a devastating hit due to the multiplication of COVID 19 patients and the lack of healthcare staff, keeping people with routine health problems out of hospitals. This sector actively moved toward telemedicine telehealth solutions. This move seemed to be very effective in ensuring routine patients stay home, allocating the hospital's resources toward designated COVID-19 wards. The abrupt and strict lockdown in the urban and rural areas has halted traffic, and, as a result, there has been a global decrease in the influx of road-related emergency patients. Patient-engaged video surveillance and robotic intervention to deliver medicine right to the patients' beds has kept the healthcare personnel safe from contracting the virus.

On the other hand, the badly thumped sector was tourism. Restriction on public gatherings and suspension of flight operations throughout the world has had a negative impact on this industry. Tourism and allied services have also received the same level of stress. Many businesses located in tourism hot spots have had to shut down to keep people away from the tourist spots.

Both sectors show a mix of both extremes of having supportive IT infrastructure and not having IT or online infrastructure. This study will explore the impact of COVID-19 on both types of businesses to analyze how an IT infrastructure helps businesses

to maintain their economic activities during such situations. We intend to answer the following questions:

- How has COVID-19 affected firms in the service sector, and how has an industry IT infrastructure made them capable of fighting COVID-19 in a lockdown situation?
- How does an IT infrastructure play a vital role in keeping businesses running and revamping them after strict lockdown?
- How does IT infrastructure play an essential role in ensuring that companies are operational and refitted after strict lockdown?
- How did different countries respond to COVID-19 to continue their economic operation, and what is their recommendation regarding IT integration?

According to the International Labor Organization (ILO), the impact of COVID-19 varies depending on the specific social and economic sectors. This study is based on the ILO's assessment of the sectoral effects and captured industries. This study will establish that it is the weakness of various companies' IT infrastructures that causes the economies to collapse. Public health concerns are forcing companies to work from home, and these companies are facing a massive loss of opportunity. Many manufacturers import their required raw material and spare parts from China, which is currently under lockdown. Manufacturing processes have had to shut down as a result. There was only one public health sector working with its full strength and workforce during this pandemic; all industries were working either partially or not. Secondly, the industry hit the worst have been tourism and its allied sectors, such as aviation and the public transport sector. The research aims to examine the effect on major industries that contribute to the economy, emphasizing their IT infrastructure.

LITERATURE REVIEW

Use of IT in the Media and Entertainment Industry

The recent lockdown highlighted the importance of the media and entertainment sector, as it plays a vital role in elevating public morale. During a pandemic, people have been instructed to stay at home, and people have thus turned toward entertainment, education, and cultural activities, which has, in turn, overloaded streaming and other online services. Simultaneously, it has been tough for production houses to keep their activities running, as recording shows and live broadcasting has become more challenging due to social distancing. Due to the pandemic, this sector has also faced unemployment and clogged production. Job losses and the fall in economic returns have been exacerbated by the increased volatility of media and culture during the pandemic. Due to the media industry's shutdown, the cost of the pandemic in terms of lost media revenue has been approximately USD10 billion (Hall, 2020).

During the strict social distancing and lockdown situation, 79.7% of the workforce of the arts, recreation, and entertainment industry lost their jobs or were placed on forced leave in the United Kingdom (Mangan, 2020). Similarly, in the Philippines, the entertainment workforce fell by 55% in April 2020 (Authority, 2018). The same is witnessed in Australia, where performing arts and other cultural activities fell by 29.5% in March and April (Statistics, 2020). Moreover, significant scaling of businesses was done, and the impact this has had is visible in both live and recorded transmission. The media industry workforce was shifted to other sectors to ensure employment and provision of services in public health; in Georgia, for example, film set workers were moved to help build hospitals.

A similar situation is observed in the media industries (news agencies, motion pictures, and broadcasting) of Brazil and the United States. According to the Institute of Brasileiro de Geografia e Estatistica (IBGE), the audiovisual news agency and editing industry production fell by around 14.8% in March 2020. According to the United States Bureau of Labor Statistics in Current Employment Statistics survey, the motion picture sector fell by 52%. The broadcasting sector fell by 9% during this lockdown in May 2020.

In the media and entertainment industry, various sectors like live broadcasting and recorded production used IT to capitalize on themselves and technology to monetize their productions. However, live media broadcasting could not take much advantage of IT to conserve their quality association with their audience. Still, recorded programs that use stipulated music and other audiovisual content showed much improvement in terms of streaming and its associated IT infrastructure. It is also observed that during the pandemic, the IT infrastructure is pacing the productions. Hall (2020) indicated that various online platforms and applications play their role in bringing up creative content with a copyrights issue.

Technological and IT infrastructure also helps filmmakers maintain social distancing. An example of this is by replacing the extras with robots and AR visual images, such as in France 24, 2020: "Robot helps Turkish sitcom keep cameras rolling in the age of COVID-19." Maintaining social distance between actors has also meant the provision of equipment that allows actors to film themselves. Similarly, those working with voiceover and dubbing are provided with the equipment to record themselves or are sent to rent cars with equipment onboard near their houses so they can work remotely. This is how the COVID-19 pandemic has hit the media and cultural industry. Information technology inclusion in this industry has allowed the industry to hit the ground running, but it would not have been easy without sufficient technology and IT services. Therefore, it is proposed that IT service deployment is often a valuable tool to integrate into existing systems. Flim Directors are using the robot camera for making a new video.

COVID-19 and Public Service

After World War II, the COVID-19 pandemic is largely considered the worst crisis the world has in recent history. It has had a severe impact on healthcare systems around the world, the global economy, and society as a whole. Much like in response to combat, the nations of the world, on the call of the WHO and UN Secretary General, have moved rapidly toward fighting this pandemic, and the public service has been placed as the vanguard in this situation. Public service departments maintaining social distancing to keep the public safety have

limited their operations. However, they also provide public services through IT infrastructure both online and remotely. COVID-19 is the first epidemic in human history in which technology and social media are used to shield people while being physically isolated. The departments that have been impacted in public services are transportation, the health industry, the media industry, etc. Some cultural events, airports, and other services that involve large public gatherings are suspended till further notice. In such settings, the IT infrastructure is the only solution to provide updated information, surveillance, and jobs that are currently impossible to execute. Examples of this include working remotely from home and tracking people's movements to contain the virus.

Along with health and education experts, public servants also help prevent virus spread and aid recovery. During this pandemic, many public servants have worked from home using the technology their respective departments have. The public servants were also part of the prevention of COVID-19, and technology has helped them do their daily office work to reduce social contacts by providing essential services using only technology. However, in some countries, not all the departments have been using technology and had very little to no IT infrastructure. In this case, they deploy the already available online platforms or cut down their operations to reduce person-to-person contact. Countries with high-tech environments have shifted their education, health, and public services to be online and have thought of ways to ensure e-governments can maintain their technical capacity. Information technology is capable of facilitating both health and social concerns.

COVID-19 and Food Retail

The drastic coronavirus pandemic has caused spikes in demand for certain goods because of panic buying. The demands for other goods have decreased frantically because of the decline in use. Nielsen, the British Retail Consortium, and the Commonwealth Bank of Australia mentioned that the surge in demand for essential products like rice and wheat, toilet paper, and various other food items has been much higher than the last year (Sarfraz et al., 2018, 2020a; ABC News, 2020; Briefs and Books, 2020; Lobach, 2020; Saria and Raheja, 2020; Bentall et al., 2021).

Pak (2020) also mentioned in his studies that "As China recovers from COVID-19, small businesses are struggling to re-open," and medium-sized enterprises will face the hardest hit, as they have no alternate arrangements like e-commerce and IT infrastructure. These businesses often lack safety nets when workers become sick. IT infrastructure and associated technologies are used to tackle the paramount pandemic hygiene and prevention measures. These include self-checkouts to decrease contact between workers, reducing cash purchases, adding protectors to counters, and re-stocking shelves using schedules. There is a change of −0.9% employment in the Australian accommodation and food services sector from March 2019 to March 2020 (Vandenbroek, 2020).

COVID-19 and the Transport Industry

The people's movement is changing with the help of technology and innovation. However, the coronavirus pandemic is likely to put moving wheels to a grinding halt. Technology and innovation can accelerate transport instead of impeding it, especially in terms of digitizing transport in urban areas. In some literature, urban transportation is the best way to embrace innovative technologies and IT infrastructure. In her blog about the transport economic situation in COVID-19, Tatiana Peralta Quiros mentioned that it is important to reopen the transport industry, keeping public safety in mind. For this, they are analyzing the moving patterns of the people to know where and how people are moving at the local and national levels. The data from the existing and new IT applications must be keenly observed to update the people in real time about the traffic and congestion on the roads, malls, parks, etc. Digital technology must be used to track the virus's spread as the situation is frenzied, unprecedented, and keeps changing every day. Covid-19 impact on air travel has been overwhelming (Gössling et al., 2020).

During this coronavirus pandemic, the burden on organizations has changed from moving people to maintaining a core transportation system functional with a skeleton crew to guarantee the continuing movement of freight and critical employees. In pre- COVID-19 times, technology and IT was never used in transport. Wayfinding through navigators is a comparatively old concept, but using it to keep social distancing will be an innovative idea. Installation of the outdoor kiosk to tackle crowded situations is also in place, and many of these have implemented touch-less screens. People's movement surveillance can limit the spread of COVID-19, but it may raise privacy issues (Hutchinson, 2020).

COVID-19 and the Healthcare Sector

Given that the healthcare sector provides spiritual services to the public, its value is visible in its demonstrable ability to improve both the economy and job ratings. The healthcare sector always comes first after an emergency and workers. The health sector is the first to fight an emergency. Digitalization and technology are becoming a vital part of the health sector. Technological advancements like online doctor consultations, telemedicine, and other pharmaceutical and treatment-related applications play an important role in providing the best health services (Ungureanu et al., 2019; Sarfraz et al., 2020b,c; World Health Organization, 2020).

In the context of the recent COVID-19 spread, artificial intelligence and related IT infrastructure can help health experts in many ways. In some regions, mobile applications were introduced to track the COVID-19 situation and collect the location-based data of people suspected to be infected. Also, call centers were established with medical experts to help patients with severe symptoms. Information technology also played an essential role in providing the updated information, training the health experts, and guiding them according to the situation. This can also help monitor service quality, management, and transparency in remote areas (Salsberg and Martiniano, 2018; Keesara et al., 2020).

The health sector is the sector most impacted by the pandemic; healthcare personnel are short of PPE and have seen cases of infection. The has been a shortage of both beds and other equipment, including ventilators. Technological advancement

plays a role in flattening the spike of the confirmed cases and reducing the flux of the patients toward hospitals (Smith et al., 2020; Wang et al., 2020).

COVID-19 and the Education Sector

The spread of COVID-19 was witnessed throughout the world in April. In March 2020, the WHO had already declared it a global emergency. In April 2020, most countries shut down their schools, colleges, and universities, keeping public safety in mind. The purpose of the closure of educational institutes was to slow down the spread of covid-19 by keeping people in their houses and away from gatherings. This encouraged distance and online learning using technology, as 91.4% of the students, around 63 million teachers, and other education-related staff were severely impacted. To tackle the raised educational challenges in school closures, technology was embraced by schools, and it has shown its value in providing virtual learning-based platforms that can mitigate the loss of education. Teachers and students show adaptability in using technology-based platforms for online learning as an alternative to the existing conventional classroom system (Chick et al., 2020; Ting et al., 2020).

Technology also helps sustain teachers' salaries and other personal training by the use of online instruments and media as people transfer their teaching process to remote learning. While transforming the educational system into a completely new digitalization environment and technology-based schooling, the teachers need strong digital and technical skills. Other ongoing studies in many countries yield insight into how online and distant learning techniques using digitization and technology can help developed and developing countries manage their responsive measures during the pandemic situation (Park et al., 2020; Verawardina et al., 2020).

COVID-19 and the Tourism Industry

Within 6 months of the day COVID-19 was initially announced in China, the spread of coronavirus was declared a global pandemic. It has had an unprecedented impact on almost everything, including activity and movement. It has left mammoth adverse effects on social, political, and economic sectors, being irreversible in some sectors. The ripples of the COVID-19 keep threatening people's health and life. Global and domestic governments have imposed different levels and sanctions on their citizens, including travel bans, restrict gatherings, stay-home orders, self-quarantine, and other business closures and time-specific restrains. The countries whose economies are hospitality-based have felt a significant negative impact on their economies as travel, tourism, and services such as aviation have come to a halt.

The hardest-hit sector of all is travel and tourism because of partial and full lockdown situations worldwide. The travel and tourism industry and other associated sectors have fallen to a small fraction compared to what they contributed in pre-COVID-19 times. Where other sectors like health, education, public transport, media, and hospitality are starting to reopen following SOPs of COVID-19, the travel and tourism sector is still at a halt due to its fragility to the whims of the virus. Moreover, other sectors transform their operations to online platforms to various degrees because of nature and adaptability. This sector is facing challenges in adopting the electronic form of tourism: the lack of IT infrastructure and technological advancement and limitation of implementing technology-based tourism. In this regard travel and tourism sector behaves differently by nature. Crises in the tourism sector are not new by any means, but from an economic point of view, COVID-19 has a more devastating impact than previous crises in recent history (Gossling, Scott, and Michael). Like all the historical crises, this pandemic also brings irreversible damage to this industry. Despite being under the discussion of researchers, e-tourism is still not implemented to an extent where it can show resilience and fight against such pandemics. Information technology and tourism have always had a challenging relationship (Werthner and Klein, 1999).

In the future post-COVID-19 era, tourism is not expected to be the same as it was in pre-COVID-19 times. The tourism sector's situation needs to be tactically dealt with to recuperate the socio-economic stability after the COVID-19. The tourism industry's subsectors have also taken bad hits, including industries of aviation, road transportation, recreation, accommodation, and the food supply chain. The tourism industry's digitalization also proposes the changes in these subsectors at a massive level. Innovative and technology-based solutions are proposed concerning travelers' safety and hygiene. The modern socio-economic system is based on the hospitality and tourism industry, as many countries are shifting their economies from natural resources to tourism. When the crises intimately affect this industry, it can even turn into a devastating slump. The tourism industry faces different natures than other sectors, as IT cannot do much about it except speeding up the booking, destination hunting, and destination recommendation process, etc. To sustain the tourism industry economy in the post-COVID-19 times, tourism brands have had to adopt innovative and bold IT infrastructure and use broader technology scales. Technological and digital innovations are the future of tourism (Huang et al., 2016; Rao and Krantz, 2020a). Chat-bots, online bookings, and journey planners are already in place. Still, this sector is now looking forward to implementing virtual tourism, robot-based services, emotion monitoring, and the internet of everything technologies. This will define tourism in a completely different way. Many hotels already implement robots to provide hotel and housekeeping services to mitigate the human-to-human interaction (Afsarmanesh and Camarinha-Matos, 2000; Palmer and McCole, 2000).

Many researchers are putting forward creative ideas to reduce humans interaction in the tourism and travel industry to minimize losses. The refined keywords from the literature can address the study's objective more precisely. New standards of room cleaning, elevator operations, locks, switches, and other tactile objects will be regulated and reworked. Some researchers work on contact-free receptions and customer voice-operated complaint and suggestion books. Other IT techniques like artificial intelligence, deep learning, and machine learning will predict customer needs, mobility patterns, and behaviors. Recreational places where social distancing

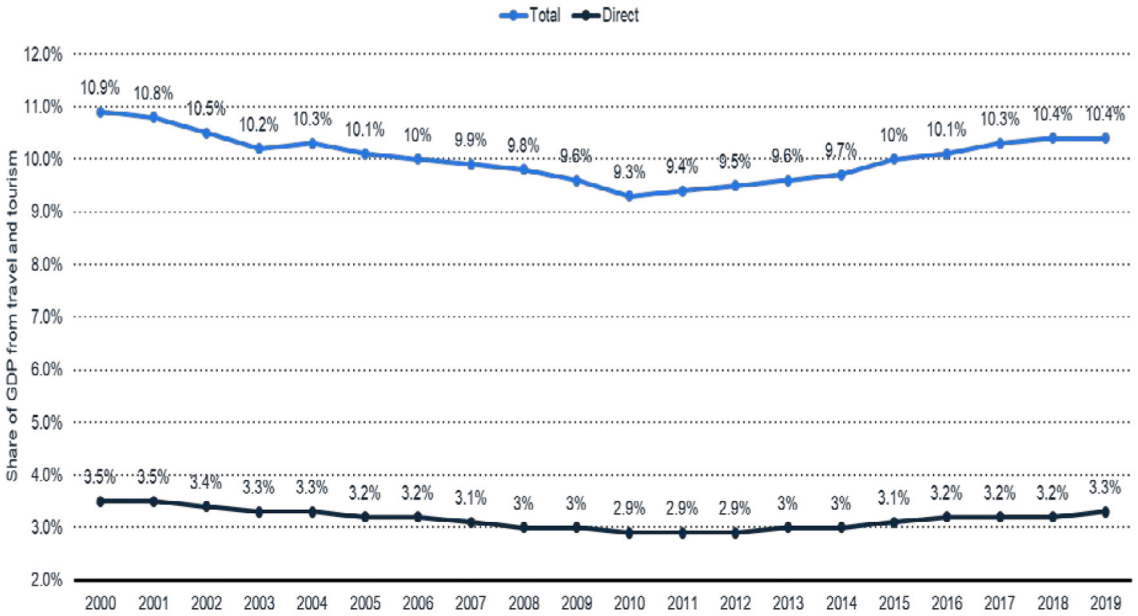

FIGURE 1 | Worldwide GDP share (travel and tourism industry). Data Source: (Statista, 2020a).

cannot be implemented effectively and the places that host many people will also be digitalized using augmented and virtual reality tours (Chirisa et al., 2020; Kwok and Koh, 2020).

Some researchers proposed VR techniques for unique travel experiences in the same scenario. The movement restrictions on the frequent travelers and tourists confined them to their homes; traveling is not currently an option now, and it is unknown if and when life will return to normal. The travelers will soon find the VR apps for their choice of destinations. VR-based traveling apps are as helpful in ordinary life as in covid-19 times. The travelers can check out their destination in 3D even before they arrive to avoid the hassle of airport requirements, tickets, and holiday arrangements (Bhuiyan et al., 2020; Rao and Krantz, 2020b; Sigala, 2020).

Figure 1 shows the worldwide GDP share of the travel and tourism industry from 2000 to 2019. Travel and tourism made a 3.3% direct contribution to the global gross domestic product in 2019, but it was stable at 3.2% from 2016 to 2018. The direct contribution to the travel and tourism industry's global gross domestic product was 10.9% in 2000 and 10.4% in 2019. The direct contribution refers to internal spending on travel and tourism.

Figure 2 presents the monthly hotel occupancy rate from Jan 2018 to May 2020. The impact of COVID-19 can be seen on the hotel occupancy. The results show that hotel occupancy has been dropped significantly due to travel restrictions. Europe hotel occupancy was declined by 82.3% in May 2020. Indonesia has faced the highest decline in tourist arrivals than other Asian Pacific nations.

Figure 3 shows the impact of COVID-19 on the different service sector industries.

RESEARCH METHODOLOGY

The current study was carried out during the pandemic period and at the height of COVID-19 with a strict worldwide lockdown situation. Therefore, the researchers used publicly accessible data to analyze the ongoing global recession based on national website data. The study's goal is to evaluate the adverse effects of COVID-19 on various industries, such as education, health, public services, and tourism. For evaluation purposes, the researcher performed the literature review, including reviews of books, journal articles, official websites, and encyclopedias that recorded the data for information dissemination (Hoque et al., 2020). These sources are considered secondary data utilized for analysis published in academic journals, historical records, government documents, and statistical databases. The current research focuses on keywords in the literature to conclude and establish the recommendations. We used a keyword search to address the study's objective and the concepts we found in the literature. The keywords are more refined for entire synonyms and acronyms from essential literature that can address the study's objective (Hoque et al., 2020).

RESULTS AND DISCUSSION

This section of the study entails analyzing and discussing previous literature. The literature shows that COVID-19 has significantly influenced all industries, including tourism, which is considered the worst-hit industry. The seriousness of COVID-19 increased in China significantly, and it has been observed that unrest is observed across the globe. The turbulence has increased rapidly due to fear of people exiting from their houses, and nearly all flights have been canceled worldwide. People have not

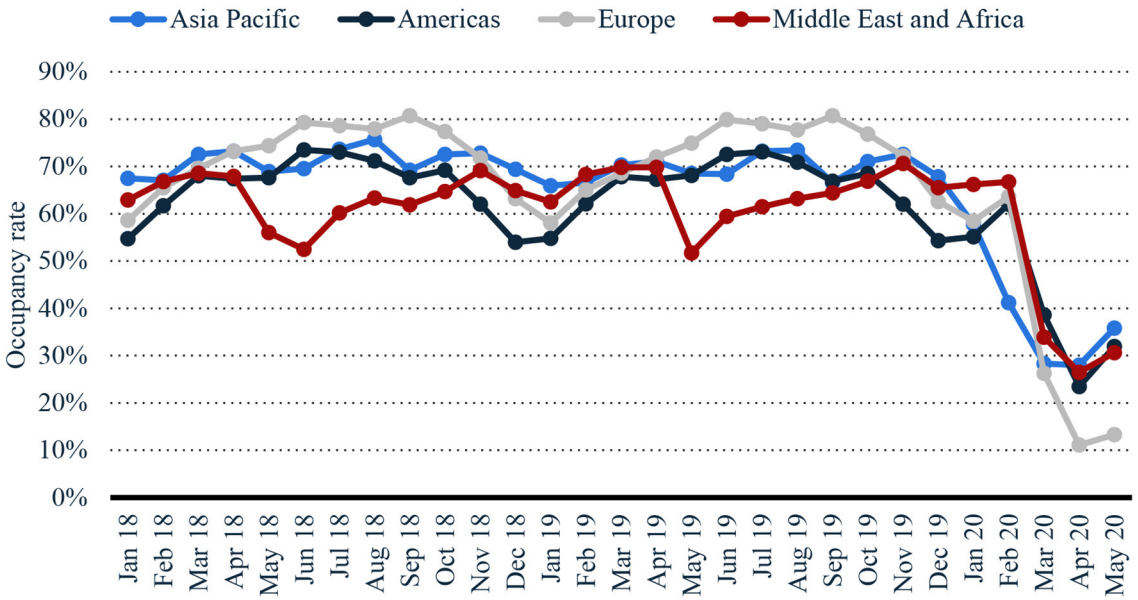

FIGURE 2 | Worldwide Monthly hotel occupancy rates (2018–2020). Data Source: (Statista, 2020b).

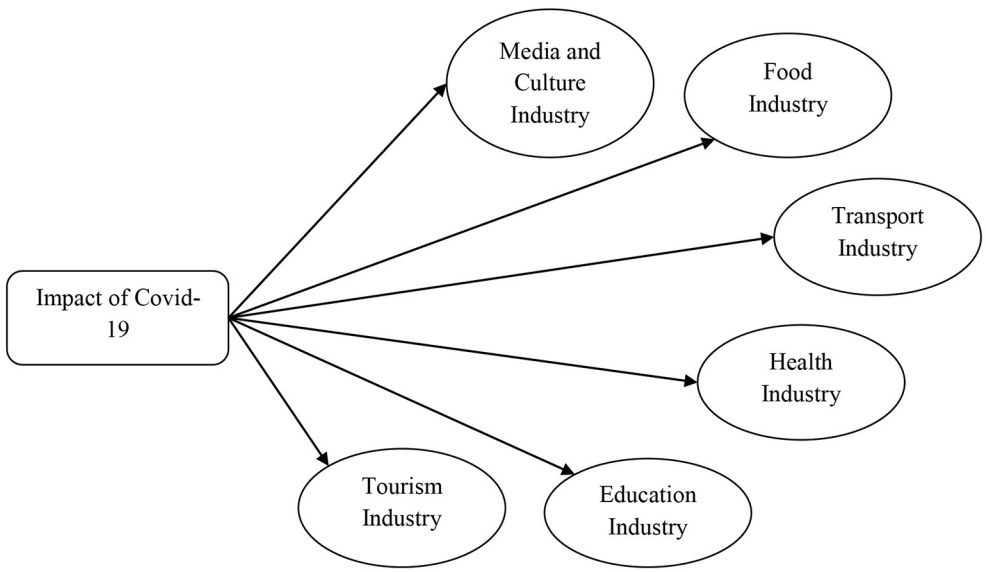

FIGURE 3 | Framework of the study.

been allowed and willing to leave their homes and go outside, and countries have placed restrictions on movement that affect associated industries. The tourism industry is the worst hit in China, as it depends upon people flying to China from the outside world. The current pandemic era has negatively affected the business sector. As stated in articles, the logistics, hotel, and airline industries have been severely damaged due to corona spread. Thus, it has been known that coronavirus has killed millions of people around the world and has devastated the tourism industry. It is predicted that the situation will last longer, as it has suspended outbound tourism. People all around the world are observed to be in terror of the coronavirus due to its severity and rapid spread. The whole environment has become infectious and dangerous for people. The social intermingling of people or social gatherings at public places contributes to the disease's large-scale spread. It has been observed that people worldwide have reduced or eliminated their relationships and contacts with the Chinese population and their businesses. Furthermore, people have reduced travel to China for tourism purposes, resulting in a substantial economic downturn.

On the other hand, Chinese people are prohibited from traveling outside the country due to the virus's harmful spread. Due to the current movement control situation, the whole population is stuck, and the hospitality industry has received the worst impact worldwide. The hotels and restaurants are empty due to the absence of customers. The transportation industry has also experienced a significant loss due to a lack of passengers. The overall economy has been negatively affected due to the emergence of COVID-19 globally, as the situation has become a worldwide pandemic (Hoque et al., 2020).

Previous literature analysis also shows that the emergence of the coronavirus has affected the tourism industry significantly and has become severe over time, and people have become afraid of each other. Hence, the government announced the lockdown and movement control to prevent the spread. Historical reports have identified that immediate contact with humans during December 2019 transmitted the virus locally, which caused a large spread. The virus has affected regular human life as the rate of infection has risen and it is locally transmitted. In China, people are in fear and avoid communication and business relationships with Chinese companies. The travel industry was also impacted due to the Chinese government's lockdown situation meant to prohibit the coronavirus spread. The coronavirus is considered a significant threat to the tourism industry since it has slowed down the economy and activity in various relevant sectors (Pastor, 2020).

There is no doubt that the futures of many businesses are uncertain now, as almost one-third of the world's businesses have suspended their operations. Businesses need financial stability to keep themselves up and running in the post-COVID-19 scenario. Similarly, the media industry is looking for sustainability and financial support to enable;e them to serve the world news, entertainment, and information. Along with this, amid the COVID-19 pandemic, the IT infrastructure supports the media industry. However, the pandemic has had such severe consequences that it is still not enough for their survival. More equipment and innovative IT adoption are required in the sector to run their operations. Information and communication techniques for validating news, creating content, and broadcasting still lack an IT infrastructure.

In the same way, the food industry, transport industry, health sector, education sector, and tourism still need to significantly innovate their IT infrastructures. All of the sectors and industries listed must involve digitalization and technology to respond to crises appropriately. Technology has been playing a prominent role in helping and maintaining frontier jobs. Technology has also reached the debatable stage; the pandemic has also defied the industrial and societal IT structure. The health sector's IT infrastructure is much more sophisticated than any other industry, but this sector is the most challenged one in this pandemic. There is thus still space for improvement, which indicates the gap in research and the consequent presence of opportunity. The decline of the restaurants and food industry during this pandemic also prompt the stakeholders to adopt the technology and digitization to respond more effectively. Likewise, the tourism industry is the most suppressed during this pandemic. It has to change significantly; researchers and engineers have been pitching their innovative ideas to be implemented in the tourism industry to sustain it both amid the pandemic and in post-COVID-19 times.

Amid the COVID-19 crises, many different countries use various technologies to support their businesses and economies and contain the virus. For monitoring the people, the Israeli government allowed their agencies to record and track their citizen's location for 30 days. South Korea, China, and Taiwan also use location-tracking services to limit virus transmission. Defiance of lockdown in different countries was also addressed using location-tracking technology, such as in Germany and Italy, where the user's data integrity laws are quite strict, and the technology is used to control the public gatherings and keep track of social distancing. The United Kingdom also uses mobile application technology for self-reporting of the symptoms. India and Pakistan launched similar applications that allow people to self-report the cases and danger and safe zone, and there is also an option for if someone might have met somebody who then later tested positive for COVID-19. Smart imaging, drones, and robotics are also used in China, Singapore, and Italy for various services.

DISCUSSION AND RECOMMENDATIONS

A country such as China has traditionally collected huge revenue from foreign tourism, ∼127.3 billion USD, but the number of tourists has been drastically reduced. Moreover, flights have been canceled and restricted put in place for travel to and from China from other parts of the world. Hence, tourist activities have decreased rapidly. Reports have been published on the loss that occurred in various industries due to COVID-19. It is reported that a similar situation will carry on, and the situation is expected to last for the next few months unless the complete remedy does not play its role. COVID-19 has affected several service industries such as tourism and hospitality, transportation, and restaurants. The government has have imposed a lockdown to avoid the significant spread of the virus. Due to considerable losses to multiple industries, worldwide, business operators have encouraged business operators to act and develop counter-strategies for businesses' survival by taking extra measures that have not been fruitful in avoiding or reducing the virus's spread. However, the tourism industry is currently at a standstill position in the face of these difficulties. The reduction in tourism has led to the loss of business for various industries and resulted in huge losses in these areas. Similarly, the situation has been observed, and we reported that the education industry, transportation industry, hotel, and restaurant industry have faced the worst economic hit due to COVID-19. The practitioners have suggested using information technology to avoid the threat.

The COVID-19 crises necessitate significant changes to the media and entertainment industry's conventional work industry. The potential solution for the media and entertainment industry to sustain the business and avoid economic collapse might not be good news for the free viewers. The local broadcasters have no other choice but to use paywalls on their content by collaborating with Apple, Facebook, and Google for revenue

sharing. Content monetization can be an excellent solution to sustain the business and attract benevolent donors. Meanwhile, deep learning and big data techniques can be monitored and useful in content automation.

Maintaining social distance levels is in line with the limitations placed on people's movement, and mass transit is strongly discouraged. Even after the COVID-19 pandemic, digital transformation could be the future of transport. Alongside the automated transport of cars, AI is also likely to be applied in a certain way in this sector using predictive transport analytical techniques. Autonomous distribution and dispatching operations with AI techniques are recommended to improve preventive steps.

COVID-19 affects the education sectors beyond the learning of students. The schools' closure put this industry at significant risk of unemployment and, at worst, complete school closure. To keep the education industry playing its role in educating the people and contributing to the world economy and employment, it is mandatory to revolutionize the education sector. Education revolution 4.0 is already equipping the education sector with technology and innovative learning ideas. The recent pandemic has provided a new direction to be included in the Education 4.0 scenario. Long-distance learning is not a new idea, but its vitality is acknowledged in this pandemic. Many solutions were put forth by the researchers and educationists. Global libraries, interactive learning applications, and other tools to support students, teachers, and parents are the future of the education sector, and these have to be seriously considered. Bloom and Book share are some very innovative solutions recently introduced to stay-at-home learning.

There is no doubt that the COVID-19 lockdown has ground the restaurants and hotel industries to a halt. These industries have equally felt the impact of COVID-19. Despite the difficulties facing this sector, the online ordering service supports the company to a degree. Like other industries, the food industry has also faced unprecedented conditions. The lack of IT infrastructures and the restricted use of technology has proven to be critical threats to the industry. However, this condition also leads researchers to digitize and innovate the food industry. The reinvention of the food sector based on the data mining techniques to know the customer needs can enhance trust. In a new environment where the customer is restricted from moving around and dining in the restaurants, the marketers must revolutionize themselves based on the IT infrastructure, such as through a robotic waiter service, AI, and CCTV to monitor the crowd, reserving the tables remotely can convert this challenge into an opportunity.

The tourism industry is working hard to plan for its recovery after the pandemic because, in the last 10 months, the tourism industry is on the verge of collapse. Tourism-based economies face the biggest challenge in their history. The efforts are placed toward the recovery of the tourism industry, keeping the strategies for social distancing and the tourists' safety. As discussed earlier, virtual and augmented reality are immersive solutions for the tourism industry. Only VR and AR can accelerate the travel and tourism industry's comeback. These technologies not only offer the solutions to overcome the outbreak challenge but also retain the enticement of tourists to travel in a virtual environment without being a victim of the virus and can act as the tentative getaway for the tourists who are not willing to travel unless the outbreak has decreased to a minimal level.

CONCLUSION

The education industry, health sector, public services, and tourism industry have faced the worst financial setbacks due to the present coronavirus. The airline industry, both at the international and domestic level, has been shut down, as most flights have been canceled due to insufficient passengers and movement control orders worldwide in different countries. The number of tourists and passengers has been rapidly reduced due to panic and the spread of disease. Companies are facing vital challenges around the world. Information technology can play a pivotal role in the firms' sustainability and growth. The government should support small–medium enterprises.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Looking Through the COVID-19 Window of Opportunity: Future Scenarios Arising From the COVID-19 Pandemic Across Five Case Study Sites

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The COVID-19 pandemic has caused (and continues to cause) severe disruption in global and local economies and has forced countries, societies, and individuals to adapt quickly to the unprecedented and unpredictable situations. Despite the obvious negative consequences of the pandemic, many have called for efforts to identify transformative opportunities for sustainable development throughout this disorderly time. In the present paper, we explore such potential opportunities in the context of an interdisciplinary, international research project, which is focusing on sustainable marine management in biosphere reserves and marine parks in Southeast Asia. During a virtual workshop conducted as part of the GCRF (Government's Global Challenges Research Fund) Blue Communities Project, future scenarios were developed depicting the potential effects of the COVID-19 pandemic on five case study sites. All of these sites are in areas of internationally recognized outstanding ecological value (Taka Bonerate Kepulauan-Selayar Biosphere Reserve, Indonesia; Tun Mustapha Park, Sabah, Malaysia; Palawan Biosphere Reserve, Philippines; North Devon Biosphere Reserve, United Kingdom; Cu Lao Cham-Hoi An Biosphere Reserve, Vietnam). At the macro-level, economies, governance structures, and societal norms are undergoing big changes. At the micro-level, the livelihoods, lifestyles, and backyards of local residents have to adapt. Collaboratively, we explored how COVID-19 posed challenges in our five case study sites, but we also focused on the potential COVID-19-related windows of opportunity for future sustainable development. Opportunities could be identified in all

three pillars of sustainable development: the environment, the society, and the economy. Although remarkable similarities can be found across all five sites, we conclude that there cannot be a "one-size-fits-all" solution to turn the tide toward achieving sustainable development. Just as before the pandemic, sustainable development starts with engaging with and understanding local environments, challenges, and situations; building on local knowledge; and developing tailor-made solutions for the communities *in situ*.

Keywords: scenarios, window of opportunity, COVID-19, sustainable development, Southeast Asia, coastal communities

INTRODUCTION

Windows of Opportunity

It has been argued that external events, such as natural disasters, or significant personal life changes, such as becoming a parent or moving house, provide windows of opportunity (Wood et al., 2005; Thogersen, 2012; Thomas et al., 2016) in which old habits can be discontinued and new habits can be established more easily (Verplanken et al., 2008). These windows can act as catalysts to change individual behaviors, such as consumption patterns (Schäfer et al., 2012), traffic mode choice (Thomas et al., 2016; Schmidt et al., 2021), and other environmentally relevant behaviors (Verplanken and Roy, 2016). Along the same lines, societies and organizational structures can be transformed by major disasters facilitating new laws to be established or peace processes to be set in motion as described in Birkmann et al. (2010).

The reason for this phenomenon is that habitual behavior is triggered by external cues, which may change or disappear during or after the disruption. In times when habits are (temporarily) disturbed, people have the opportunity to refocus on their values and intentions, as the drivers of their behavior. On those occasions, people are more sensitive to new information and information that is in line with their personal values (Schäfer et al., 2012; Verplanken and Roy, 2016). Similarly, in times of broader transition, contextual constraints and structures may change and allow for a period of adaptation and change. It is assumed that a window of opportunity can be up to 3 months long, indicating a temporal space for new habits or structures to be established (Verplanken and Roy, 2016).

We argue that COVID-19 might, despite the uncontested negative effects, have opened up such a window of opportunity (Schmidt et al., 2021). With a total of almost 151 million cases and over 3.1 million deaths (World Health Organization [WHO], 2020) across almost every country in the world (Guan et al., 2020), as of May 1, 2021, the latest data from the World Health Organization (WHO) confirm that the COVID-19 global pandemic has not abated yet. The pandemic has necessitated the alteration of many aspects of daily lives across the globe. Many governments introduced border closures and repeated, prolonged periods of lockdown, controlling the movement of people from their local districts, restricting almost all forms of direct physical contact outside the immediate family and closing of schools and other educational settings (Dwivedi et al., 2020). Nevertheless, the global responses toward the pandemic have not been well coordinated, with the policies of various governments being constantly in flux (Imtyaz et al., 2020). Global business activities have also been disrupted, causing what has been commented as a "cross-border economic disaster" (Ibn-Mohammed et al., 2020), with global supply chains, including for critical medical supplies and pharmaceuticals, being affected (Shih, 2020).

In many societies, the early impacts of prolonged periods of restrictions on normal activities have been observed to be wide-ranging. Some have pointed out that the mental health and well-being of many people have been, and will continue to be, adversely affected during this time of pandemic (Groarke et al., 2020; Serafini et al., 2020; Torales et al., 2020). Moreover, the pandemic is also predicted to cause the worsening of structural inequalities found in many societies and exacerbated the social risks of already-vulnerable groups (Blundell et al., 2020; Lambert et al., 2020; Sharma, 2020; United Nations Development Programme [UNDP], 2020; van Dorn et al., 2020).

In some areas, positive change could be observed as well. In recent months, fossil fuel emissions dropped significantly (Muhammad et al., 2020), less noise pollution was recorded in many cities around the world (Basu et al., 2021; Terry et al., 2021), and pressured ecosystems started to recover (Patterson Edward et al., 2021). Furthermore, changes in patterns of individual behavior have been observed (de Haas et al., 2020), and many forms of technological innovation that can improve our quality of life have been accelerating (Brem et al., 2020). These COVID-19-provoked transitions can be used as indicators to where sustainable change processes might be leveraged.

We now have the decision to relapse to our environmentally destructive investment patterns and activities or to "build back better" as stated in a recent document on policy responses on the Coronavirus by the Organisation for Economic Co-Operation and Development (OECD, 2020). So far, the build back better targets are formulated on a non-specific global scale, leaving smaller regions and local governments with the question of implementation. Given the limited time window we have, in which COVID-19 still keeps normality on hold, specific areas for positive sustainable change on a local level urgently need to be identified (Lambert et al., 2020).

The aim of this paper is to identify the challenges and windows of opportunity as well as leverage points for sustainable change processes across five case studies, using a future scenario

development approach. All five case studies (Taka Bonerate Kepulauan-Selayar Biosphere Reserve, Indonesia; Tun Mustapha Park, Sabah, Malaysia; Palawan Biosphere Reserve, Philippines; North Devon Biosphere Reserve, United Kingdom; and Cu Lao Cham-Hoi An Biosphere Reserve, Vietnam) are areas of internationally recognized outstanding ecological value and are part of the GCRF (Government's Global Challenges Research Fund) Blue Communities Project, described below. Four of the case study sites are located in South East Asia, representing areas of particular vulnerability to climate change-related pressures (Eckstein et al., 2019). One case study site is located in the United Kingdom, representing a Western counterpoint and compelling opportunity to discuss similarities and differences across geographical regions and cultures. The cultural, historical, and political differences between the European and the South East Asian case study are being considered in the interpretation and discussed.

GCRF Blue Communities and the Sustainable Development Goals (SDGs)

GCRF Blue Communities[1] is a project funded by the UK GCRF, in response to the call for "Growing Research Capability." Through academic–stakeholder collaborations, community co-creation, and co-delivery, the GCRF Blue Communities Project is supporting the development, implementation, and ongoing management of initiatives that promote the sustainable use of marine resources by multiple users. At the same time, it aims to protect the fragile marine ecosystems and support the livelihoods, food security, health, and well-being of the people in these coastal communities.

Within the GCRF Blue Communities Project, the research capabilities of the team are being increased through training and co-developed research with stakeholders in the case study areas. Interdisciplinary research is being applied to foster health and well-being, and protecting both human and ecosystem health, within the framework of the United Nations' (UN) SDGs. Particular focus is on the SDGs: SDG 1, no poverty; SDG 2, zero hunger; SDG 3, good health and well-being; and SDG 14, life below water. The UN's SDGs are an urgent call for action by all countries in a global partnership (UN)[2]. As highlighted by Lambert et al. (2020), the impact of the COVID-19 pandemic goes beyond health and well-being, potentially affecting society in many ways that underpin the UN SDGs. It is therefore key to identify not only the vulnerabilities and threats posed by the COVID-19 pandemic on societies, the environment and economies but also potential opportunities to build back better.

Scenarios as Way to Communicate and Connect to the Future

The human brain is wired to prioritize immediate futures and short-term time horizons (Gardner and Stern, 1996). This stands in conflict with sustainability as a concept that revolves around the long-term consequences of our current behavior (Pahl et al., 2014). To realize sustainability, we need an active dialogue between today and potential long- and short-term futures.

Future scenarios have been promoted as a way to render concrete links between the future and humans' present situations or actions, which may benefit the sustainability agenda (Boyko et al., 2012; Arnocky et al., 2014). Scenarios, in this sense, can be described as coherent descriptions of imagined futures deemed to be plausible. However, in most cases, the depicted futures are far away (end-of-century scenarios), on a global scale or in the form of complex biophysical predictions (Sheppard et al., 2011; Intergovernmental Panel on climate Change, 2014). These forms of scenarios are eligible within their discipline, but they do not meet the requirements for effective communication to overcome psychological distance or reactance (Kollmuss and Agyeman, 2002; Nicholson-Cole, 2005; Maibach et al., 2010; Moser and Dilling, 2011). One way to address such shortcomings is to include diverse perspectives in the scenario development and adapt the scenario design to the respective target audiences (Johnson et al., 2012). It has been demonstrated that the incorporation of such diverse inputs is best undertaken using a participatory approach with groups representing different, or sometimes, opposing perspectives (for instance in Hulse et al., 2004; Enfors et al., 2008; Kok et al., 2011).

Using a participatory approach can be useful for the development of more robust, effective, and representative future scenarios. Participatory scenarios can make the future more tangible by painting detailed pictures based on local references. Thereby, participatory scenario development can address a number of barriers such as the overwhelming scale of the problem, uncertainty, scientific abstraction, and the predominantly global nature of the available modeling and scenarios (Sheppard, 2008; Burch, 2010; Pahl et al., 2014). Potential downsides of participatory scenario development that need to be considered are a risk of poor comparability across different groups and the high subjectivity of the method (Kok et al., 2007). We need to be aware that the scenarios developed are based on personal perceptions and expectations and not a definite representation of the real world from a natural science perspective.

Alternative scenarios cannot only bridge the gaps between today and the future, but also between various stakeholders and community members. They have been claimed to be effective tools of communication as they are capable of engaging broad audiences and making complex systems more tangible (Chaudhury et al., 2013; Reed et al., 2013; Nygrén, 2019). Examples of co-created scenarios that have been used for strategic conversation between stakeholder groups, scientists, and policy makers are the UK National Ecosystem Assessment (NEA) Scenarios (Lead et al., 2010). Scenarios like these can help to identify important choices we need to make and further, illustrate the consequences of those choices for ecosystems, society, and the economy. Beyond the product, i.e., the scenarios as deliberate tools for decision making, the process of scenario development itself is valuable. It gives a voice to experts and non-experts and pushes them to think and communicate beyond their own discipline and peer group (Haines-Young et al., 2014).

[1] www.blue-communities.org

[2] https://sdgs.un.org/goals

Within GCRF Blue Communities, alternative future scenarios were developed for each case study site, which helped all involved researchers and stakeholders to familiarize themselves with the locations and to create springboards for sustainable development. However, to take into account the impacts of the unexpected COVID pandemic, these scenarios need to be revisited, and this is the focus of this paper.

MATERIALS AND METHODS

Process

The aim of the virtual workshop held in July 2020 during the GCRF Blue Communities' third Annual Meeting was to create five future scenarios to establish the potential impacts of the COVID-19 pandemic at each case study site (Taka Bonerate Kepulauan-Selayar Biosphere Reserve, Indonesia; Tun Mustapha Park, Sabah, Malaysia; Palawan Biosphere Reserve, Philippines; North Devon Biosphere Reserve, United Kingdom; and Cu Lao Cham-Hoi An Biosphere Reserve, Vietnam). Each case study team had already, together with their local stakeholders and community members, developed three alternative future scenarios looking approximately 10 years into the future (business-as-usual scenario (BAU), best-case scenario, and worst-case scenario) before the COVID pandemic hit (see **Supplementary Table 1**). These scenarios served as education and communication tools by GCRF Blue Communities' researchers, communities, and stakeholders.

The development of the COVID-19 scenarios took place in the form of group discussions held *via* Zoom. Compared to face-to-face interactions and workshops, virtual interactions have a number of advantages and disadvantages in regard to accessibility, equality, and engagement. For a project-related overview of this issue, please refer to Richter et al. (2021). Each case study was represented by researchers from different disciplines (n = 3–6 for each case study). The team members have been selected based on a history of close collaboration with the local communities and stakeholders in the case study sites. Directly involving stakeholders and community members has been considered but deemed not feasible due to unequal access to stable internet connections, COVID-19-related movement restrictions, and sensitivity considerations for local populations already experiencing economic and social pressures.

To set the scene, each GCRF Blue Communities case study team revisited their BAU scenario (approximately 5 min allocated). The original scenarios have been narrated from the perspective of a stereotypical local family experiencing future changes in 10 years' time. This is based on research by Pahl and Bauer (2013) looking at perspective-taking in the context of imagining the future. They found that perspective taking induces higher levels of behavioral intentions and engagement with the topic as compared to focusing on objective facts only. The COVID-19 scenarios are therefore narrated from the same perspective. Each case study team was placed in a breakout group and given 30 min in total to identify the changes and opportunities imposed by the COVID-19 pandemic at their case study site. With the BAU as orientation, the groups were able to identify the parts of the BAU scenarios that changed, positively as well as negatively, through the impact of the pandemic (approximately 15 min allocated). This alternative scenario development drew upon the existing knowledge about the case study site, insights into the current situation as well as continuous community and stakeholder communication that has been undertaken by the case study teams during the project. In the final 10 min of the breakout session, the case study teams identified which of these changes could be turned into opportunities for sustainable development, using the SDG subgoals as orientation. Once the breakout sessions ended, each team shared their COVID-19 scenario discussing similarities and differences between the case study sites. As an overall output, the teams developed five COVID-19 scenarios, representing the projected future of their case study site, approximately 10 years after the pandemic. Please refer to **Supplementary Table 1** for the details of the original BAU scenario, the alternative COVID-19 scenarios, and the identified opportunities. In the case of the United Kingdom, no BAU scenario has been co-developed before the pandemic. Instead, the workshop participants developed the Devon Biosphere Reserve BAU (before the workshop) as well as the Devon Biosphere Reserve COVID-19 scenario based on their expert knowledge of the area.

Materials

Due to positive experiences regarding connectivity, sound, and interactive features, Zoom was chosen as the online platform to connect the researchers across five countries. In two countries (the Philippines and Vietnam), the researchers were able to meet physically in one location, whereas all other participants joined individually from their offices or homes due to the COVID-19 movement restrictions. In terms of materials, each group had the documentation of their previously developed BAU scenario available. Further, the virtual workshop utilized flip charts, pens/markers, post-it notes, and a camera/mobile phone with a camera to facilitate discussions and person-to-person interaction as recommended in the study by Richter et al. (2021). The workshop was moderated by one of the UK-based researchers, documented by the project manager, and video-recorded for later reference.

Scenarios

The materials produced in the workshop are the session recording and transcript as well as flip charts and post-it notes, which were particularly extensive in the groups that were able to meet in person. These transcripts and notes were collectively synthesized after the workshop, supported by the recording (for a summary, see **Supplementary Table 1**). Each group developed one case study-specific alternative future scenario for the time approximately 10 years after the COVID-19 pandemic.

Palawan, the Philippines

Before COVID-19, agriculture, fisheries, and tourism were the primary economic activities in the province of Palawan. Especially the tourism sector was growing expeditiously and was expected to provide local employment as more tourists visited the island. Palawan has been ranked the number one travel

destination by Travel + Leisure magazine in their 2013, 2016, 2017, and 2020 edition.

During the COVID-19 pandemic, the link between tourism and agri-fisheries in Palawan became more evident. Tourism had been creating local income and employment because of the high demand for farm products and seafood. As tourism stands still due to the pandemic, farmers and fishers cannot sell their products and catch. This is aggravated by the restrictions on local travel because the products cannot be transported to the markets in Puerto Princesa or Manila.

Before this pandemic, Palawan's coastal communities exported fish and seafood to other parts of the country and abroad. The Philippines's popular and lucrative live reef fish export was mainly sourced from Palawan. The travel ban affected this important economic sector. As income decreases, food and other necessities cannot be bought anymore. Consequently, families that own the small local stores known as "Sari-Sari" lose their income as well.

Amid the unstable health and economic situation brought by the COVID-19 pandemic, we see opportunities for fisheries and agriculture as well. Children who have been studying in the city are staying home. Now, they help with the farming and fishing activities of their families. Through this experience, the young generations of Palaweños can relearn the lost skills and appreciate the importance of agriculture and fisheries for food security. Another opportunity potentially leading to long-term change on the island is that people start to explore selling their goods online. For the environment, the decrease in fishing and farming activities provides a unique chance to recover. For an overview over the key aspects of the COVID-19 scenario for Palawan (see **Figure 1**).

Tun Mustapha Park (TMP), Sabah, Malaysia

Before COVID-19, the rural communities produced agricultural products to sell them in nearby settlements in exchange of other essential products. One of the major disruptions during the movement control order is that rural and marginalized groups are now cut off from their access to essential foods such as rice, sugar, milk or cooking oil, reinforcing pressure on this group with already low income.

FIGURE 1 | COVID-19 scenario for Palawan. Illustration by Lina Ernst Illustrations.

Meanwhile, the influx of undocumented people from the Philippines and Indonesia has been a complex issue in Sabah for decades. The migrants have limited access to healthcare and education, as they do not possess the proper documentation. This limits their opportunities for formal employment, which further exacerbates poverty among the communities. In order to sustain their livelihood, some fishermen turn to illegal activities such as poaching or the use of destructive fishing methods. Government agencies argue that they lack the resources to handle the situation.

During the COVID-19 pandemic, the undocumented communities in TMP were heavily impacted by the lockdowns and movement control orders (MCOs). Confusion about the new laws created fear of going out to fish or getting essential supplies such as medicine, fuel, and freshwater. In addition, the limited awareness about how the virus transmits substantially increased the risk of the undocumented communities being hit by COVID-19. Not being able to pay for the hospital charges as well as the fear of being arrested kept the undocumented communities from seeking medical help. These unfortunate circumstances lead to an explosive rise of cases in Sabah, forcing the government to act. This can be interpreted as an opportunity arising from COVID-19: legal frameworks related to undocumented people and their access to basic facilities including education and healthcare services will be revisited and adjusted; social systems will be improved taking into consideration the health and well-being as well as equality of everyone.

Another opportunity is the higher levels of appreciation for nature within the population. Spending time in nature provides a remedy for stress and mental health issues. This combined with the reduction in (destructive) fishing activities provides a chance for fish stocks and other marine species to recover. Differences in recovery rates point to where marine protected areas would be appropriately located and offer the opportunity to strengthen measures to protect marine biodiversity for the long term. In addition, the pandemic prompted communities to adopt a more hygienic lifestyle to prevent the spread of the virus. For an overview over the key aspects of the COVID-19 scenario for Tun Mustapha Park (see **Figure 2**).

Cu Lao Cham Islands, Hoi An, Quang Nam, Vietnam

Before the COVID-19 pandemic, Cu Lao Cham was usually busy with tourists and visitors from all over the world. Hundreds of boats and canoes departed every day from the mainland in Hoi An, to bring thousands of people to the island. Tourism has generated many job opportunities and raised local people's income. The standard livelihoods have shifted from fishing to hospitality services. Homestays, restaurants, shops, and cafeterias have sprung up, and local people consider tourism services such as offering boat rides as a lucrative profession.

As a consequence of the COVID-19 pandemic, the government had imposed a national lockdown and social distancing. Some famous islands in Vietnam, including Cu Lao Cham, had to suspend all tourism operations. This implied

FIGURE 2 | COVID-19 scenario for Tun Mustapha Park. Illustration by Lina Ernst Illustrations.

FIGURE 3 | COVID-19 scenario for Cu Lao Cham. Illustration by Lina Ernst Illustrations.

that only shipments of goods and necessities for local people on the island were permitted; however, visiting the island for non-essential purposes was declared illegal. These restrictions caused severe consequences for the local population. Many people lost their jobs and income, children had to interrupt their education, and all schools were closed.

At the same time, people returned to traditional jobs such as fishing, net making, or forest leaf collecting to provide local self-supply. This made them independent from the mainland. Although the local people's income decreased significantly, they started appreciating the island in a less crowded state. They started living more harmonious and less pressured lifestyles. Traditional local culture experienced a comeback. Their increased value of nature and environmental conservation might provide an opportunity for the rise of slow tourism after the pandemic. This would bring less, but higher-quality tourism to the island, cause less pollution, and help the marine ecosystem in the waters surrounding the island to recover. For an overview of the key aspects of the COVID-19 scenario for Cu Lao Cham (see **Figure 3**).

Taka Bonerate Kepulauan Selayar Biosphere Reserve, Sulawesi, Indonesia

On the island of Selayar, destructive fishing practices are popular and were predicted to increase due to minimal monitoring and law enforcement before the COVID-19 pandemic. Coastal ecosystems, especially the coral reefs, were subject to heavy damage, impacting the livelihoods of fishers and gleaners who were forced to find alternative jobs. Moreover, forests on the island have increasingly been cleared to provide land for agriculture. Poverty, mental health problems, and criminal activities have been on the rise, especially within the male population, which often forced women toward taking on more responsibility.

The pandemic forced the business-as-usual activities to a halt. As a positive result, disturbances to local ecosystems have been significantly reduced, if only in the coastal areas. This provided a time of recovery for marine ecosystems, especially the coral reefs, acting as a "fish-stock replenishment time." The recovered fish stocks secure the catch for the local fishermen, and open the discussion for the implementation of no-catch zones or seasons on a governmental level. Many people are also learning new agricultural skills, planting staple foods in their backyards, which will be useful to support their economic self-sufficiency after the pandemic.

However, COVID-19 also created challenges especially related to the island becoming more self-sustained and separated from the mainland. The coastal communities will have to intensify gleaning activities, which will cause physical damage to sensitive ecosystems, such as coral reefs. Those who move inland will need more land to build living spaces and plant crops, resulting in deforestation. The restrictions on people's movements will put further stress on interpersonal relationships giving rise to domestic conflicts and violence. For an overview over the key aspects of the COVID-19 scenario for Selayar (see **Figure 4**).

North Devon Biosphere Reserve, Devon, United Kingdom

The North Devon Biosphere Reserve is a mainly rural area, and its natural beauty and unpolluted environment have attracted visitors from across the United Kingdom and beyond for decades. Before COVID-19, the main economic activities have been tourism and farming, but there was also some office and industrial employment. There have been many small businesses producing speciality products marketed to be of local origin. Restaurants often emphasized their use of local products. Environmental issues have been important to many local residents and tourists. Wages have been below the national average, but employment rates were high. Many households had some form of debt, such as a mortgage or business loan.

FIGURE 4 | COVID-19 scenario for Selayar. Illustration by Lina Ernst Illustrations.

FIGURE 5 | COVID-19 scenario for North Devon Biosphere Reserve. Illustration by Lina Ernst Illustrations.

As COVID-19 cases started to rise rapidly, a national lockdown in England was imposed during March 2020. All schools and non-essential workplaces were closed for several weeks or months. Tourism stopped completely, so many small businesses lost their income suddenly, without any opportunity to plan or manage implications. Some office workers struggled with working from home due to unstable internet connections in rural areas. Uncertainty and the threat of redundancy put a strain on many, especially those who saw their home at risk if they could not afford rent or mortgage payments. Food banks, which provide emergency help for those in need, saw a rise in demand. With schools closed, parents had to manage childcare and education. In the longer term, the pandemic will cause many businesses to fail, workers will be made redundant, and people will fall into debt.

However, there are opportunities too. Due to travel restrictions imposed by the government, people have been unable or reluctant to travel overseas; thus, domestic UK tourism is likely to increase. In North Devon, this can be marketed as green tourism, avoiding air travel and supporting small-scale local businesses. Money from tourism could be invested in local environmental improvement, in a virtuous cycle where the green credentials attract further tourism. Some business owners have found new markets, often online, and will be able to develop these. There is likely to be a long-term drop in commuting, leading to reductions in local air pollution. The lockdown experience has also changed personal relationships within families as the generations spent more time together, in many cases building a strong foundation for the children. Daily exercise regulations encouraged people to take time to enjoy the natural outdoor spaces, which has been reported to improve health and well-being as well as increase pro-environmental behaviors (Bratman et al., 2019; White et al., 2019; Martin et al., 2020). At times when there were limited provisions available, some people started to home-grow vegetables. For an overview of the key aspects of the COVID-19 scenario for North Devon Biosphere Reserve (see **Figure 5**).

DISCUSSION

Each case study site developed a comprehensive scenario describing future developments of how the three pillars of sustainable development, namely, the environment, the society, and the economy, are being shaped by the COVID-19 pandemic. Across the five scenarios, recurring themes have been identified such as the fate of the fisheries industry, the way people procure for their daily needs and health, changes in the ecosystems, and how the environment is perceived as well as the magnified role of the internet in communication activities. In addition, some themes occur that are unique for each of the respective locations.

Commonalities Across Scenarios

Across all five case study sites, there are several common themes. Economic impacts of the COVID-19 pandemic have been found to be a relevant issue in each case study site. Across scenarios, the restriction of movement and global travel bans had an immediate negative effect on global and local economies (Fotiadis et al., 2021): Many people have lost their source of income, and therefore, especially in the Southeast Asian case studies, struggled to provide the necessities for their families (OECD, 2021). In all five scenarios, this economic blow has forced people to take their focus away from international dependencies and toward local, self-sustained lifestyles, which might be a seminal trend. People are starting to grow their own food, collaborate more within their families and communities, or become tourists in their own country (Erokhin and Gao, 2020; Fan et al., 2021).

Marine and forest ecosystems have had the chance to recover during the national lockdowns, and nature reclaimed some space. Fish stocks are increasing from depleted levels, local water quality is improving, and the extent of litter has reduced due to the

break from human intrusion (Patterson Edward et al., 2021). In all five case study sites, some ecosystems have benefitted more than others.

Under the scenarios, together with ecosystem restoration come increased levels of nature appreciation (Pouso et al., 2021). People across all five case studies develop a recent feeling of gratitude for their environment as a space for comfort, pleasure, and social interaction.

Not only in our five case study sites, but certainly around the world, online activities replacing or compensating for face-to-face interactions have been rising abruptly. Almost all areas of life have been transferred to the virtual space in some form, be it for education, news, work, trade, leisure, or social interactions (De' et al., 2020). So far, this development has mostly been projected to be beneficial (Gabbiadini et al., 2020). It might, however, pose strains on mental health as well as interpersonal and human–nature connections in the future (Kuss et al., 2014; Dong et al., 2020).

Differences Between Scenarios

Tourism is being discussed as a key theme in all scenarios; however, different trends can be identified between the four South East Asian scenarios and the European scenario. In South East Asia, a region that heavily relies on international tourists, the international travel ban caused the loss of jobs and livelihoods of millions of people, the majority of whom do not have an economic safety net (Fotiadis et al., 2021). Local tourism only accounts for a small percentage of the total revenue and is therefore not able to offset the losses. In the UK scenario, local visitor numbers are rising as people are encouraged to make holidays within their own country and local businesses have the chance to expand. In our UK scenario, the North Devon Biosphere Reserve did not heavily rely on international travel before the pandemic and might therefore benefit from the international travel restrictions. These different trends indicate opposite trends that might emerge in the years after the pandemic. We can't predict with certainty how global and local tourism will develop after the pandemic, but in the Blue Communities COVID-19 scenarios as well as in the scenarios developed by Wassler and Fan (2021) concerns are being raised about a rebound of tourism during post-COVID-19 (termed as "revenge tourism"). Such "revenge travel" could potentially pose a shock to the environment and the communities. Opportunities for more conscientious and environmentally ethical travel and behavior of both local and international tourists need to be identified, some of which are described in this paper (e.g., slow tourism, eco-tourism).

Dynamics within families have been forced to change during and after the pandemic. Across our case study sites, these changes are perceived to be diverse and again following different trends. In some case studies (North Devon, Palawan), families seem to get closer and interactions and support across generations are increasing which is perceived as positive. In Selayar, the new family dynamics are reported to cause more domestic violence, as family members do not have the opportunity to spend time separately from each other. We assume that both phenomena, increased bonding, and increased violence, will occur across all five case study sites, potentially at varying rates, and cause lasting societal effects in interpersonal interaction (Evans et al., 2020). Observing these phenomena underlines the importance of an inclusive safety net for social and mental health services.

Unique Themes of Each Case Study Site

Each scenario contains at least one theme that appears to be unique for the particular case study.

In Palawan, this is the live reef food fish trade (LRFFT). For decades prior to the pandemic, about 60–70% of fishing communities were involved in LRFFT (Pomeroy et al., 2008). The economic benefits of this activity have been substantial. However, the unregulated, destructive fishing practices caused the radical decline of fish stocks and reef habitats. The ongoing pandemic has negatively affected the economic gains but has also provided an opportunity for the marine ecosystems to recover. In 10 years' time, LRFFT in Palawan will be back to the levels from before the pandemic. However, the Philippine government will also invest more funds in fisheries and aquaculture to support local food security and employment and thereby decrease illegal activities. Part of these investments will go into multispecies hatcheries across the country and into Community Fish Landing Centers (CFLCs) in strategic areas. The rise of digital channels for transactions and delivery services[3],[4] can already be observed today.

In Malaysia, the spread of COVID-19 among the undocumented communities is having serious repercussions on public health and well-being. This has prompted actions by the authorities to better acknowledge and regulate their presence. There is an opportunity for the current legal framework to be revised and improved taking into account the health and well-being of the undocumented communities. Furthermore, the educational information about COVID-19 conveyed to the coastal communities contributes to the increased awareness of the importance of practicing hygienic lifestyles. It is foreseen that there will be a remarkably improved access to basic facilities including education and healthcare for the whole population, including the undocumented communities. We also expect stable internet and access to reliable sources of information across the country, including remote coastal communities in 10 years' time.

In Vietnam, people came back to their traditional skills and livelihoods and realized the role of less tourists and natural systems. Local governments and residents have started to identify more sustainable livelihoods and improve their own resilience to cope with risks like a pandemic or climate change. Thus, the community learned to appreciate their less crowded island and recognize their own responsibilities in nature conservation. In 10 years' time, the Cham islands are likely to become a national brand in the context of community-based ecotourism, limiting for the number of tourists, protecting marine biodiversity, and engaging the community to say no to plastic pollution.

[3]https://www.bfar.da.gov.ph/

[4]http://pdp.neda.gov.ph/

In Indonesia, the communities living on the small island of Selayar have been forced to rely on subsistence agriculture activities to support themselves, if only temporarily. Nevertheless, the new agricultural skills obtained by fishers during this time of hardship may be beneficial to increase their resilience as it diversifies their source of nutrition and, potentially, income. It has to be acknowledged, however, that the environmental pressure on terrestrial ecosystems in small islands may not be able to support such shifts from coastal to terrestrial economic activities. In 10 years' time, should the reliance on the terrestrial ecosystem to provide daily sustenance to the local communities persist, land-use changes brought about by human activities may alter the landscape of the small island. Previously pristine tropical forests will be changed to farmyards, which will, inevitably, cause lasting damages to the ecological integrity of the islands terrestrial ecosystems. The migration away from the island will likely increase, risking the demographic profile on the island to be dominated by an aging population.

In the United Kingdom, there has been a move to working online (or a blend of online and face-to-face delivery) for the provision of education and many office-based employees. Some people have learned new technological skills, or started up new businesses from home, which they will be able to use in the future. In addition, regional businesses in the North Devon Biosphere Reserve have been able to benefit from a rise in national tourists and an increased awareness of local produce since the supply chain for some products was affected by the pandemic. In 10 years' time, the trend toward reduced commuting and more tourism from UK residents is likely to be maintained, as practices started during the pandemic are reinforced by the need to reduce the carbon emissions associated with travel. Residents who have discovered local outdoor spaces are likely to continue to visit these on a regular basis, increasing the footfall and visitor numbers in the natural environment.

Opportunities Arising From COVID-19 Scenarios

The abrupt interruption of business as usual around the world provides an opportunity for change. For the development of future management plans for sustainability, the scenarios created for this paper provide valuable insights and areas that can serve as springboards. These potential springboards differ between locations and situations and therefore need to be individually identified.

For sustainable marine management, the appropriateness of locations for marine protected areas should be reviewed, considering different local and national food security and conservation needs with and after the COVID-19 pandemic. The consequences of the suspension or reduction in fishing activities should be documented and used to identify species that benefit from seasonal pauses in fishing. Information like this can be used to feed into sustainable marine resource management in the future. Sources of plastic litter and other pollutants are changing rapidly, causing new long-term risks. This will need to be addressed, politically and on a behavioral level, especially in regard to the increasing amount of single-use plastics and personal protective equipment being littered (Silva et al., 2021). Human interactions have been undergoing strict restrictions, some of which will remain in place for the foreseeable future such as social distancing and the usage of face covering. Under these conditions of extended times of social isolation, easily accessible and inclusive measures to support human health and well-being are becoming more relevant. It already shows that people's mental, physical, and social health and well-being is suffering significantly, and further action is required (Pan et al., 2014). These are just a few examples of how abrupt interruptions identified in this paper can feed into long-term management solutions and thereby mitigate newly arising risk factors as well as utilize newly arising opportunities.

Limitations and Concerns

Since the COVID-19 situation has been uncertain and continuously changing, the discussions that we had during the annual meeting in July 2020 might not be completely timely anymore. Furthermore, no comprehensive empirical research was conducted to investigate the situation following the COVID-19 pandemic in all study sites. The scenarios are therefore not an objective representation of the current situation. Instead, they are a product of timely expert knowledge, experiences, and perceptions provided by local partners, researchers, and stakeholders. Despite all scenarios being built around the principles of sustainable development, each area has different priorities due to individual, biological, social, and political circumstances.

CONCLUSION

The pandemic has provided a moment to stop, think, and potentially reset current practices. It is possible to make use of this window of opportunity and "build back better" (OECD, 2020). COVID-19 can lead society and individuals into a gloomy future, which is shaped by increasing amounts of poverty, desperate over-exploitation of ecosystems in order to survive as well as social distance, plastic waste, and poor physical and mental health. Our future scenario exploration suggests that COVID-19 can also enable a future that is characterized by independent small communities, less carbon emissions, newly announced nature reserves, sustainable and local harvest, and strong family bonds. Most opportunities described in this work are observed and reflected at the community level. On the governmental level, potential change might include reprioritization of existing policies that emphasize biodiversity recovery and the connectedness of humans with nature; it might include facilitating the diversification of livelihood options such as creating *additional* livelihoods rather than *alternative* livelihoods. Change might be reflected in a newly created dialogue beyond national boundaries with regard to human

rights and migration. It will be key to find a sustainable balance between bringing income to the local communities again and protecting fragile ecosystems that just started to recover; this could potentially be accomplished with a future focus on slow tourism and the introduction of more systematic rest periods for fishing (Conway and Timms, 2010; Kroner et al., 2021).

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

IR conceptualized the manuscript idea, developed the outline, and led the workshop. MA was leading the GCRF Blue Communities project and supervises all collaborations. All other authors contributed equally to the co-creation of this final version of this manuscript in a highly collaborative effort. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.635686/full#supplementary-material

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Job Insecurity, Work-Related Flow, and Financial Anxiety in the Midst of COVID-19 Pandemic and Economic Downturn

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During the COVID-19 pandemic, every domain of industry has experienced a severe economic downturn with concomitant stress throughout the economy. Employees working in government and private sectors are experiencing different psychological problems. The current study was conducted to investigate the role of work-related flow in the relationship of job insecurity with financial anxiety in the employees working in private and government sectors of Saudi Arabia. The sample comprised 1,195 employees, 886 females, and 309 males. The participants' ages ranged from 25 to 60 years. The Financial Anxiety Scale, Work-Related Flow Inventory, and Qualitative Job Insecurity Measures were found valid and reliable. Structural equation modeling was applied to test the associations. As hypothesized, the results indicated that job insecurity was positively related to financial anxiety, work-related flow was negatively associated with financial anxiety, and work-related flow mediated the relationship between job insecurity and financial anxiety. All these associations were significant regardless of gender, age, marital status, sector of employment, income, self-rated health, and COVID-19 infection status. Further research is needed to understand the impact of job insecurity on financial anxiety in-depth through the paths of work-related flow, especially in the midst of COVID-19.

Keywords: COVID-19, job insecurity, financial anxiety, work-related flow, Saudi Arabia

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INTRODUCTION

The current situation of the novel coronavirus 2019 (COVID-19) pandemic has increased levels of anxiety and depression in individuals (U.S. Census Bureau, 2020). The emergence of anxiety has been shown to be due to the pandemic's negative impacts on the economy and workforce. Concerning the transmission of COVID-19, some recommendations are given by different health organizations regarding social distancing to reduce the spread of virus, which has directly or indirectly affected businesses. These health organizations recommended closing unnecessary businesses. Even developed countries have faced economic downturn, i.e., the U.S.A. employment rate fell enormously, and over 41 million Americans became unemployed between February and May 2020 (Congressional Budget Office, 2020). Likewise, Saudi Arabia faced problems in economic productivity; the unemployment rate hit 15.4% by September 2020 (Barbuscia, 2020).

When COVID-19 was declared a pandemic, there was a significant fall in economic growth globally. Likewise, unemployment in the U.S.A. increased by 1.4 million people

(U.S. Bureau of Labor Statistics, 2020). A further 33% of Americans reported that they had lost their jobs due to COVID-19 (Forbes and Krueger, 2019). The records reveal that by mid-April in 2020, the unemployment rate was significantly greater, the highest since the Great Depression (U.S. Bureau of Labor Statistics, 2020). So, due to this unfamiliar and unprecedented pandemic, the sharp declines in economic activity and employment highlight the likelihood of significant job insecurity and financial anxiety. These may have contributed to the increased anxiety in young, employed people, and even affected their efficiency in and pleasure at their work tasks/activities. Forbes and Krueger (2019) report that individual motivation toward work tasks/activities has decreased. Because COVID-19 has become prevalent everywhere and economic crises have arisen, it is necessary to study the impacts of COVID-19 on individual mental health. With the sharp economic decline, employees can experience job insecurity and can be troubled about their finances (U.S. Census Bureau, 2020).

Some studies have claimed that perceptions of job insecurity may have impact on financial anxiety of employees. Choi et al. (2020) investigated the links between job insecurity and financial stress and reported that job insecurity was related to financial stress through financial well-being. In the context of corona pandemic, another study found that job insecurity due to COVID was associated with psychological well-being through financial stress (Sarwar et al., 2021). Moreover, job insecurity was found to impact on mental health of employees. Wilson et al. (2020) found that job insecurity due to COVID increased depressive symptoms among employees. Similarly, it was revealed in Europe that increased job insecurity was related to lower vitality (Rajani et al., 2016).

The positive psychology field has paid attention on what makes employees flourish and major concepts in positive organizational behavior are engagement and flow (Bakker and Schaufeli, 2008). These positive concepts have been found to broaden employees' behavioral repertoire, resources, and skills that make them more resilient when coping with adversity (Fredrickson, 1998). Despite these positive benefits of work-related flow for employees in challenging times, no studies have investigated how work-related flow might impact well-being of employees in the midst of COVID-19. Wang et al. (2015) explored the factors affecting employee job performance. They examined the relationship between job insecurity and employee performance, as employee performance depends on work-related flow. Their results indicated that low levels of performance were present among employees who had insecure jobs. As a result, this study deals with the relationship between job insecurity and financial anxiety and aims to discover the mediating effect of work-related flow.

LITERATURE REVIEW

Job Insecurity

Job insecurity was first described in the 1980s. A person's perception was related to a sense of powerlessness regarding their threatened job (Greenhalgh and Rosenblatt, 1984). Quantitatively, job insecurity is perceived as a threat for a job as a whole (De Witte, 1999; Sverke and Hellgren, 2002), whereas qualitatively it is considered as a perceptual threat to the job's domain. Specifically, job insecurity as a qualitative experience is denoted as "threats of impaired quality in the employment relationship" (Hellgren et al., 1999). Job insecurity has various key elements such as the experience of a perceived threat, and emphasis on one's perception, and feeling that one's job conditions and security are at risk. However, job insecurity does not include expectations regarding security and involuntary threats. This distinguishes job insecurity from potential antecedents, consequences, moderators, and criticism considered by many authors (Probst, 2003; Elst et al., 2012). This construct comprises a particular continuum extending from insecure to secure where employees claim to experience job security in conditions of unthreatened, perceived continuity, and balance between a job's demands and skills. This continuum explains that job insecurity is a global construct; it does not cover only quantitative or qualitative components.

This construct of the job insecurity continuum highlights the concept of job insecurity, so it can be understood. Firstly, job insecurity is about an employee's subjective experience (De Witte, 1999). This experience comprises perceptions, although coherency is present with most conceptualizations. Job insecurity contrasts with job positions that are objectively insecure, such as jobs for temporary workers, and those subject to objective organizational circumstance such as layoffs. When considering the subjective nature of job insecurity, it is noteworthy that two employees experiencing the same objective situation may perceive different levels of job insecurity (Vuuren et al., 1991). Secondly, the notion of threat signifies job insecurity as a future-focused experience. Job insecurity denotes that an event is forecast, specifically one which can result in loss and which might occur at any time in the future. Hence, not all job-related events develop job insecurity, but only those that involve the constituents of potential harm or loss (Folkman and Lazarus, 1985; Boswell et al., 2014), because threats are considered as perceptual, whereas job insecurity involves uncertainty (De Witte, 1999; Sverke et al., 2002; Probst, 2003). Hence, job insecurity explains the intricacies of individuals' perception and their responding relationship to elements of job loss (Greenhalgh and Rosenblatt, 1984) in contradiction to the actual job or job loss elements. Finally, the job's stability and continuity are threatened by job insecurity (De Witte, 1999; Probst, 2003). This differentiates job insecurity from related other constructs, like employability, which considers an employee's perceived ability to get a new job due to their having skills related to job demands and knowledge regarding the market (De Cuyper et al., 2008).

When unemployment figures rise in countries for periods, job insecurity is considered to be the greatest fear among workers (Keim et al., 2014) and a stressor for workers in their working environment (Greenhalgh and Rosenblatt, 1984). And as job insecurity creates stress in employees, the examination of it reveals negative consequences for workers' well-being and mental health (Cheng and Chan, 2000; De Witte et al., 2016; Lee et al., 2018; Llosa et al., 2018), and significant links with depressive disorders (Blom et al., 2015; Kim et al., 2017) and anxiety too (Boya et al., 2008).

Work-Related Flow

When an individual completely concentrates on a task/activity, they start experiencing what is called "flow," i.e., absorption in the present time, reaches a peak where the individual becomes unaware of their personal needs and forgets their surrounding environment. Mihali Csikszentmihalyi first recognized this construct during the 1970s (Chen, 2007). The state of flow occurs within a specific zone (Chen, 2007). According to Nakamura and Csikszentmihalyi (2002), the state of flow can even bring happiness to a person's life because its effect makes them aware of a previously unknown route to happiness. A person must know about the necessary conditions for achieving the state of psychological flow, so they can successfully create the conditions for it. This construct has evolved through several refinements related to real-world states and their dynamics, and from there, the flow concept has become embedded.

A wide range of work is included within Maslow and Rogers' humanistic perspectives (McAdams, 1990). Later, Privette (1983) introduced the concept of peak performance. A performance was counted as such an episode if superior human functioning emerged within it. Further empirical literature has found that work-related flow is part of intrinsic motivation and what an individual is interested in Deci and Ryan (1985) and Renninger et al. (1992).

Three significant elements of flow are common to definitions of flow in any sort of activity: absorption, immersion in task/activity, intrinsic motivation, and enjoyment. In flow research, these three elements are considered as core components (Csikszentmihalyi and Csikszentmihalyi, 1988; Csikszentmihalyi, 1997). According to Csikszentmihalyi and Csikszentmihalyi (1988), work-related flow refers to those experiences in which an individual becomes fully engaged in a controllable situation, which involves challenging or difficult tasks/activities requiring some skill, and for which the individual is fully motivated and focused on their intrinsic factors. Self-awareness vanishes when a person is involved in such an intrinsically motivated task, and surprisingly the sense of self emerges and increases when the task is complete. During work-related flow experiences, an individual's time perception alters. The person realizes that hours seem like minutes, and when an individual does not achieve work-related flow, the opposite perceptual effects can occur (Carr, 2004).

Massimini and Carli (1988) suggested that experiencing flow requires unification between a challenging task and the required skills above a critical threshold. To remain in the flow, it is necessary to increase the task/activity's complexity by creating new challenges and skills (Csikszentmihalyi and Csikszentmihalyi, 1988). Employee capabilities and competencies should be matched with their job responsibilities, so they are likely to engage in work-related flow for a longer period (Lu, 1999). Larson (1988) claimed it is necessary to continue balancing challenging tasks/activities and competencies to an increasingly complex level as that develops growth and the discovery of personal capabilities. Work-related flow is a peak experience that helps the person to fulfill their potential (Percival et al., 2003).

When employees apply this flow state in their work, it can be considered as a short peak experience at work, that comprises absorption, work enjoyment, and an intrinsic state of work motivation (Bakker et al., 2005). Absorption has been explored as a state in which employees have full concentration on their work-related tasks/activities, and simultaneously experience short-term peak experiences. Many employees report that when they do their work in a state of flow, their time at work passes quickly, they lose interest in their surroundings and become involved in their tasks/activities (Csikszentmihalyi, 1990). Those employees who do their work with pleasure, and experience enjoyment in doing it, make positive judgments and decisions regarding their job situations and career (Veenhoven, 1984). Basically, their enjoyment and pleasurable states are consequences of affective and cognitive evaluations of work-flow experiences (Diener and Diener, 1996; Diener, 2000). Eventually, researchers discussed employee intrinsic motivation as the performance in certain work situations/job activities which resulted in experiences of pleasure, enjoyment, and satisfaction in the task/activity (Deci and Ryan, 1985). Employees who have intrinsic motivation toward their work experience interest and flow in their work (Harackiewicz and Elliot, 1998). Employees who work because of their intrinsic motivation in their work/tasks, mostly continue working because they are fascinated their office tasks/activities.

Different theories found in the existing literature suggest that the individual's task/activity should be neither too challenging nor too easy (Nakamura and Csikszentmihalyi, 2002). Simple tasks/activities do not create engrossment, and the individual is unable to achieve the work-related state of flow. When a person has a difficult task/activity, they will probably face problems in maintaining attention. This further affects the individual's attention and motivation, and consequently, they will have difficulty, discomfort, and lack of ease in handling the job and will not experience work-related flow (Chen, 2007). Csikszentmihalyi's (1997) experience in sampling studies has shown that people more often experience flow during their work than during their free time. This means that one has to invest time and energy to experience flow. Researchers generally agree that the occurrence of flow is most likely when people perceive a balance between the challenge of a situation and their skills in dealing with this challenge (e.g., Massimini and Carli, 1988; Csikszentmihalyi, 1990; Clarke and Haworth, 1994; Ellis et al., 1994).

Rogers (1980) introduced the construct of the "fully functioning person," which seems to link with the concept of the autotelic personality (Csikszentmihalyi, 1990). According to Csikszentmihalyi (1997), an individual's personality type suggests the likelihood of their flow state. Autotelic personality-type individuals tend to maintain flow, because the autotelic personality has traits related to an internal drive and exhibits elements related to purpose and curiousness. Asakawa (2004) claims that individuals having autotelic personalities have more tendency to experience the flow state more easily than other types.

Financial Anxiety

Financial anxiety is a recently emerging topic for researchers in the domains of financial planning, financial therapy, and

financial counseling. The term "financial anxiety" refers to anxious feelings or specific worry due to a disturbance of one's financial situation (Archuleta et al., 2013). A few researchers have formalized financial anxiety by adapting criteria about anxiousness, irritability, difficulty in controlling worry, sleeping problems, concentration issues at work or school, muscle spasm or tension, and fatigue that are outlined in the Diagnostic and Statistical Manual of Mental Disorders-IV-TR for the Generalized Anxiety Disorder (American Psychiatric Association, 2000). These criteria also apply to an individual's financial situation (Archuleta et al., 2013). Financial anxiety has been considered as a syndrome consisting of psychosocial factors, the presence of which causes an individual to feel uneasy and stressed toward their finances. In the administration of personal finances, such an individual demonstrates unhealthy attitudes (Burchell, 2003).

The American Psychological Association (2015) investigated stress in the American population. Their results indicated that a majority of Americans had some degree of anxiety-related issues. According to the survey conducted in the U.S.A., the most common source of anxiety was money, followed by work and the economy. The survey results showed that people with good jobs were better at managing their financial anxiety. Approximately 25% of respondents reported that they had experienced extreme stress about money. Some participants even reported putting their medical care demands on hold due to financial concerns or money issues (American Psychological Association, 2015). Management of financial anxiety was also explored. A significant number of people reported that they tried to manage their financial anxiety by reading some books, or spending time socializing with others, their friends and family, walking, or exercising. Different research studies have been carried out, in which the overall construct of financial anxiety was measured by using subjective evaluations (Archuleta et al., 2013).

Due to job insecurity, various individuals experience financial anxiety and have deep concerns because of COVID1-19's impacts. Keeter's (2020) research shows that most employees have experienced pay cuts and that nearly 49% of Americans report that the pandemic is a major threat to their finances. Of the respondents reporting much anxiety about their finances, 57% reported medium to high levels of psychological issues and distress, anxiety, and depression.

Dijkstra-Kersten et al. (2015) indicated that financial stress has been accompanied by anxiety and depressive disorder, even for managing the income for household tasks/activities. Researchers have further argued that lifestyle adjustment problems deriving from financial problems are significantly linked to psychological well-being (Marjanovic et al., 2015; Fiksenbaum et al., 2017). Fiksenbaum et al. (2017) found that greater economic hardship can be experienced as job insecurity associated with increased anxiety regarding finances. At present, many individuals experience job insecurity due to the COVID-19 pandemic's negative consequences. They report financial anxiety and concerns about finances too. In the current prevalent situation, the huge unemployment rate and many closed businesses have raised employee job insecurity, and their financial anxiety seems to be significantly higher.

The previous literature suggests that job insecurity and financial anxiety are significantly linked; job insecurity and work-related flow have also been examined. No study indicates the relationship between job insecurity, work-related flow, and financial anxiety. This current study will focus on the predictive effect of work-related flow on job insecurity and financial anxiety and also examine the relationship between those variables.

Having job insecurity is linked with inefficient wage models. Employees have more chance of being dismissed in insecure jobs. Consequently, they are less motivated in their work, and their work-related flow decreases. The literature suggests that insecure employees regard their jobs are less productive than secure employees. Those employees who retain their jobs also experience job insecurity; they experience more than relief. In the U.S.A., Doherty and Horsted (1995) surveyed 170 employees working in financial services when many major employers were downsizing their employees with involuntary redundancy programs. They found increased levels of stress, anger, skepticism and bitterness, and decreased levels of work-related flow, motivation, morale, confidence, and loyalty to their organizations. Hallier and Lyon (1996) studied managers facing the threat of redundancy. Forty-two employees were selected for qualitative interviews. Five semi-structured interviews were carried out with each employee over 12 months. The initial interviews were done when the employees were informed about their redundancy. They experience widespread shock, despite being aware of the redundancy program. Feelings of bitterness, low work-related flow, and decreased motivation were found, and they had less trust in the employer.

The outbreak of COVID-19 pandemic has led to loss of many jobs and this has increased job insecurity among employees. In turn, this might have impacted the work-related flow and financial anxiety of employees. This theoretical framework is displayed in **Figure 1**.

With regard to the theoretical and empirical evidence, the following hypothesis were tested:

Hypothesis 1: Job insecurity will be positively associated to financial anxiety

Hypothesis 2: Work-related flow will be negatively associated with financial anxiety

Hypothesis 3: The association between job insecurity and financial anxiety will be mediated by work-related flow

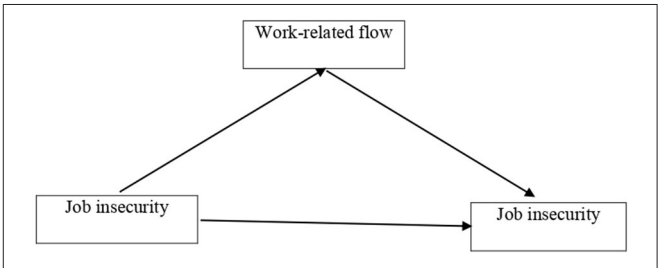

FIGURE 1 | Conceptual model. Covariates: gender, age, marital status, income, SRH, and COVID infection status.

METHOD

Study Design and Sample

Different quantitative research-based techniques were used in the current study, which was conducted in a correlational structure. There were 1,195 participants involved in the study. The research was conducted using a purposive probability sampling technique. Employees of government and private sectors working in Saudi Arabia were selected as research participants. The participant age range was 25–60 years ($M = 40.2$, $SD = 9.35$), with more females (74.1%) than males. Regarding age, the modal category was middle-aged between 36 and 45 years (42.7%), and for the sector, the majority worked in the government (84.5%).

Measures

Demographic Form

This form included the personal question for the study sample. The questions related to the participant's age, gender, education, employment status, and employment sector.

Financial Anxiety Scale

Financial anxiety was assessed by using the Financial Anxiety Scale (FAS). This scale was developed by Archuleta et al. (2013) by adapting Generalized Anxiety Disorder diagnostic criteria set forth by DSM-IV-TR (American Psychiatric Association, 2000) to a financial situation. Generalized Anxiety Disorder is characterized by excessive anxiety or worry that occurs for 6 months or longer about events or activities. This scale comprises seven items on a 7-point Likert-type scale, ranging from 1 (never) to 7 (always). Factor loadings for the scale achieved 0.72 and above, which showed its good construct validity. Internal reliability, using Cronbach's alpha, was also found to be high ($\alpha = 0.94$).

Work-Related Flow Inventory

This inventory was developed by Bakker (2008) and consists of three factors: absorption, work enjoyment, and intrinsic motivation. The inventory comprises 13 items using a 7-point Likert-type scale, ranging from 1 (never) to 7 (always). Internal consistency of scale ranged between 0.96 and 0.75. The sample's test-retest reliability was found to be good, with stability coefficients of 0.75.

Qualitative Job Insecurity Measure

This scale was developed by Blotenberg and Richter (2020) and comprises 11 items and a 5-point Likert-type scale. The responses range from 1 (totally disagree) to 5 (totally agree). Internal reliability of the items was excellent and had Cronbach's α of 0.94.

Procedures

Before the data collection, the researcher mailed the authors of the scales used in the present study to get permission for their use. Then the researcher translated the scales into Arabic and later invited employees by email and social media to participate in an online questionnaire. The invitation informed the employees about the study's aim and stated that their participation was voluntary and that they could end their participation at any time. The researcher also contacted the relevant public and private employer sectors seeking formal permission from their heads. Informed consent was obtained from the employee participants, and the researcher explained the study's aim and purpose. Their confidentiality and anonymity were ensured. They were instructed to be honest while responding to the items of the scales. Permissions to conduct this study were obtained from the Umm Al-Qura University in Saudi Arabia. In order to ensure the accuracy and originality of items, translation and back translation methods were employed with three experts in the field.

RESULTS

This study sought to investigate the relationship between job insecurity (JINS), work-related flow (WOLF), and financial anxiety (FAS). To achieve this, the data was collected using a Likert-scale-based structured questionnaire, and a total of 1,195 questionnaires were collected. Using G*Power, this sample size corresponded to a sampling power of 0.982, which according to Wywial (2015) and Kyriazos (2018) was more than the minimum prescribed power of 0.80. Alternatively, using the Kaiser criterion of 1 item: 15 observations, the minimum required sample for 31 items (JI−11; FA−7, and WOLF−13) was 465 (Oakshott, 2012). In this regard, it can be confirmed that the data collected was a good sample. The R statistical software (Ihaka and Gentleman, 1996) was used to analyze the data, and several statistical techniques were applied. Construct validity and reliability were done first, followed by the testing of the hypotheses.

Reliability and Validity Testing

This study investigated three broad constructs, that is Job Insecurity (JINS), Financial Anxiety (FAS), and the Work-Related Flow (WOLF). WOLF was a latent variable measured by three sub-constructs, namely, absorption (ABS), work enjoyment (WE), and intrinsic work motivation (IWM). Nevertheless, prior to their use in testing the study hypotheses, construct reliability, and construct validity were tested as prescribed by Blunch (2016) and Harrington (2017). The Cronbach alpha was used to test for reliability. According to Field (2018), the minimum acceptable threshold for reliability considered is 0.70. The lowest alpha was for absorption ($\alpha ABS = 0.745$), and since this alpha and the others were all >0.70, which meant that the constructs were internally consistent and reliable. The results are summarized in **Table 1**.

Construct validity was tested using both convergent validity and discriminant validity. The Average Variance Explained (AVE) measured the convergent validity, the minimum threshold of which is 0.60 (Harrington, 2017). Since none of the construct AVEs were <0.60, the minimum being 0.893, convergent validity was not violated. For discriminant validity, the heterotrait-monotrait (HTMT) ratio was computed, and according to Beaujean (2014), its maximum tolerable threshold was 0.85. None of the constructs had an HTMT >0.85, and, therefore, discriminant validity was not violated. Overall, the constructs used in this study were confirmed to be both reliable and valid.

TABLE 1 | Construct reliability and validity.

					HTMT				
	Items	**Alpha**	**AVE**	**MaxR**	**MSV**	**JINS**	**FAS**	**IWM**	**WE**	**ABS**
JINS	13	0.908	0.893	0.989	0.444	1				
FAS	7	0.956	0.902	0.985	0.141	0.062*	1			
IWM	5	0.824	0.911	0.982	0.303	0.295**	0.376**	1		
WE	4	0.836	0.929	0.982	0.339	0.532**	0.082**	0.551**	1	
ABS	4	0.745	0.902	0.975	0.444	0.666**	0.100**	0.492**	0.582**	1

$^{**}p < 0.01$ and $^{*}p < 0.05$.

TABLE 2 | Socio-demographic characteristics of the sample and mean of FAS per category.

Variables	***n***	**%**	**Mean (*SD*)**	**Mean (*SD*) of FAS**	***p***
Financial anxiety	1,195		21.8 (13.3)		
Job insecurity	1,195		26.05 (11.1)		
Work related flow	1,195		57.1 (16.6)		
Age	1,195		40.2 (9.35)		
Gender					0.03
Male	309	25.9		21.38 (13.2)	
Female	886	74.1		23.24 (13.2)	
Marital status					0.14
Not married	260	21.76		20.8 (12.8)	
Married	935	78.24		22.1 (13.4)	
Sector					0.00
Government	1,010	84.5		21 (13)	
Private	185	15.5		26.4 (13.6)	
Income					0.00
<5000RS	131	11		30 (13.8)	
5000–<9000SR	257	21.5		23.4 (13)	
9000–<13000SR	311	26		21.6 (13.2)	
9000–<13000SR	496	41.5		19 (12.2)	
Self-rated health					0.00
Weak	56	4.7		34.6 (13.1)	
Average	167	14		27.9 (13.5)	
Good	259	21.7		23.1 (12.1)	
Very good	383	32		19.7 (12.7)	
Excellent	330	27.6		18 (12.2)	
COVID infection status					0.93
No	1,028	86		21.8 (13)	
Yes	167	14		21.7 (14.6)	

TABLE 3 | Product-moment correlation coefficient.

	Skew	**Kurt**	**JINS**	**FAS**	**ABS**	**WE**	**IWN**	**WOLF**
JINS	0.493	−0.527	1					
FAS	0.585	−0.881	0.437**	1				
IWM	0.139	−0.757	−0.248**	−0.199**	1			
WE	−0.135	−0.945	−0.307**	−0.222**	0.754**	1		
ABS	−0.027	−0.904	−0.253**	−0.191**	0.626**	0.779**	1	
WOLF	−0.030	−0.814	−0.300**	−0.227**	0.880**	0.941**	0.884**	1

$^{**}p < 0.01$.

Descriptive Statistics and Testing of the Hypotheses

The descriptive statistics and the mean score of financial anxiety per category of the sample are summarized in **Table 2**.

The mean score for job insecurity was 26.05 ($SD = 11.1$), for financial anxiety the average score was 21.8 ($SD = 13.3$), and for work-related flow it was 57.1 ($SD = 16.6$). Most of respondents were females (74.1%), married (78.2), working in government sector (84.5%), earing between 9000 and 13000SR (41.5%), with very good health (32%), and had no COVID infections (86%).

In relation to the correlations, the results are presented in **Table 3**. There was a weak negative correlation between JINS and work-related flow, $r_{(1,195)} = -0.300$; $p < 0.05$. There was also a weak negative correlation between FAS and work-related flow, $r_{(1,195)} = -0.227$; $p < 0.05$. However, the correlation between JINS and FAS was moderate and positive, $r_{(1,195)} = 0.437$; $p < 0.05$. Additionally, a higher level of FAS was associated with a higher level of JINS.

Structural equation modeling was carried out because of the latent nature of the constructs. This SEM analysis was performed with the lavaan package (Rosseel, 2012). The results of the structural equation model are presented in **Table 4** and are displayed visually in **Figure 2**.

The association between job insecurity and financial anxiety was positive and statistically significant ($\beta = 0.37$, $p < 0.001$), the first hypothesis was then accepted, meaning that there was sufficient statistical evidence at $\alpha_{0.05}$ that job insecurity was significantly related to financial anxiety. A negative relationship was found between work related flow and financial anxiety ($\beta = -0.09$; $p < 0.05$). The second hypothesis was accepted. All these paths were significant while controlling for gender, age, marital status, employment status, income, sector of employment, self-rated health, and COVID infection status. The validity of the SEM model was confirmed by the favorable model fit indices in **Table 5**.

The Comparative Fit Index was CFI = 0.91, which was greater than the prescribed threshold of 0.90. The Standardized Root Mean Residual, SRMR = 0.06, was less than the prescribed

TABLE 4 | SEM paths (predicting financial anxiety).

	Coef.	SE	*p*	Path
Job insecurity	0.43	0.06	0.00	Direct
Work related flow	−0.09	0.01	0.00	Direct

Covariates: age, gender, marital status, employment status, income, self-rated health, sector of employment, and COVID.

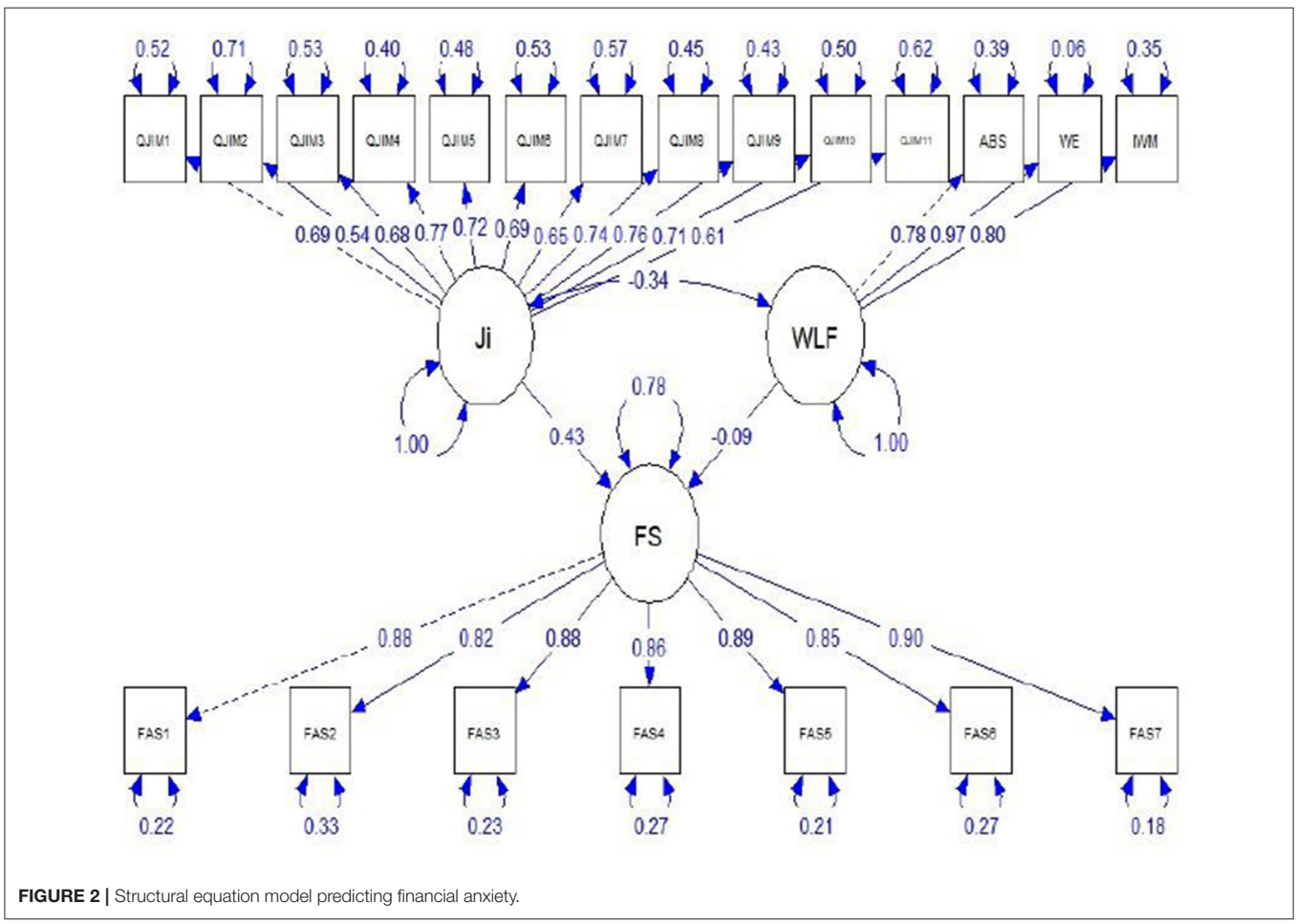

FIGURE 2 | Structural equation model predicting financial anxiety.

TABLE 5 | SEM model goodness-of-fit.

Measure	Estimate	Threshold	Interpretation
DF	357		
CFI	0.91	>0.90	Excellent
SRMR	0.06	<0.08	Excellent
RMSEA	0.06	<0.08	Excellent
PClose	1	>0.05	Excellent

TABLE 6 | Results of the mediation role of work-related flow.

Effect	Estimate	95% CI lower	95% CI upper	*p*-value
ACME	0.02	0.01	0.05	<0.001
ADE	0.40	0.33	0.47	<0.001
Total effect	0.43	0.37	0.50	<0.001
Prop. Mediated	0.06	0.03	0.11	<0.001

maximum threshold of 0.08. Lastly, the Root Mean Square Error of Approximation (RMSEA) was 0.06, which was <0.08, the prescribed maximum. As all the model fit measures were within their prescribed thresholds, the tested model was validated (Hair et al., 2014; Fuller et al., 2016; Kline, 2016).

Prior to mediation analysis, Baron and Kenny (1986) recommended four steps that have to be followed: first, the independent variable should be significantly related to the dependent variable. Second, the independent variable should be significantly related to the hypothesized mediation variable. Third, the hypothesized mediating variable should be related to the dependent variable. Fourth, a reduction in the effect of the independent variable on the dependent variable must be observed when controlling for the mediation variable.

The results showed that the association between job insecurity and financial anxiety was statistically significant ($\beta = 0.43$, $p < 0.001$). Secondly, job insecurity was significantly related to work-related flow ($\beta = -0.36$, $p < 0.001$). Thirdly, work-related flow was significantly related to financial anxiety ($\beta = -0.14$, $p < 0.001$). Fourthly, a reduction in the effect of job insecurity on financial anxiety was observed when controlling for work-related flow ($\beta = 0.40$, $p < 0.05$). Therefore, work-related flow mediated the relationship between job insecurity and financial anxiety. The third hypothesis was also accepted as there was enough evidence against the null hypothesis. The average causal mediation effects (ACME), the average direct effects, and the proportion mediated were calculated using the "mediation" package (Tingley et al., 2014) and the results are presented in **Table 6**.

DISCUSSION

Employees are experiencing increased perceptions of job insecurity due to COVID-19, which has resulted in decline of overall well-being. The present study sought to investigate the relationships between Job Insecurity (JINS), Work-Related Flow (WOLF), and Financial Anxiety (FAS) in employees of private and government sectors. It was hypothesized that a positive relationship would be found between job insecurity and financial anxiety, a negative association would be found between work-related flow and financial anxiety, and finally that a mediation role of work-related flow would be found in the relationship of job insecurity with financial anxiety. The findings supported our first hypothesis, as the results indicated a positive relationship present between JINS and FAS. The second hypothesis was also supported as a negative relationship was found between work-related flow and financial anxiety. A significant mediation of work-related flow was found in the relationship between job insecurity and financial anxiety which supported our third hypothesis. All these associations were significant while controlling confounding variables.

The results are consistent with prior studies that found that job insecurity was associated with financial anxiety (Choi et al., 2020; Sarwar et al., 2021). Widespread job insecurity increases the risk of mental health issues (Forbes and Krueger, 2019). When the Great Recession occurred, job-related issues were associated with significant anxiety and depressive symptoms for 3–4 years after the recession ended at least (Forbes and Krueger, 2019). A study by Burgard et al. (2012) indicated that employees experienced the features of depression and anxiety with job insecurity. These findings are considered especially relevant to the current COVID-19 pandemic, as many employees have experienced significant job insecurity because of the pandemic. Increased perceptions of job insecurity due to COVID-19 were indirectly related to increased symptoms of anxiety through financial concerns (Wilson et al., 2020).

Greenhalgh and Rosenblatt (2010) has called out the need to investigate the associations between job insecurity and its consequences through mediating variables. This study has found a mediating role of work-related flow in the relationship between job insecurity and financial anxiety. Job insecurity due to COVID-19 impacts on the work-related flow of employees, which in turn impacts on the financial anxiety. According to Locke (1978), employees who experience job insecurity are less motivated toward their task/activity. And those employees with high-level work-related flow have great motivation for their work. So, the results can be explained by employee motivation, as it plays roles in the experience of job insecurity and also in the maintenance of work-related flow. Moreover, Doherty and Horsted (1995) explained that employee performance is only dependent on their motivation and ability to work with high flow. Those employees who are motivated and highly focused on their job receive sufficient wages not to experience financial concerns and anxiety because they do not experience job insecurity.

Implications of the Study

Work-related flow is the least researched construct for employees in the government and private sectors. The current study will help develop an understanding of it on behalf of those employees. Currently, there is no relevant literature on the relationships between job insecurity, work-related flow, and financial anxiety, especially in Saudi Arabia. Nor is there any literature on the role of work-related flow in the relationship between job insecurity and financial anxiety. As a result, this study will be helpful in

understanding the mediating role of work-related flow for job insecurity and financial anxiety. This present study might have organizational significance as well. Organizational psychologists can use it to design policies for employees to lessen employee insecurity by maintaining sound levels of work-related flow which might reduce their financial anxiety. This study will enable theorists to understand work in greater detail. Policymakers can try to ensure job security and make friendly policies, so their employees don't experience financial anxiety.

Limitations

There are some limitations of this research in that it has been conducted during COVID-19 conditions. Due to the rare and unprecedented effects of COVID-19, several studies indicate that individuals have started experiencing mental health issues, like anxiety, stress, or depression. The present research focuses on employee JINS, WOLF, and FAS. But in the current scenario, there might be other factors negatively impacting the individual's WOLF, such as social distancing or needing to adapt to new situations. The study had a cross-sectional design, no causal relationships can be inferred. Moreover, future studies should explore the details and nature of work for those employees working from home during COVID-19.

CONCLUSION

During the COVID-19 pandemic, there have been huge unemployment levels worldwide. Vast numbers of people have lost their jobs and experienced financial pressure, which has consequently impacted the job insecurity, work-related flow, and financial anxiety of many others as well. This study has explored how greater job insecurity among employees due to COVID 19 is significantly linked with financial anxiety. It also explores the effect of work-related flow on job insecurity and financial anxiety. Further research is needed to understand the consequences of job insecurity and financial anxiety in depth, thereby investigating the role of work-related flow.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

Ethical approval for conducting this study was obtained from Umm Al-Qura University in Saudi Arabia. All procedures performed in this study were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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The Threat of COVID-19 and Job Insecurity Impact on Depression and Anxiety: An Empirical Study in the USA

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As the coronavirus disease 2019 pandemic causes a general concern regarding the overall mental health of employees worldwide, policymakers across nations are taking precautions for curtailing and scaling down dispersion of the coronavirus. In this study, we conceptualized a framework capturing recurring troublesome elements of mental states such as depression and general anxiety, assessing them by applying standard clinical inventory. The study explores the extent to which danger control and fear control under the Extended Parallel Processing Model (EPPM) threat impact job insecurity, with uncertainty phenomenon causing afflicting effect on the experiential nature of depression heightened by anxiety. With the aim to explore the job insecurity relationship with anxiety and depression, and measure the impact of EPPM threat, an empirical study was conducted in the United States on a sample of 347 white collar employees. Demographic data, EPPM threat, job insecurity, anxiety, and depression data were collected *via* a standardized questionnaire during the coronavirus disease 2019 (COVID-19) pandemic. The questionnaire consisting of multi-item scales was distributed online. All the scale items were evaluated on a 5-point Likert scale. SEM software AMOS version 23 was used to perform confirmatory factor analysis with maximum likelihood estimation. In the structural model, relationships between the threat of COVID-19, job insecurity, anxiety, and depression were assessed. The findings of the study suggest that job insecurity has a significant impact on depression and anxiety, whereas the threat of COVID-19 has a significant impact on depression. Mediating effects of job insecurity and EPPM threat impact on anxiety were not established in the study. The study contributes to the apprehension of the repercussions of major environmental disruptions on normal human functioning, and it investigates the effects of self-reported protective behaviors on risk perception. The study also explains the underlying mechanisms of coping behavior as possible antecedents to mental disorders. When subjected to stressful events, heightened psychological arousal causes physical and psychological challenges of affected employees to manifest as behavioral issues.

Keywords: COVID-19, depression, anxiety, job insecurity, EPPM threat, EPPM model, mood disorders

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INTRODUCTION

The coronavirus disease 2019 outbreak caused a general concern regarding overall mental health implications on employees worldwide. The coronavirus disease 2019 (COVID-19) pandemic hastened the most abrupt and profound economic contraction the United States has experienced since the Great Depression, leaving millions of Americans jobless and destitute, counting the rise of the unemployment rate and operating below the full capacity for a prolonged period (Parolin et al., 2020). As temporary lockdowns, mass layoffs, and economic crisis became an objective threat to public welfare, psychologists and psychiatrist around the world warned about severe long-term consequences such conditions will have on psychological well-being and increase in cases of mental disorders (Stein et al., 2013; Godinic et al., 2020). Autonomy and a sense of control over the environment and one's overall life situation are essential components of psychological well-being, meaning unpredictable and uncontrollable nature of the current pandemic is bound to have a detrimental effect on mental health (Huber et al., 2011; Lo and Cheng, 2014). Mass protests against economic closing and extreme social distancing measures resulted in bitterness, intentional breaching of protective policies, and willingness to risk contagion, and finally, an increase in dissatisfaction, resentment, and public despair. These actions stress the relevance of preservation or restoration of the very resources employees find crucial for their healthy functioning (Brashers, 2001). According to existing studies, the need for socializing and companionship can predict stress levels during a crisis (Casale and Flett, 2020). The damages to the human psyche have manifested in a drastic increase in general anxiety, insomnia, depression (Giorgi et al., 2020), and suicidal ideation.

In this study, we conceptualized a framework capturing recurring troublesome elements of states such as depression and general anxiety, assessing them by applying standard clinical inventory, as we found the self-assessment and self-appraisal of the ephemeral plight sheds light on the alternations and breakdown in experiences shadowed by the abrupt danger of COVID-19 (Shirahmadi et al., 2020). As Clarke (2002) posits, according to common belief regarding human nature, in peril, people act alarmed when in crowds. These make them subjective to reckless conduct in search of self-preservation, possibly endangering the survival of the rest. The observations of bearings of the prevailing fear caused by general uncertainty, especially within the limits of economic context, allowed hypothesizing a link between the central concept of job security and its effect on psychological impairment, namely, depression and anxiety. These were found to be the root of social and, consequently, individual self-disintegration and cause of emotional, psychological, and occupational disengagement designated by the loss of interest, self-doubt, and negative appraisals of one's overall life situation. We posit that experiential alternations, as reported by the respondents, ranging from suffering, low-mood, disinterest, impairment, and disability in pursuing one's goals, professional or otherwise, as well as an inability to find previous activities meaningful are the result of maladaptive responses to the COVID-19 cautionary campaigns. As such, the study sets a dual objective, i.e., of exploring the extent to which danger control and fear control under the EPPM threat impact job insecurity, with uncertainty phenomenon causing afflicting effect on experiential nature of "going through" depression heightened by anxiety, and broadening the emergent literature on crisis management for sustaining psychological welfare as required by the immediate threat of COVID-19 pandemics. Van Bavel et al. (2020) noted that the research topic selection centring on underlying mechanisms of behavioral response to pandemics is exceptionally relevant for informing the authority, governments, epidemiologists, social scientists, and national headquarters on how threat, anxiety, perceived danger, and social influences guide the behavior.

In some respect, the healthcare system has been subjected to analogous epidemiological hazards and has gone through similar case scenarios with Avian flu, SARS, and MERS outbreaks. We also draw from lessons on potential psychological adversity induced by other societal and economic global disasters, such as the Great Depression. The coronavirus is unique, as it encompasses the cumulative disruption of all well-being-related aspects—social, physiological, psychological, and monetary. As the emergent situation is relatively new, there is a clear lack of indication on how to proceed best with prospective workplace prevention and protection (Zhao and Wu, 2021). This study provides a preliminary exploration of potential key antecedents of mental resilience of employees and risk factors for the occurrence of mental disorders under prolonged stress exposure. While most studies on risk communication are focused on the influence of media on employees response formation (Chong and Choy, 2018; Garfin et al., 2020; He et al., 2020; Manzoor and Safdar, 2020; Tsoy et al., 2021), we have undertaken to investigate how threat perception and perceived efficacy under the ongoing exposure to job uncertainty can precipitate mood disorders. There is lack of support in the literature that would explain how exposure to hazard-related information influences the formation of adaptive or maladaptive coping strategies of employees aimed at psychological well-being retention. Also, although many studies have previously corroborated that uncertainty influences psychosocial and occupational functioning (Aguiar-Quintana et al., 2021; Blanuša et al., 2021; Ganson et al., 2021; Ruffolo et al., 2021), there are not many studies in the field of occupational psychology examining how job uncertainty leads to protective motivation when EPPM perpetuates the insecurity.

The findings will be of great use for aligning the scientific and epidemiologic communication to existing public concerns, comprehending how external stimuli influence internal states of individuals, steering the public toward ethical decision-making and healthy coping strategies (Lasbeur et al., 2020).

THEORY AND RESEARCH MODEL DEVELOPMENT

The Threat of COVID-19 (EPPM Threat)

We gain much by understanding how rational considerations, i.e., efficacy beliefs and emotional reactions such as fear, inform and determine behavioral decisions. To be consequential and

influential, educational propagations regarding pressing health matters that may not be entirely eradicated but whose adverse effects can be significantly reduced should be born out of episteme focusing on extensive behavioral change. The EPPM, also known as Threat Management or Fear Management, accounts for particular modifications in active engagement of individuals in responding to significant health-threatening events. Etymologically, EPPM tenets were borrowed from three preceding models, namely, the fears-acquired drive model (Hovland et al., 1953), parallel process model (Leventhal, 1970), and protection motivation theory (PMT; Rogers, 1975, Maddux and Rogers, 1983). The Hovland et al. (1953) model accounts for both adaptive and maladaptive responses. The leading idea stems from a theory that human behavior can be interpreted through learned responses and rewards, much in line with behaviorist reasoning. Individuals learned to fear a threat as an incentive to reduce the unpleasant state of fear by assuming a particular action.

Effective actions provided a habitual response for all future analogies. The fear intensity determined whether the adaptive action with "reassuring recommendations" or "maladaptive" defensive avoidance will be assumed. According to the parallel process model, the duality of responses implied the existence of two autonomous reactions to fear—a cognitive danger control process devising a strategy to avert the threat, and an emotional fear control process rooted in retraction and avoidance. Finally, protection motivation theory (Maddux and Rogers, 1983) singled out four components of a threat message. The first referred to the probability of a threat, the second concerned with severity, the third was related to response effectiveness, and the fourth referred to self-efficacy. Optimal protection response was given when all the four cognitions were highly intense and, thus, provided increased protection motivation, resulting in adaptive behavioral change (Popova, 2012). Such application is ideal in the advent of COVID-19, as many campaigns on prevention and reduction emerge daily, accompanied by specific national, local, and organizational policy measures and recommendations (Lasbeur et al., 2020; Raude et al., 2020). The EPPM provides an action-oriented framework for emotion acting as a behavioral predictor rather than a mere mental state devoid of action (Shirahmadi et al., 2020). The rationale for EPPM is that threat intensity influences the decision to act, and that confidence in the viability of effective prevention of the threat determines the action. The two mental processes, namely, danger control and fear control, lead to adaptive and maladaptive responses. The successful exploration hinges on the imperative that a severe threat or a hazard of COVID-19 is taken seriously by the target recipients, to whom the appeal is presented. The EPPM relies on a persuasive exposure to messages relating to fear and the subsequent introduction of an adequate response that aids to avert the threat (Kotowski et al., 2011). Combining the threat presentation and the response action is expected to stimulate protective motivation. Such communication mechanism is often used by healthcare adversaries in a range of campaigns, such as health advocating (Dutta-Bergman, 2005), early breast cancer detection (Kaplowitz et al., 2002), alcohol warnings (Campo et al., 2005), caution on tobacco usage repercussions (Sanderson and Wardle, 2005), and chronic disease awareness (McKay et al., 2004).

Furthermore, the EPPM predicts that when a threat is considered irrelevant, the subject will lack the incentive to accept the message and fail to enact the action. Perceived self-efficacy in the current context involves the perception of individuals of their capability to enact the defensive response, i.e., to practice social distancing, avoid gatherings, wear protective masks, and frequently wash hands using hand sanitizers. Response efficacy then refers to the perception of individuals that said instructions would reduce and prevent the virus spread. The successful campaign should balance the threat perception and response efficacy, i.e., high levels indicate that while danger is acknowledged, it is perceived as being conveniently and simply avoided.

Most common strategic measures to contain coronavirus spread propose practicing social distancing, wearing protective masks, avoiding large gatherings, frequently washing hands, using hand sanitizer, and practicing e-education and remote working. It is only logical that the fear posed by novel virus threat is excessive. With part of the public still doubting the severity of the disease, protesting about novel policies and confinement, as well as commuting and mobility restrictions, policymakers are coming up with caution techniques and warning campaigns containing educational materials, showcasing photos of hospitalized individuals and devastated family members, exposing long-term consequences.

Such maneuver aims to educate by increasing public awareness and amplifying the threat while providing advice and recommendations on avoiding the infection. The communication of repercussions concerns health side effects and informs the public about the danger national economies and local businesses face, with a realistic possibility of prevalent unemployment. One of the most controversial measures to save the global economy and avoid further closures and layoffs was implementing remote working.

Both depression and anxiety were related to impaired psychosocial and occupational functioning (Alonso et al., 2004; Druss et al., 2009; Hussain et al., 2011). With the ambiguity surrounding roles and responsibilities of employees, as tasks and priorities are rapidly changing in pace with the alternations in policies and company activities in response to progression in pandemics, contention and disagreements are bound to arise. Much of the protest to changing operational approach according to volatile market appears as a fallout caused by unfamiliarity and hostility of emerging threat, as well as affliction of the continuous fear and instability surrounding current employment of employees, future employability, loss of income and social support, work-related monetary and non-monetary benefits, as the threat may result in the deprivation of vital psychological resources (Jofre-Bonet et al., 2018). Following the EPPM, we investigated whether the threat of COVID-19-induced fear impacts job insecurity. Therefore, we theorize:

Hypothesis 1: The threat of COVID-19 (EPPM threat) leads to job insecurity.

The Relationship Between Uncertainty and Depression

Previous qualitative studies concentrated on interviewing depressed individuals have found that the respondents felt "unpredictability and lack of control over something that has a life of it's own…" (Karp, 1996, pp. 124–5). Interestingly enough, the very absence of control and autonomy that characterizes depressive state during the depressive episode is, at the same time, considered to be the trigger for the mood disorder. Causal relationship should, therefore, be evident, as the same feature is the cause as well as prevailing quality of said condition. Furthermore, the notion that depression influences the Self is not new, as psychoanalytic account has long ago identified depressive swing, or melancholy as Freud named it, as an acute feeling of suffered loss that eventually leads to grief and self-hatred (Freud, 1957). Moreover, agency of the Self is embodied in human experience as world-dependent, as philosophers, namely, Freud (1957), Heidegger (1927/1962), and Fuchs (2002), long supposed, the contextual societal or economic life situation and the environmental causation of psychological disorder cannot be denied. More specifically, changes brought about by disruptions in regular social, political, and economic functioning are bound to affect psychological well-being (Reichert and Tauchmann, 2011). The more negative dimensions of said changes are pronounced, the more paralyzing and detrimental they are for the well-being of individuals. Several studies found that financial stressors related to economic crises and perceived, prospect, or actual job loss precipitate a strain on mental health (Catalano et al., 2011; Althouse et al., 2014; Jesus et al., 2016), causing depression, anxiety, and suicidal ideation. Such conclusions were mostly derived from the aftermath of the 2008 financial crisis (Green, 2011; Huber et al., 2011; Flint et al., 2013), and following the Great Recession and the increase in the recorded instances of mental disorders (Lo and Cheng, 2014; Phillips and Nugent, 2014).

According to DSM, the concept of disorder encompasses a clinically significant behavioral or psychological syndrome or pattern occurring in an individual that is associated with present distress (e.g., a painful symptom) or disability (i.e., impairment in one or more critical areas of functioning) or with a significantly increased risk of suffering death, pain, disability, or a significant loss of freedom (American Psychiatric Association, 2000, xxxi). Nevertheless, we intentionally divulge from such categorical classification of depression, especially considering the underlying notion that depression is biologically embedded in specific brain dysfunction. Such rigid account ignores the circumstantial sources and explanandum of depressive episodes, some of which, when considered on a societal level, even bears the title of "The major depression" as a historical reference. Many previous studies generated substantial empirical evidence associating economic collapse, catastrophes, natural disasters, epidemics (Liao et al., 2014) and the like with increase in the recorded number of instances of depression, anxiety, paranoia, chronic exhaustion, substance abuse, and suicidal ideation (Almeida and Xavier, 2013; De Vogli et al., 2013; Branas et al., 2015).

Such characterization indicates that external environmental factors, such as distress, risk of suffering a loss, or being depleted of freedom, are the root cause of psychological impairment. Apart from autonomy and sense of control over one's environments, other psychological well-being constituents were previously identified as the need for relatedness, belonging, support, accomplishment, self-confidence, achievement, professional and personal growth, and individual advancement. These stem from safe, secure, fulfilling, purposeful, and meaningful employment, where occasional disturbances or changes do not affect the overall satisfaction of employees.

Job Insecurity

Insecurity- or uncertainty-defining features comprise ambiguous, complicated, volatile, inconsistent, and unpredictable conditions, prompting an individual and the general public to dwell on their competency and ability to reason, and reliability of the knowledge and information available (Brashers, 2001). We draw from the conservation of resources theory to account for the adverse effects of uncertainty on psychological health, prompting psychological distress, arousal, fear, and exhaustion, thus causing the increase in depression and anxiety instances. According to COR, every insecurity is consequential for the deprivation of resources, as one invests an extensive amount of energy in devising coping mechanisms to decrease stress intensity and sustain the impression of stability (Vander Elst et al., 2014). Previous studies have found coping behavior to mediate the relationship between economic stress variables and psychological health variables (Stein et al., 2013). Job security is characterized by Herzberg (1968) as a state wherein the organization provides a stable environment and a guarantee of employment, including all the corresponding benefits, such as seniority rights, retirement security, steady income, and an opportunity for self-development and self-actualization. Job security is commonly characterized as persistent certainty regarding one's employment situation, involving financial, social, and economic stability through continued employment within the organization or a particular profession (Herzberg, 2017).

Furthermore, relatedness and the desire to stay connected are especially relevant during catastrophic events and crises, as pressing circumstances amplify the need for social support (Ryan and Deci, 2000). Burke (2020) suggested identity as an umbrella term regarding what it means to be who one is in a role he/she assumes, therefore referring to role identities, social identities, and personal identities; all of which are, consequently, threatened by uncertain and turbulent situations. One way these can be threatened by job insecurity is through the very notion of social identity, as revealed in the sense by individuals of pertaining to a broader community, thus making the concept dependent on societal conditions. Job uncertainty brings to the surface fear of poverty, leading to marginalization, stigmatization, and social exclusion (Rafi et al., 2019). It is relatively easy to recognize the association between sustaining continuous employment and fulfillment of basic human needs. Individuals strive for self-actualization, whereby they are provided with the opportunity

to achieve their full potential and engage in creative endeavors, further developing their creative skills. Self-esteem needs refer to one's social status and recognition, ensuring the desired social position related to accomplishment and prestige. The need for affiliation encompasses one's intimate relationships and concerns a social network comprised of friends, family, partners, coworkers, subordinates, team members, supervisors, and mentors, including accompanying support, counseling, therapy, and guidance. Isolation, recess in social interaction and social exclusion, perceived as losing social control and valuable resources, causes severe damage to the psyche. Safety needs directly concern job security, as job is the central component of psychological well-being from which all other resources derive. Apart from providing security regarding continuous employment, future career prospects, financial income, and non-monetary benefits, it also serves as a tool to satisfy essential physiological needs for survival, providing access to food, water, and housing.

In contrast, continuous adverse, volatile, and unpredictable disruptions affecting the work environment pose a threat for distress, psychological strain, extreme fear, panic event, ambiguity, loss of interest, disengagement, falling behind on performing regular work tasks, exhaustion following extensive worrying, disturbed interaction, loss of faith in leadership and organizational sustainability, and therefore, one's existential security. Job security is a means for securing the most essential resources (Thompson et al., 2017; Huang et al., 2020). Consequently, we conclude the following hypothesis:

Hypothesis 2: Job insecurity leads to depression.

Anxiety

The phenomenon of anxiety as the uncovering of the ultimate meaning of life and death, as well as the existential dread or the existential stratum, does not exclusively fall under the domain of psychology and psychiatry but has, long before the establishment of said disciplines, inhabited the minds of some of the greatest philosophers (Kierkegaard, 1843/1954, 1849/1954; Sartre, 1939/1994, 1989; Husserl, 1954). For example, Tillich (1952a,b) distinguished between fear and anxiety, maintaining that fear has a definite object while anxiety does not. Moreover, existential anxiety occupying the central place in the theoretical and philosophical discussions was closely associated with fear, where the fear of death was interpreted as the reification of anxiety. Therefore, when contemplating fate, death, and contingency of life, the Self is preoccupied with its fate.

Theoretical assumptions were further supported by empirical research, including survey studies and detailed interviews that sprouted out of the terror management theory (TMT). TMT assumes that all anxiety eventually springs out of fear of absolute annihilation, proceeding from a drive for self-preservation combined with an awareness of mortality (Solomon et al., 1991). When a safeguard to this awareness cannot be maintained, psychopathology arises. According to the empirical study of Cypryańska and Nezlek (2020) on emotional reactions, coping behaviors, and willingness to undergo economic sacrifices concerning COVID-19, the level of anxiety, hopelessness, and panic was examined. They found that threat to the Self was predictive of emotions and coping, while anxiety was the most reliable determinant of spread prevention and economic sacrifice, while panic predicted self-preservation. Furthermore, Stanton et al. (2020) found a correlation between anxiety and stress during COVID-19 with sleep and substance abuse.

In psychiatric terms, following the DSM, the symptoms of depression result in clinically significant distress and impairment in social, occupational, or other important life domains. Agitation following depression may be caused by underlying anxiety; therefore, diagnostic tools regularly include anxiousness to establish the presence and severity of depression (Svenaeus, 2007, 2008). Phenomenologically taken, the diagnostic scheme of depression consists of an acute alternation of embodiment and pathologically estranged alienation from previous activities, professional or otherwise, social, educational, family, and marital. Building on the (1962, 1971) motivational hierarchy of human needs by Maslow, the crisis prompted by the COVID-19 pandemic results in physiological, relational, esteem and self- determination, and most importantly, safety needs not being met, being restricted or cutoff because of changes in external circumstances and socio-economic changes, such as economic collapse following the global pandemic. Limited access to a job, finances, and healthcare benefits causes severe psychological impairment, anxiety, and corresponding depression (Fabian, 2013; Flores et al., 2017; Blustein et al., 2019). Such states only increase because of the perpetuating absence of clinical treatment, further damaging well-being (Lai et al., 2020).

Hypothesis 3: Job insecurity leads to anxiety.

Furthermore, social isolation, prevention of gatherings, closing of restaurants and coffee shops, and other entertainment facilities, introducing police hours and restricting commuting depleted many individuals of much needed social support (Jahangiry et al., 2020). As mentioned before, one of the fundamental human needs for affiliation suffered a severe blow, and this left a psychological strain on people (Killgore et al., 2020a,b; Tull et al., 2020). Social identities were shaken, and group affiliations broke, leaving people dealing solely with dark chronicles and depressing thoughts. In adopting a defensive response, people will base the judgment according to information gathered through official sources and personal social network channels (Zhao and Wu, 2021). Appraisals and facts concerning threat severity and available resource to form an effective coping system will function either in support of or against the implementation of mental health interventions, as they can be perceived as valuable or ineffectual (Pollock et al., 2020). An adaptive response to campaigns launched would consist of restraining oneself from breaking the rules and socializing only when necessary, otherwise using the online channels for working, networking, and interacting. Furthermore, it would include the apprehension that such measures, including even lockdowns, benefit the entire community.

Regarding guidance of the EPPM health campaign, individuals would ward off incoming depression by utilizing widely available services for psychological support and free counseling sessions and therapeutic advice, available *via* phone or online. The simplicity of the response depends on

individual self-efficacy belief (Van Bavel et al., 2020). Enacting the response seems simple enough, yet among dependent personalities, psychologically imbalanced and prone to mood disorders individuals, it may easily trigger depression. Deprived of reactions from other people and lacking validation from a previously established intersubjective network, unstable personalities may even feel as they are seizing to exist. A maladaptive response would consist of excessive resistance or avoidance that would finally result in alienation and loss of interest for any previously meaningful activity (Aguiar-Quintana et al., 2021; Ganson et al., 2021). Life itself may even become meaningless when the fear overweighs the efficacy belief. Therefore, we hypothesize the following:

Hypothesis 4: The threat of COVID-19 (EPPM threat) leads to depression.

Impulsion to constantly check news outlets stressing the hazards of the virus, counting the number of infected, unemployed, businesses closed, and highlighting the financial debt leaves one not only fearing the virus but rather dreading its extensive consequences even long after the pandemic is contained. In the United States, GDP plunged in the second quarter of 2020, leaving millions of Americans unemployed and permanently laid off. The preventive measure Coronavirus Aid, Relief, and Economic Security Act (CARES) amounting to $2.2 trillion was launched in March; yet, according to a study on poverty and social policy conducted by the researchers of Columbia University, the number of poor people has grown by eight million since May (Parolin et al., 2020). Many sudden and uncontrollable disasters induce extreme anxiety, causing fear, anxiousness, irritability, aggression, suicidal ideation, substance abuse, and even psychosis. Previous studies have identified many individuals to have developed a full-blown general anxiety disorder or PTSD in the aftermath of a sudden crisis. While the educational purpose is to raise awareness and provide guidelines for safe navigation through the new normal, the fear provoked by absorbing projected images and news communicated may become too intense, causing individuals to develop maladaptive coping mechanisms (Witte and Allen, 2000), such as excessive avoidance that gradually turns into an avoidance personality disorder. One may develop obsessive-compulsive disorder, always under attack of intrusive thoughts and harmful actions such as, for instance, excessive hand-washing and scrubbing resulting in physical harm. Alternatively, the howling fear and anticipation may become so exhaustive that they paralyze the individual, rendering one temporarily incapacitated for work, thus increasing one's chance to lose a job. Excessive fear of threat makes the threat seem imminent (Cole et al., 2013; Zhao and Wu, 2021). The foundation of a healthy economy is a healthy workforce, yet stressing over the recession, budgetary cutback, salary reduction, and making drastic economic sacrifices to combat the virus induces profound anxiety. The danger control, e.g., the adaptive response, would comprise strictly complying with the instructions of the epidemiologists provided by EPPM propagation, as it is abundant with useful advice on how to apply lifestyle changes to thwart the infection successfully. Moreover, by relying on national aid programs, packages and relief, anxiety regarding one's access to job and essential life supplies would expectedly decrease (Carmassi et al., 2020). From this, the following is concluded:

Hypothesis 5. The threat of COVID-19 (EPPM threat) leads to anxiety.

MATERIALS AND METHODS

Participants and Procedure

The purposive sampling technique was employed in the study, which conducted an online cross-sectional survey distributed among employees in companies and institutions located in the United States. Respondents were working in information technology, electronics, medicine, and biochemistry field. The survey focused on white collar workers to increase the homogeneity of the research sample. All participants were informed of the purpose and anonymity of the investigation and their right to terminate participation at any time when needed. Data collection was conducted from May to August 2020, during COVID-19 pandemic. Demographic data, EPPM threat, job insecurity, anxiety, and depression data were collected *via* a standardized questionnaire. The questionnaire consisting of multi-item scales was distributed online to collect data. All the scale items were evaluated on a 5-point Likert scale. A total of 500 emails were sent to employees *via* the company HR department. A total of 413 respondents accessed the survey link and completed the questionnaire. All the incomplete replies were eliminated from the data set. Only the completed questionnaires were used in the analysis process. A final sample prepared for analysis consisted of 347 employees.

After eliminating the missing values, the analysis was performed on the sample of 347 respondents, of which 51.5% were males and 48.5% were females. Most of the respondents were over 50 years old, with 70.8, and 25.6% were between 30 and 50 years old, respectively. Only 3.6% of the respondents were under 20 years old. In terms of educational background, over 90% of the participants have a bachelor degree or above. Specifically, 5.2% of the respondents have a bachelor degree, 85.3% hold a postgraduate and PhD degree. The remaining 8.5% hold a high school degree. As for employment status, among all the respondents, 64.8% worked 40 h or more per week, and the others worked $<$40 h per week.

Measurements

Extended Parallel Process Model Threat

An extended parallel process model (EPPM) was utilized to explore the impacts of COVID-19 on individuals. There were two mental processes in this model, danger control and fear control. The process of danger control leads audiences to respond adaptively, such as accepting a message, while the fear control process caused them to make maladaptive responses, such as rejecting the message (Witte, 1992). The scale consists of six items that measure the perceived severity and susceptibility of COVID-19 on people.

Sample items include: "I am at risk for COVID-19," "I believe that COVID-19 is a serious threat to my health." The response options ranged from "strongly disagree" to "strongly agree" on

a 5-point Likert scale. The internal inconsistency was at an acceptable level, measured with Cronbach's alpha ($\alpha = 0.78$).

Job Insecurity

The job insecurity (JIS) scale was adopted from De Witte (2000). This instrument measured the degree of JIS from two directions: one was the impact of external environment of an individual on his or her job insecurity level, and the other combined both cognitive appraisal and affective appraisal, that is, the impact of the personal perception of these situations on his or her job insecurity level. Four items assessed JIS, and as follows: "(1) Chances are, I will soon lose my job, (2) I am sure I can keep my job, (3) I feel insecure about the future of my job, and (4) I think I might lose my job in the near future." The scale showed an acceptable level of reliability ($\alpha = 0.82$). The response options ranged from "strongly disagree" to "strongly agree" on a 5-point Likert scale.

Anxiety

The seven-item Generalized Anxiety Disorders (GAD-7) scale is commonly used to measure general worry and anxiety symptoms in different settings and populations. The GAD-7 scale has shown adequate reliability in past studies (Tong et al., 2016; Wang et al., 2018), and the scale reliability was confirmed in this study ($\alpha = 0.91$). The GAD-7 scale consists of seven items, and each item was scored on a 5-point Likert scale ranging from "1" represented "not at all" to "5" represented "nearly every day." In addition, the respondents were asked to evaluate how often they have been bothered by the specific problems over the last month. Sample items include: "Not being able to stop or control worrying" and "Becoming easily annoyed or irritable."

Depression

The Center for Epidemiology Scale for Depression (CES-D) (Radloff, 1977), developed by the National Institute of Mental Health for epidemiological research, was used to measure the frequency of depression symptoms. The scale consists of 20 items and five possible answers in a Likert format for respondents, from "1" for "rarely or none of the time (<1 week)" to "5" for "almost or all of the time (the whole month)." The CES-D scale consists of four independent factors: depressive affect, somatic symptoms, positive affect, and interpersonal relations. The respondents were asked to mark how often they have felt in a certain way during the last month. Sample items include: "I was bothered by things that usually don't bother me," "People were unfriendly," and "I had crying spells." Cronbach's alpha of the depression scale was at an acceptable level ($\alpha = 0.85$).

Statistical Analysis

The research model was constructed to explain the impact of EPPM threat on anxiety and depression, the impact of job insecurity on anxiety and depression, and their mediating effect of job insecurity (**Figure 1**). SEM software AMOS version 23 was used to conduct the analysis. Statistical analysis was performed on a sample of 347 respondents after eliminating 66 respondents because of missing values. The measurement tool was validated and tested for reliability. CFA with maximum likelihood estimation was performed for the observed model. CFA is a first step to assess whether the data fit a hypothesized measurement model during a structural equation model analysis. Next, the goodness-of-fit indices $\chi 2/df$ (normed chi-square statistic); GFI (goodness-of-fit index); RMR (root-mean-square residual); RMSEA (root mean square error of approximation); NFI (normed fit index); TLI (Tucker–Lewis Index), CFI (comparative fit index) were calculated to assess model goodness of fit. Absolute fit indices determine how well the presumed model fits the data. Next, composite reliability (CR), average variance extracted, and correlation matrix were determined, confirming convergent and discriminant validity, with results presented in **Table 2**. Common latent factor (CLF) method captured the common variance among all observed variables in the model. Latent variables are represented as circles, whereas variances are drawn as double-headed arrows into an object. Squares represent tested items, and e is a measurement error in each item. In the structural model testing with SEM, relationships between EPPM threat, job insecurity, and anxiety and depression were examined. Path analysis has been conducted, and standardized parameter estimates, standard errors, and *p*-values for the structural model were computed. They are summarized in **Table 3**.

RESULTS

The data received were cleaned, missing values excluded, and prepared for further testing. Analysis was performed on the sample of 347 respondents. In the structural model testing with SEM, relationships between EPPM threat, job insecurity, and anxiety and depression were examined. Path analysis has been performed, and standardized parameter estimates, standard errors, and *p*-values for the structural model were computed. The initial confirmatory factor analysis test showed that the model needs further improvements ($\chi 2/df = 3.754$; CFI = 0.798; SRMR = 0.08; RMSEA = 0.053). $\chi 2$/degrees of freedom ratio is higher than the recommended value of 3 (Hair et al., 2013). SRMR is equal to 0.08, which is the minimum requirement of good model fit (Byrne, 2010). CFI illustrates good model fit with a value below 0.95. While RMSEA indicates the need for model fit improvements with a value higher than the threshold of 0.05, it still meets the suggested level of <0.08 (Ferdinand, 2002). Factor loadings of below 0.55 were deleted (Fornell and Larcker, 1981), consequently improving the model fit.

Furthermore, because of the correlation found between some components, the covariances were added. Also, the pair

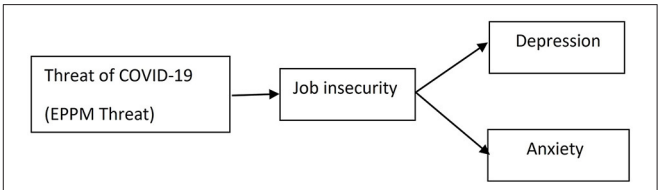

FIGURE 1 | Research model of the study.

of items within depression errors (3–5, 6–9) was correlated. Such manipulation was justified by Byrne (2010) because of synonymous formulation. The covariance of within item errors resulted in the achievement of excellent model fit. That is indicated with SRMR (0.053), which was below 0.08, as suggested by Byrne (2010). Simultaneously, the value of RMSEA was also below 0.08. According to the requirement for $\chi 2/df$ (Hair et al., 2013), the ratio fits within the required range of 1–3. As for the CFI, the index is above the threshold of 0.9 (0.952), thus achieving an excellent model fit ($\chi 2/df = 2.519$; CFI = 0.952; SRMR = 0.053; RMSEA = 0.039) as per Hu and Bentler (1999) and Byrne (2010). **Table 1** indicates the model fit parameters.

Convergent and discriminant validity checks of the measurement model were performed. The average variance extracted (AVE) coefficients are higher than the minimum requirement of 0.5. Moreover, AVE of all the variables except for the EPPM threat is above 0.6. CR was also calculated for each construct, with all values above 0.8. Obtained CR coefficients values surpass the threshold of 0.6, indicating consistency. That confirms the convergent validity of all the variables. Discriminant validity was also established by comparison of the AVE and maximum shared variance (MSV).

AVE for each of the constructs is higher than MSV, confirming discriminant validity. Validity results together with the factor correlation matrix with the square root of AVE are displayed in **Table 2**. Factor correlation values are located diagonally in the table.

Table 3 illustrates the standard regression weights between latent variables and observed ones. Items in the constructed survey represent observed components of the latent variables such as Depression, Anxiety, EPPM threat and Job Security. Thus, Anxiety 1 or Depression 18 represents item 1 of the Anxiety construct and item 18 of the Depression construct. All the standard regression weights represented in **Table 3** are above 0.5.

CFA analysis was followed by structural equation model testing (SEM). The hypothesized relationships between EPPM threat, Depression, Anxiety, and Job Security were examined for the model fit. The results indicated that the hypothesized model requires improvements. Based on modification index (MI) illustrating the improvements in chi-square (CMIN), there are two options to improve model fit: 1) to add the path between Anxiety and Depression and 2) to add covariance between e2 and e3. The Anxiety and Depression model path would result in model overfit and inability to calculate chi-square and degree of freedom. Moreover, CFI would increase to 1, indicating overfit as all the factors are linked. Thus, to achieve a good model fit, the covariance between e2 and e3 was added. As a result, the MI indicated chi-square (CMIN) improvements of 323.

Before removing the path between EPPM threat and Job Security, an additional check of the indirect impact of Job Security on the relationship between EPPM threat and two

TABLE 1 | Model fit measures.

Measure	Estimate	Threshold	Interpretation
CMIN	1088,061	–	–
DF	432	–	–
CMIN/DF	2.519	Between 1 and 3	Excellent
CFI	0.952	>0.95	Excellent
SRMR	0.053	<0.08	Excellent
RMSEA	0.039	<0.06	Excellent

PClose 1 >0.05 Excellent.
χ2/df, normed chi-square statistic; GFI, goodness-of-fit index; RMR, root-mean-square residual; RMSEA, root mean square error of approximation; NFI, normed fit index; TLI, Tucker–Lewis Index; CFI, comparative fit index.

TABLE 3 | Standardized regression weights.

			Estimate
Depression.18	<-	Depression	0.865
Depression.6	<-	Depression	0.909
Depression.9	<-	Depression	0.68
Depression.19	<-	Depression	0.721
Depression.5	<-	Depression	0.722
Depression.3	<-	Depression	0.76
Anxiety.3	<-	Anxiety	0.909
Anxiety.2	<-	Anxiety	0.884
Anxiety.1	<-	Anxiety	0.904
Anxiety.4	<-	Anxiety	0.875
Anxiety.6	<-	Anxiety	0.831
Anxiety.7	<-	Anxiety	0,821
EPPM.Threat.4	<-	EPPM.Threat	0,881
EPPM.Threat.6	<-	EPPM.Threat	0,886
EPPM.Threat.5	<-	EPPM.Threat	0,768
Job.Security.1	<-	Job.Security	0,893
Job.Security.4	<-	Job.Security	0,891
Job.Security.3	<-	Job.Security	0,702
EPPM.Threat.1	<-	EPPM.Threat	0,533

TABLE 2 | CR, AVE, and correlation matrix.

Variable	CR	AVE	MSV	MaxR(H)	EPPM.Threat	Depression	Anxiety	Job.Insecurity
EPPM.Threat	0.820	0.547	0.005	0.877	**0.739**			
Depression	0.907	0.620	0.612	0.925	0.050	**0.788**		
Anxiety	0.945	0.740	0.612	0.948	0.068	0.782	**0.860**	
Job.Insecurity	0.884	0.720	0.141	0.909	−0.023	0.376	0.249	**0.848**

The bold values represent square root of the AVE for each of the variable.

other variables, Depression and Anxiety, was performed. The bootstrap significance test ($p > 0.05$) detected no mediation effect, confirming that the exclusion of the path will not impact dependent variables. Thus, the insignificant path between EPPM threat and Job Security has been removed due to the poor connection and insignificant p-value significance ($p = 0.573$), resulting in the rejection of Hypothesis 1. The above-mentioned manipulations helped to achieve an excellent model fit ($\chi 2/df = 0.417$; CFI = 1; SRMR = 0.012; RMSEA = 0). The improved model is illustrated in **Figure 2**.

As part of path analysis between the variables, SEM testing was performed. According to the results, there is a positive and highly significant impact of Job Security on Depression ($\beta = 0.293$; $p < 0.001$) and Anxiety ($\beta = 0.213$; $p = 0.001$). Thus, both Hypotheses 2 and Hypotheses 3 can be accepted. The SEM model is depicted in **Figure 3**.

The relationship between EPPM threat and Anxiety stated in Hypotheses 5 was insignificant with p-value above the set threshold, resulting in hypothesis rejection. On the other hand, the positive β-coefficient (0.151) with a significant p-value of 0.02 confirms the effect of EPPM threat on Depression. Thus, Hypotheses 4 is accepted. The tested and obtained regression results are displayed in **Table 4**.

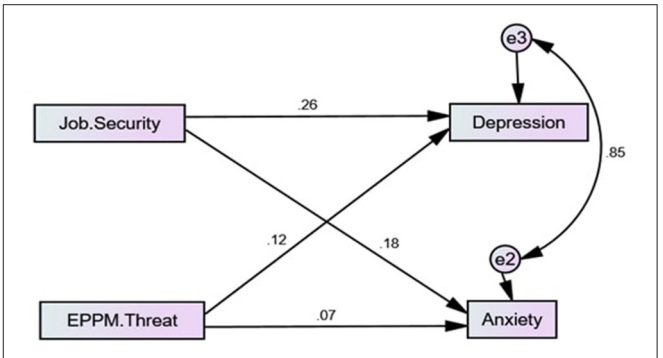

FIGURE 3 | Improved structural model.

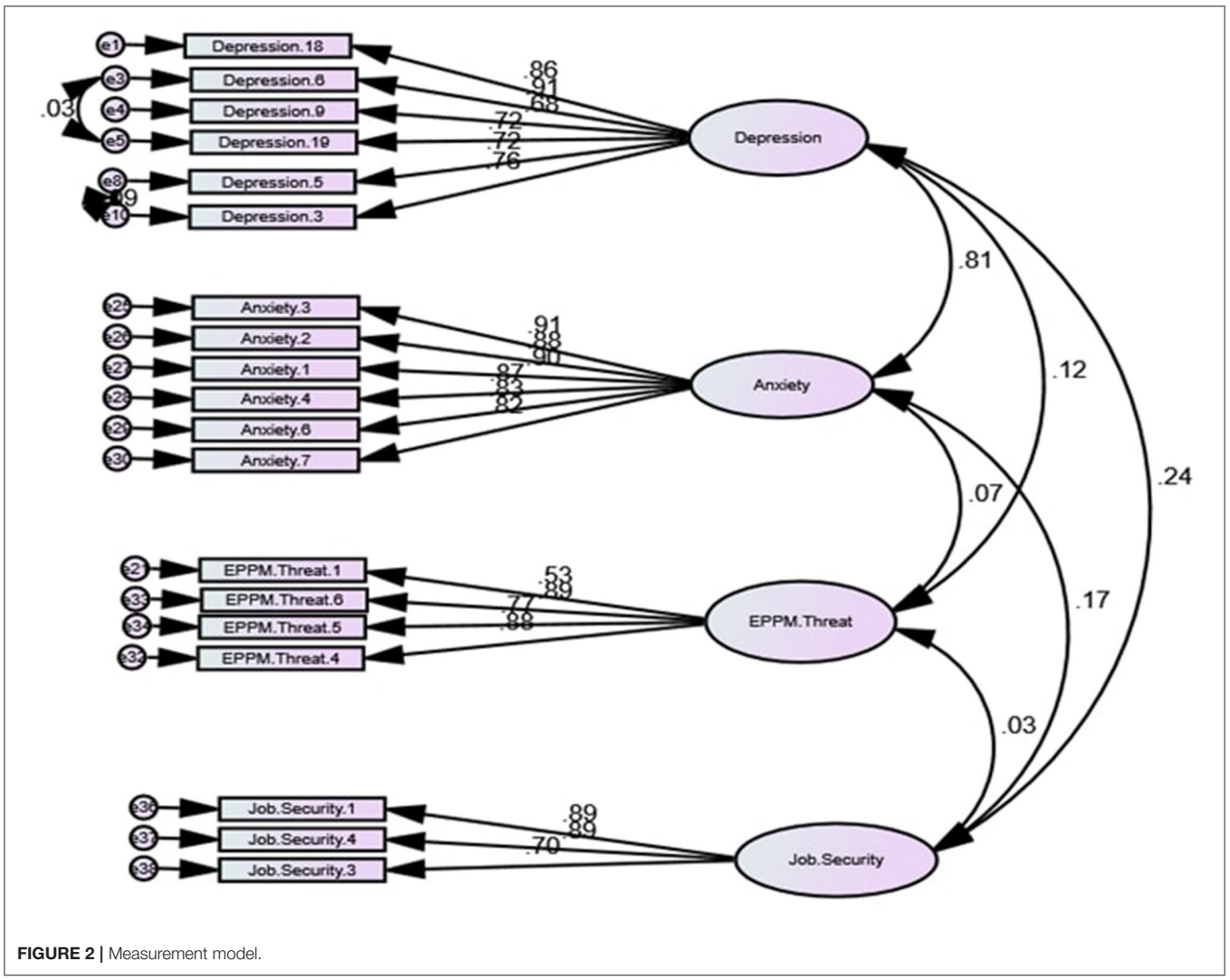

FIGURE 2 | Measurement model.

DISCUSSION

In the COVID-19 pandemic economic situation, concerns regarding long-term fiscal outlook are justified, as rise in job insecurity and economic turmoil is spilling over, affecting the mental health of citizens. Such circumstances bring to attention the consequences of maladaptive coping with unemployment on psychological and mental health. We theorized that adverse emotional reactions to the perceived threat account for maladaptive coping, while positive self-efficacy and response efficacy beliefs lead to assuming adaptive damage control actions, affecting the level of depression and underlying anxiety. The reasoning for assuming such approach stressing the role of threat and coping mechanisms stems from the conclusions of previous studies on the relationship of infectious disease to coping behaviors (Rubin, 2009; Bish and Michie, 2010; Teasdale et al., 2012; Van Bavel et al., 2020). During infectious respiratory pandemics, psychological conditions and protective responses help brief on effective risk communication and interventions directing behavioral modifications. Such study is concentrated on risk assessment through normative cognitive processes, such as measuring the perceived plausibility of infection, while affective processes are examined by measuring the intuitive and experiential dimensions of worry and anxiety. Several studies so far explored the relationship between psychological and behavioral indications during preceding epidemics (Liao et al., 2014), and we endeavored to assess associations between distinct cognitive and affective responses to risk reduction measures based on self-reported protective behaviors enriching the existing theoretical and empirical body of knowledge on the subject.

The findings are consistent with cross-national evidence on adverse mental health outcomes generated during the assessment of coronavirus uncertainty repercussions (Godinic et al., 2020; Aguiar-Quintana et al., 2021; Blanuša et al., 2021; Ganson et al., 2021; Ruffolo et al., 2021). Blanuša et al. (2021) found that the distress increases proportionately to the rise of job uncertainty and fear of COVID-19. Nelson and Kaminsky (2020) asserted that the ongoing crisis concerning health and social and monetary security significantly contributes to intense anxiety and depression. Dramatic disruptions in the work setting cause significant adverse economic, social, and psychological fallout, resulting in psychological and physical impairment (Stanisławski, 2019). As the phenomenon is of major concern for organizational psychology, the negative effect of job uncertainty on anxiety and depression levels of an employee has previously been extensively investigated (Bert et al., 2021; Ganson et al., 2021; San Too et al., 2021), and this study corroborates the relationship in the novel context of coronavirus among United States workers. Therefore, Hypotheses 2 and 3 stating that job insecurity leads to depression and anxiety are accepted. Many respondents reported harmful emotional and affective effects of sudden and extreme lifestyle changes introduced by authorities to constrain infectious COVID-19, such as compulsive fear, severe anxiety, and depressive reflection. Such negative appraisals resulted mainly from job uncertainty because of economic slowdown, recession, paycheck reduction, growing unemployment, and poverty. Although enforcing precautionary measures, such as social distancing, mobility restrictions, large gatherings regulation, introducing online schooling and remote working, and implementing educational protective campaigns, for most states, resulted in temporary suppression of the pandemic, and a pervasive pattern of maladaptive coping strategies among the survey participants was recorded. Expectedly, the respondents showed a high degree of threat awareness and concern over recommended defense response effectiveness. However, even those fully compliant with the instructions were not excluded from experiencing an existential crisis, exhaustion, inability to concentrate, isolation, worry, and depression.

TABLE 4 | Standardized parameter estimates, standard errors, and *p*-values for the structural model.

			Estimate	S.E.	C.R.	*P*
Depression	<-	Job.Security	0.293	0.059	4.929	***
Depression	<-	EPPM.Threat	0.151	0.065	2.324	0.02
Anxiety	<-	EPPM.Threat	0.098	0.072	1.375	0.169
Anxiety	<-	Job.Security	0.213	0.065	3.248	0.001

****p-value < 0.001; SRW, standardized regression weights; URW, unstandardized regression weights; CR, critical value.*

Following EPPM, we supposed that individuals perceiving themselves to be highly exposed to the virus and aware of the severity of the threat, with the high-efficiency appraisal of defensive response usefulness, would develop adaptive coping strategies directing positive behavior change. However, the results of this study show that EPPM does not impact job insecurity. For the second hypothesis, we assumed job security would impact depression, as uncertainty and intensive fear leave a strain on psychological well-being. Stressful and trauma-inducing events, such as significant catastrophes or natural disasters, economic breakdowns or global health threats, marked by intolerable uneasiness and confusion, predispose individuals to anxiety disorders (Maslow, 1962, 1971; Boya et al., 2008; Burgard et al., 2012; Caramanica et al., 2014; IMF, 2020; Li et al., 2020). In this, the results corroborate the findings of Leininger and Kalil (2014) and Gladstone et al. (2005). Job insecurity, in particular, comprises cognitive and affective dimensions. Cognitive refers to the perception of the prospect negative changes by employees, and affective encompasses the experiential state of anxiousness over possible job loss (Huang et al., 2012), whereby the presence of each leads to severe psychological damage (Bünnings et al., 2017). Therefore, the hypothesis is accepted. Furthermore, in line with the previous results generated by studies of Godinic et al. (2020), LaMontagne et al. (2020), and Rossi et al. (2020), the results confirm the detrimental effect of job security on anxiety. Additionally, the findings suggest that the EPPM threat has a positive impact on depression. Therefore, health campaigns educating the general public on prevention, psychological support, and therapeutic advice *via* online channels would transform to a positively adoptive response combating depression.

At the same time, psychologically weaker and vulnerable personalities already predisposed to mood disorders would

be negatively afflicted by novel measures, thus developing a negative fear-related response in the form of adverse coping behaviors. Finally, the EPPM threat has a positive impact on anxiety. Often, media and society induce fear by exposing individuals to provocative photos and information, providing at the same time simple and effective solutions. Depending on the fear-induced degree, one will respond negatively by excessive avoidance, leading to anxious paralysis. On the other hand, in psychologically stronger personalities, danger control adaptive response may lead to decreasing anxiety levels by perceiving response as effective and plausible. Therefore, the hypothesis stating EPPM impacts anxiety was accepted, in line with previous evidence from Lee (2020).

In light of the most recent research on the ongoing hazard, by examining 16 most relevant studies, Pollock et al. (2020) found that insight, information as well as beliefs concerning the threat can act both as facilitators and barriers to administering mental health interventions. Such appraisal is in line with the tenets of EPPM, and the results further support this conjecture. When employees perceive disaster severity and the potency of constraint as both high and effective, the intervention to prevent workplace stressors will have a higher success rate (Stanisławski, 2019). Excessiveness of misinformation from both official and private sources causes doubt and hinders intervention implementation. It is only logical that the exaggerated fear and negative beliefs regarding possible hazard curtailing will cause depression. Depression is characterized by the prevalence of negative emotional copings, such as instability in the sense of self, low mood, inadequate motivation, loneliness, and fearfulness (Stanisławski, 2019), and all of these are perpetuated by pandemic-related uncertainty, especially concerning prolonged recovery and in the absence of disaster precedents with positive aftereffects. The lack of knowledge, inability to render reliable forecasts, and the shortfall of coherent and accurate information on COVID-19 are especially disheartening. Thus, the hypothesis stating that the EPPM threat of COVID-19 leads to depression is accepted, consistent with the findings of Aguiar-Quintana et al. (2021) and Ganson et al. (2021).

Furthermore, the extensive analysis of Pollock et al. (2020) provides an insight into underlying intervention impediments. Workers and organizations are possibly not fully apprehensive of resources required to improve mental resilience, or they cannot foster a positive atmosphere by setting up a psychosocial support system beforehand, such as counseling and psychological aid. Organizations that failed in their preparedness attempts and lack control are likely to have higher stress levels and low response success rates. The lack of adequate infrastructure for carrying out large-scale mental health interventions and shortage of qualified personnel can also be recorded at a state level. When this happens, the organizational issue translates to a full-blown national challenge. However, despite the initial assumption, we did not find the same positive association between the EPPM threat of COVID-19 and anxiety. Only some of the employees reported anxiousness and substantial worry over imminent threat to their social, working, and psychological status and enduring threat to job security.

EPPM posits that the increased threat will elucidate greater fear. The lack of fear appeal may be due to disbelief in the accuracy of risk communication and the misperceived threat severity and susceptibility or overconfident efficacy belief. The anxiety component of EPPM is not raised when people believe that information on emergent and disastrous events, such as the COVID outbreak, are fabricated, amplified, or exaggerated by the government and media outlets to cause chaos and panic, and impose restriction obedience. Furthermore, when employee perception of threat severity is diminished, their anxiety levels are bound to be lesser. Zhao and Wu (2021) found that in such cases, employees rather rely on their social networks for intel, and clues they get may be biased, censored, incorrect, or filtered. Accordingly, in line with the study of Zhao and Wu (2021) on the mediation effect of EPPM, we, too, have failed to establish a meaningful mediation effect of job insecurity between COVID-19 risk perception and anxiety and depression of employees. At the onset of an emergency, marked by a high level of uncertainty, fear may not be the prevailing emotion, as alternative instances of worry, sadness, stress, and depression cannot be precluded and are potentially more significant (Kleinberg et al., 2020; Zhang et al., 2020).

The results are consistent with most of the assumptions discussed in Carmassi et al.'s (2020) analysis of studies on psychological distress risk factors during three Coronavirus outbreaks. Authors who have examined the adverse effects of previous outbreaks shed light on the protective role of psychological support in fostering resilience and reported on the relevance of clear precautionary measures communication during adversity. In line with EPPM, precautionary measures are perceived as relevant, unambiguous, attainable, and effective. Each reduction in these conditions, almost without exception, results in increased anxiety and depression and can, through accumulative and prolonged exposure, further progress in PTSD. Although some studies (Huang et al., 2020; Lai et al., 2020) have reported that the outbreak-related work burden resulted in depression and anxiety, we could not confirm with substantial significance the relationship between the EPPM COVID-19 threat and anxiety. EPPM advocacy should draw from the cognizance of the risk factors interacting with increased stress and concern, such as lack of support and resources, to better manage the crisis and advance prevention (Zhou, 2021). In terms of disaster preparedness, anxious employees are often less likely to prepare, as they are less susceptible to risk and are prone to avoidance and emotional coping (Mishra and Suar, 2012; McNeill et al., 2016). When experiencing extreme anxiousness or depression, employees tend to shut down and disregard instructions, as they lack the incentive to act defensively, and each action may seem meaningless. Healthcare adversaries should be attentive and use appropriate wording when managing fear-driving campaigns. They should be careful not to induce negative emotions of distress and fright when raising awareness, stimulating protective motivation and healthy coping, and retaining subtle balance while communicating threat severity and safety recommendations.

CONCLUSION

We find the multidisciplinary psychological, psychiatric, and phenomenological approach to essential dimensions of human experience and illuminating discussion of basic features of mental disorders to be rather informative and best suited in light of the COVID-19 situation. This study contributes to the apprehension of the repercussions of major environmental disruptions on normal human functioning, and it investigates the effects of self-reported protective behaviors to risk perception. Even though the study is valuable, several study limitations exist. First, self-reported measures were employed to assess the variables of the model. Future studies could use observations and reports of mental health professionals on the mental states of the studied sample. Next, the study was cross-sectional, with data collected at one point in time. Future studies can be longitudinal to evaluate how anxiety and depression change with decreased fear and insecurity, and if the relationships between the variables are significant in the COVID-19 pandemic aftermath. Another limitation pertains to the generalizability and applicability of the results. Because of high contagion and data availability on psychological COVID-19-precipitated impairment, the authors only focused their efforts on United States workers. Thus, there is a question of whether the study findings are generalizable. We assume that the findings are applicable in other states and contexts, given that the results concerning the relationship between EPPM threat and job uncertainty, depression, and anxiety are concerned with the more general nature of causality between fear, emotional responses, and coping strategies.

Nevertheless, the study research model should be validated in other contexts and on other samples. This study considers the EPPM threat an additional critical risk factor influencing the psychological well-being of workers and, thus, falls under the comprehensive scientific and clinical action-oriented undertaking to explain and understand the versatile nature of the ongoing disaster. The study contributes to understanding the underlying mechanisms of coping behavior as possible antecedents to mental disorders. When subjected to stressful events, heightened psychological arousal causes physical and psychological challenges of affected employees to manifest as behavioral issues. EPPM threat stems from the presumption that employees under stressful conditions engage in emotional regulation and stress management by forming opposing cognitive and affective problem-solving coping strategies. Depending on the appraisal of the upcoming threat and EPPM campaign message interpretation, workers rise to the occasion by engaging in danger control on the spectrum ranging from effective preservation to adjustment to trauma. The research study contributes to the existing theories on the relationship between threats to financial and psychological welfare and psychological impairment, which are often consulted when creating intervention policies. Moreover, the negative account on the association between EPPM threat and anxiety can be of great value for the assessment of the EPPM model validity and applicability in the context of health disasters, granting many academics regard the two constructs as positively associated and consequential (Hayes-Skelton and Graham, 2013; Panah et al., 2018; Lee, 2020). As such, the study can be integrated with the emerging academic literature on COVID-19.

Moreover, the model is pragmatic in that it can be practically employed during the design and execution stages of large-scale psychological policy interventions aimed at supporting mental health resilience in most work settings. Model is meant to be used for converging the occupational with epidemiologic communication regarding the current and imminent mental healthcare concerns. Persuasive messages concerning the appropriate and effective methodology to foster the psychological resilience of employees can, based on the findings, be used to induce protective motivation and appropriate damage-averting response. EPPM campaigns are employed to inform about the dangers of long-term exposure to workplace stress and contagion risks and on the threat COVID-19 poses to job certainty. Furthermore, the explanation of the authors on how external stimuli shape individual internal states can help steer organizations and managers toward ethical decision-making and healthy coping strategies. It is not limited to a particular national, professional, or work setting.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Jiangsu University. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

BO conceived the idea, contributed to the design of the study, involved in all steps of the research process, wrote the first setup, and draft of the study. JD contributed to the study design, data acquisition, result interpretation, and drafted the manuscript. DG made a substantial, direct and intellectual contribution to the study and participated in writing, and editing the manuscript. DT researched the statistical methods and contributed to analysis and result interpretation. MB contributed to the design of the study, manuscript editing, and data collection. All authors approved the manuscript and agreed to be accountable for all aspects of the study.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.648572/full#supplementary-material

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Perceived Decrease in Workplace Security Since the Beginning of the COVID-19 Pandemic: The Importance of Management Styles and Work-Related Attitudes

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The coronavirus disease 2019 (COVID-19) pandemic has reduced the sense of security of people in everyday life. The efforts of managers in the workplace to minimize the health risks and economic damage, however, can provide the employees with a greater sense of security. The aim of this study was to identify the types of workplace responses to the pandemic outbreak with respect to the characteristics of employees and their employers accomplishing the differences in subjective sense of workplace security before the pandemic and during the outbreak. Three hundred and thirty-seven Polish employees completed an online survey during the first 2 weeks of the COVID-19 pandemic in March 2020. Using the cluster analysis, we identified four subgroups of employees differing in their sense of workplace security, work-related psychological factors, and perceived management styles of their supervisors. Employees led by developers and executive managers sustained a high sense of work security and positive attitude to work, while those led by compromisers and deserter managers suffered from the highest drop of subjective security. In this study, we proposed how employees can be protected from overreactions and unnecessary panic in a time of global crisis by virtue of the psychological competences of their supervisors and employers.

Keywords: workplace security, psychological security, COVID-19, management style, satisfaction of work, psychological safety and trust

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INTRODUCTION

The ongoing coronavirus disease 2019 (COVID-19) pandemic caused by the new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is potentially the greatest threat to global health and security since World War II. Many managers and employees were taken by surprise by the sudden onset and rapid spread of the disease that forced the immediate implementation of changes to their daily habits, work organization, and social contacts. Although we faced previous pandemics (e.g., SARS in 2003, influenza A H1N1 in 2009, and Ebola in 2014), we have learned only a few lessons on how to cope with a crisis as fast-developing and as worldwide as this one. The COVID-19 pandemic has forced employers to deal with such issues as

unplanned absences of a large pool of employees, customers leaving, and the need for protecting oneself and others in a diverse range of work environments. To protect employees and clients from this invisible threat, as well as to protect the company itself from the crisis and perturbations in the global economy, leaders must provide their employees with knowledge and skills that, in addition to personal dispositions, are the bases for successful adaptation to quickly changing and stressful circumstances (Berger et al., 2019).

The fact that the ongoing pandemic will cause—and has already caused—widespread changes to all spheres of human functioning is indisputable (Pfefferbaum and North, 2020; Zandifar and Badrfam, 2020). At the moment, we cannot be sure about the scope of these changes nor their long-term influence. However, the first published reports confirm early signs of a growing danger to mental health and global social conditions. Research reports a significant increase in stress, depression, and anxiety in many countries, including China (Wang et al., 2020), Italy (Amerio et al., 2020), Spain (Ozamiz-Etxebarria et al., 2020), Germany (Bauerle et al., 2020), France (Husky et al., 2020), the United Kingdom (Smith et al., 2020) and the variety of other populations observed during COVID-19 and previous epidemics (Torales et al., 2020). For example, the first Chinese large-scale research showed that even more than 50–70% of citizens were suffering moderate or high intensities of serious psychological symptoms, such as depression, anxiety, phobic anxiety (Wang et al., 2020), obsessive compulsive symptoms, interpersonal sensitivity, and other stress-related mental issues (Tian et al., 2020). Beside serious mental problems, the ongoing pandemic also increased the levels of xenophobia, stigma, and racism (Jakovljevic et al., 2020). An emotional dysregulation increasing the psychological distress was observed not only in the general population (Moccia et al., 2020; Janiri et al., 2021) but also in clinical samples of people with affective (Di Nicola et al., 2020) and neurological disorders (Taquet et al., 2021). It seems that people with poorer general health, women, students, young employees, individuals aged older than 50 years, and medical staff might be particularly sensitive to the psychological difficulties of the crisis (Tian et al., 2020; Wang et al., 2020). Indeed, those initially most exposed to direct danger—medical workers from hospitals in Wuhan—have demonstrated increased scores for depression, exhaustion, and anxiety. The highest psychological cost was paid by nurses (Lai et al., 2020). A suffering of healthcare workers has been already observed in China (Pappa et al., 2020), India (Chew et al., 2020), the United States (Shechter et al., 2020), Spain (García-Fernández et al., 2007), and other countries.

The first longitudinal studies also confirmed the persistent deterioration of mental health along with the development of the pandemic (Daly et al., 2020; Niedzwiedz et al., 2020; O'Connor et al., 2020). While there is already convincing evidence of the impact of the COVID-19 pandemic on the mental health of healthcare workers, the information of such effects on the general population of adults working in a variety of industries and work environments is still relatively scarce. To understand possible long-term costs paid by employees of industries other than medical, it might be useful to infer from other crises that have shattered global safety. Some conclusions can be drawn from the reaction of the world to the terrorist attack on the World Trade Center (WTC) in 2001, which, similarly to the pandemic, shook the global sense of security and made people aware of a previously underestimated threat. The effects of posttraumatic stress among the employees of the different professions directly engaged in the WTC rescue and reconstruction have been observed over both the short and long terms. For policemen, posttraumatic stress disorder (PTSD) appeared even 10–11 years after the tragedy, and being unemployed, unable to work due to health issues, or being retired was significantly associated with the comorbidity of mental health (Bowler et al., 2016). Among the multicultural population of citizens who survived the attack, keeping their jobs was one of the factors protecting them from both chronic and late-onset PTSD (Kung et al., 2018). Cukor et al. (2011) observed that subjective perception of a lack of security was the best predictor of probable PTSD also for American employees who were not involved in rescue after the WTC attack.

Direct actions of managers, such as providing the personal protective equipment, flexibility of work schedules, and ensuring stability of employment, can physically protect employees from global threats and the psychological effects thereof. After having dealt with the second wave of the 2009 A/H1N1 flu pandemic, the willingness of nurses to work in the next possible flu epidemic was greatly determined not only by the availability of the personal protective equipment but also by having emotional and informational support (Hartley and Cabanac, 2013). A qualitative research on willingness to work during influenza epidemics among healthcare workers indicated that the behaviors undertaken by managers were crucial for decisions of nurses related to readiness to work. Information flow and work guidance influenced individual perceptions of personal risk in the workplace, which, in turn, influenced personal choices concerning whether to work or not during that epidemic (Ives et al., 2009). Evidence from previous epidemics indicated that informational support could play a central role in human resource management in times of crisis. The open sharing of information about the situation and objective danger can make employees feel that they are important for the institution and have a role to play in coping with crisis situations, which in turn may affect the sense of security of employees in the workplace and can help in avoiding burn-out syndrome (Gutierrez et al., 2013). In Florida, medical workers who had read the H1N1 influenza pandemic plan were much more ready to work in further epidemiological danger than those who did not read it (Basta et al., 2009). Hence, while a rapidly developing pandemic stays mostly out of control, leaders have some influence on the psychological response of employees to this threat. The constructive management style may decrease negative emotions and hence support the health and well-being of employees (Restubog et al., 2020). However, there still is a knowledge gap concerning how to manage in a crisis such as pandemic and how to prepare managers to manage in such conditions (Hirpara and Taylor, 2020). Current lessons from management during the COVID-19 outbreak revealed that leaders in epidemiological crises should especially

communicate with employees frequently and strive to build trust in their teams.

According to the study by Kalina (2020), the most crucial competences for successful managing in a difficult time is to stay calm, stable, constantly educated, focused, trustworthy, visible, decisive, assertive, confident, flexible, open-minded, adaptive, authentic, honest, clear, creative, realistic, and credible. However, there is virtually no research on specific management styles that could be especially effective in coping with pandemic crises in a variety of work environments and industries other than healthcare. In this research, we focused on the classic three-dimensional (3D) management style theory that can be helpful in planning a management strategy for a variety of employees (Reddin, 1990; see also Reddin, 1967). This theory identifies eight main leadership styles and indicates that their effectiveness depends on specific requirements or circumstances under which the leader and his subordinates work, representing a situational approach to management and assuming that leadership styles are not objectively positive or negative (Fiedler, 1976). However, independent of the situational background, Reddin (1990) suggested that some leadership styles—such as bureaucrat, developer, benevolent autocrat, and executive—might be, in most cases, considered as more constructive than others, including a deserter, missionary, autocrat, and compromiser.

A manager representing the deserter style is isolated and often lacks interest both in tasks and in relationships. The missionary style, the second management style considered as less effective, is more relationship-focused than other styles, which can lead employees to overstate satisfaction but reduces productivity, especially in difficult and risky tasks. This style is mostly ineffective, as such managers prefer to be seen as a good person rather than an effective leader. In turn, the priority of an autocrat is the immediate success of the task over relationships and other considerations. Such an attitude often leads to too much pressure, thus lowering employee motivation and generating non-constructive emotions, such as lack of trust in authority and aversion to the leader. Finally, leaders who compromise identify the benefits of both task and relational orientation but are usually unable to make decisions confidently, which in turn leads to their ambiguous workplace behavior depending on the current situation and short-term requirements. Such leaders prefer to minimize the current problems rather than to maximize the long-term benefits and concentrate on employees who are helpful for their career or well-being, while being ready to sacrifice those who are not only more competent but also more demanding (Reddin, 1990).

Among the more effective leadership styles, Reddin (1990) distinguished a bureaucrat, who is really not interested in the success of tasks or relationships but simply follows all formal rules and norms. Such an approach can be beneficial, especially in large hierarchical companies and government institutions. In turn, a developer is focused on good relations with employees and also on high efficiency and considers a positive atmosphere in the workplace to be an important factor in the work efficiency and skills development. Contrary to the less-effective missionary style, having a developer as a supervisor requires a lot of commitment on the part of employees, but such a person also gives a lot of themselves. Then, benevolent autocrats focus on efficiency and, to a lesser extent, on good relations with employees. While they also make high demands on employees, they do not create a tense atmosphere in the workplace; hence, they differ from "ordinary" autocrats described earlier. Finally, an executive manager is task-, people-, and efficiency-oriented. A manager representing such a style sets ambitious goals for employees, has high personal results, maintains a positive atmosphere, is open to new ideas, and involves employees in the planning process (Reddin, 1967, 1990).

Applying different leadership styles can be useful for dealing with diverse types of problems, but, as we have already mentioned, some of them are generally more successful than others in daily management, as well as during times of crisis. In a correlation study involving executives, Limbare (2012) found that executives mostly preferred missionary leadership and appeasement conflict management, while deserter leadership and resignation conflict management were the most rejected (Limbare, 2012). Karim (2016) explored the model of *charismatic leadership* in a time of crisis and concluded that this framework is essential to assess the readiness of managers to deal with extreme events and often unavoidable difficulties. In comparison with the paradigm of Reddin, the charismatic leadership style combines the self-confidence typical of the executive style, the cooperation and flexibility characteristic of the developer style, and the empathy of the missionary leadership style. Other features of a charismatic manager include high motivation, empowerment, clarity of vision, caring about others, providing clear and simple instructions, coordination, loyalty, flexibility, poise, control, decision-making, the ability to command without hesitation, and readiness to accept leadership responsibility. These abilities are a predictive criterion for assessing whether a leader has the appropriate predisposition and qualifications for leadership in times of crisis (Karim, 2016).

Based on a review of the current knowledge, we assumed that the efforts that managers put into their workplaces in order to minimize health risks and economic damage might contribute to the successful implementation of protective measures and provide employees with a greater sense of security to decrease the psychological burden. Recent research has focused mainly on healthcare workers, but it seems that similar effects can also be observed in other professions and industries. For addressing this gap, it becomes crucial to look for psychological factors linked to better coping with ongoing crises in order to reduce short- and long-term damages from individual, local, and global perspectives and to provide informative suggestions for further research and coping strategies. Hence, the aim of this study was to investigate the types of workplace responses to the pandemic outbreak with respect to the characteristics of employees and their employers, accomplishing the differences in subjective sense of workplace security before the pandemic and during the outbreak. Using the cluster analysis, we aimed at identifying subgroups of employees differing in their sense of workplace security, work-related psychological factors, and perceived management styles of their supervisors.

MATERIALS AND METHODS

Participants

We recruited 337 Polish employees (i.e., 273 women, 63 men, and 1 non-binary person) aged from 18 to 61 ($M_{age} = 29.64$, standard deviation [*SD*] = 8.22) with professional work experience from ∼1 month to 37 years ($M = 7.03$ years, $SD = 7.23$). Most of the participants (64.1%, $n = 216$) were working in Poland, and 35.9% ($n = 121$) were working abroad, mostly in Germany ($n = 45$), the Netherlands ($n = 10$), Malta ($n = 9$), Spain ($n = 8$), England ($n = 7$), and France ($n = 7$). The detailed sociodemographic characteristics of the studied participants are presented in **Table 1**.

Procedure

We collected the data using an online survey distributed *via* Facebook from March 13 to March 23, 2020, i.e., during the earlier days of the COVID-19 pandemic in Europe. After providing informed consent, participants were asked to fill in the survey organized into four sections. In the first section, we collected information about basic sociodemographic characteristics of the employees, employers, and companies, such as gender, age, level of education, place of residence and work, seniority, company size, and industry. The second section contained questions about the work-related factors describing the subjective sense of engagement of employees in work ("How do you assess your general engagement in your current job?"), general work satisfaction ("How do you assess your general work satisfaction?"), work atmosphere satisfaction ("How do you assess your satisfaction with the atmosphere at work?"), and feelings of trust in the manager ("How do you assess your general trust in your manager?"). Participants answered these questions using a scale from 1 = "very low" to 7 = "very high." Further two sections measured manager acceptance ("How do you assess your agreement with the sentence 'I would not change anything about my manager'?") and willingness to change the current job ("Do you wish to change your job in the near future?") and were answered using a scale from 1 = "strongly disagree" to 7 = "strongly agree."

The third section of the survey contained two assessments of the subjective sense of workplace security of participants. Using a scale from 1 = "very low" to 7 = "very high," the participants assessed their present sense of security ("How do you assess your workplace security right now?") and retrospectively assessed their security before the COVID-19 pandemic outbreak ("How do you assess your workplace security before the COVID-19 pandemic?"). The final part of the survey contained the questionnaire by Reddin based on the 3D management style theory (Reddin, 1967, 1990, 2005) that we used to assess the perception of leadership styles of employees expressed by their managers. This questionnaire consists of eight questions with eight answers each, and participants evaluated the basic managerial competences of their supervisors by choosing one of the characteristics representing eight leadership styles described in the theoretical introduction (Cronbach's α 0.28–0.60). Therefore, each leadership style can be scored from 0 to 8 points, and the sum for all styles should be always 8.

TABLE 1 | Demographic and work-related characteristics of the study sample ($n = 337$).

Variables	*N* (%)
Education	
Primary/secondary	23 (6.9%)
High school-general	78 (23.1%)
High school-technical	51 (15.1%)
Bachelor's degree	162 (48.1%)
Master's degree	23 (6.8%)
Place of residence	
Rural	22 (6.5%)
Small city	48 (14.2%)
Medium city	25 (7.4%)
Big city	56 (16.6%)
Very big city	186 (55.3%)
Place of work	
Rural	12 (3.6%)
Small city (< 50,000 citizens)	48 (14.2%)
Medium city (50,000–150,000 citizens)	23 (6.8%)
Big city (150,000–500,000 citizens)	59 (17.5%)
Very big city (> 500,000 citizens)	195 (57.9%)
Company size	
Micro (< 10 employees)	49 (14.5%)
Small (< 49 employees)	81 (24.0%)
Medium (< 250 employees)	70 (20.8%)
Big national (> 250)	39 (11.6%)
Big international (> 250)	98 (29.1%)
Work position	
Physical worker	48 (14.2%)
Executive worker	109 (32.3%)
Specialist	33 (9.8%)
Independent specialist	108 (32.0%)
Manager	32 (9.5%)
Others	7 (2.2%)

Analytical Approach

We conducted a statistical analysis using the IBM SPSS Statistics 25 software. We performed a two-step cluster analysis with iterative partitioning methods in line with guidelines provided by Clatworthy et al. (2010). We used psychological variables related to work and work security, including (1) subjective sense of workplace security before and during the pandemic outbreak, (2) eight management styles, and (3) six work-related factors, namely, work engagement, general work satisfaction, atmosphere satisfaction, trust in the manager, manager acceptance, and willingness to change the current job. All variables were *Z*-scored before analyses. We verified the similarity between variables included in the cluster analysis using Pearson's correlation, and we found weak to moderate correlations confirming that they were related but not equivalent (**Table 2**).

We determined the number of clusters using the silhouette measure of cohesion and separation (Kaufman, and Rousseeuw, 1990). A two-step clustering suggested the existence of two to

TABLE 2 | Descriptive statistics and correlations between variables measured in the study.

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Subjective workplace security																								
1. Before the pandemic	5.80	1.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. At the beginning of the pandemic	3.81	2.16	0.58***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Perceived change	−1.99	1.81	−0.02	0.74***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leadership styles:																								
4. Deserter	0.47	0.80	−0.26***	−0.30***	−0.20***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Missionary	0.69	0.90	0.07	0.13*	0.15**	−0.11*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Autocrat	1.13	1.25	−0.31***	−0.40***	−0.24***	0.21***	−0.14**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Compromiser	1.36	1.54	−0.23***	−0.32***	−0.27***	0.33***	−0.04	0.24***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8. Bureaucrat	0.79	0.98	−0.15**	−0.14*	−0.09	0.07	−0.22***	0.13*	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Developer	1.11	1.30	0.39***	0.43***	0.24***	−0.33***	0.11*	−0.39***	−0.44***	−0.22***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Benevolent	1.12	1.14	0.08	0.16**	0.12*	−0.25***	−0.05	−0.28***	−0.41***	−0.08	0.27***	-	-	-	-	-	-	-	-	-	-	-	-	-
11. Executive	1.00	1.24	0.33***	0.41***	0.25***	−0.42***	0.02	−0.38***	−0.49***	−0.14*	0.35***	0.30***	-	-	-	-	-	-	-	-	-	-	-	-
Subjective sense of:																								
12. Work engagement	5.96	1.06	0.13**	0.03	0.02	−0.11*	0.05	−0.07	−0.14*	−0.03	−0.10	0.01	0.12*	-	-	-	-	-	-	-	-	-	-	-
13. Global work satisfaction	4.88	1.55	0.41***	0.51***	0.34***	−0.25***	0.16	−0.34***	−0.34***	−0.16**	0.34***	0.15**	0.39***	0.38***	-	-	-	-	-	-	-	-	-	-
14. Atmosphere satisfaction	5.15	1.64	0.46***	0.46***	0.27***	−0.17**	0.17	−0.39***	−0.29***	−0.16**	0.43***	0.14**	0.30***	0.18**	0.65***	-	-	-	-	-	-	-	-	-
15. Trust in manager	4.61	1.88	0.46***	0.62***	0.44***	−0.39***	0.20	−0.52***	−0.41***	−0.19**	0.55***	0.30***	0.46***	0.19***	0.64***	0.62***	-	-	-	-	-	-	-	-
16. Manager acceptance	3.70	2.12	0.44***	0.55***	0.36***	−0.36***	0.16**	−0.50***	−0.40***	−0.13*	0.52***	0.44***	0.44***	0.17**	0.55***	0.58***	0.82***	-	-	-	-	-	-	-
17. Willingness to change work	3.92	2.25	−0.37***	−0.47***	−0.32***	0.26***	−0.11	0.39***	0.37***	0.16**	−0.39***	−0.35***	−0.35***	−0.18**	−0.66***	−0.59***	−0.59***	−0.56***	-	-	-		-	-
Demographics																								
18. Employee's age	29.64	8.22	0.03	0.09	0.12*	−0.01	0.06	0.06	−0.11	−0.05	−0.01	−0.01	0.12	0.18**	0.19**	−0.01	0.12*	0.11	−0.04	-	-	-	-	-
19. Seniority	7.03	7.23	−0.01	−0.08	0.13*	−0.00	0.04	−0.03	−0.12*	−0.08	0.02	0.00	0.10	0.15**	0.21**	0.01	0.16**	0.16**	−0.08	0.71***	-	-	-	-
20. Place of residence	4.88	1.58	0.10	0.06	−0.04	−0.01	−0.02	−0.06	0.05	0.04	0.05	0.04	−0.01	−0.11	−0.05	0.05	0.02	0.03	0.02	−0.15**	−0.12*	-	-	-
21. Place of work	5.04	1.42	−0.07	−0.01	−0.12*	0.03	0.01	0.01	0.00	0.01	0.00	0.03	0.01	−0.15	−0.04	0.02	−0.03	−0.01	0.06	−0.15	−0.09	0.77	-	-
22. Education	4.24	1.12	0.22***	0.22***	0.07	−0.05	−0.05	−0.09	−0.01	0.01	0.15**	0.05	0.08	−0.01	0.01	−0.02	0.07	0.06	0.01	0.21***	0.06	0.21***	0.13*	-
23. Company size	3.16	1.44	0.12*	0.10	0.05	−0.14*	−0.06	−0.07	−0.17**	0.11*	0.19*	0.05	0.14*	−0.02	0.02	0.01	0.11	0.13*	−0.04	0.07	0.04	0.01	0.02	0.08

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

four independent clusters in our data. We chose a four-cluster solution; the two- and three-cluster solutions appeared to be trivial. Subsequently, we conducted a K-mean (non-hierarchical) cluster analysis. In such an analysis, the number of clusters is determined before the analysis, and the algorithms find the cluster center and assign the objects to the nearest cluster center. K-mean algorithms usually prefer clusters of approximately similar size (Vogt and Nagel, 1992), which we considered an advantage of this method in our study. The value of silhouette coefficient of cohesion and separation was around 0.2, so it indicated well the stability of four-cluster solutions to best explain the types of reactions exhibited by Polish employees and managers. To verify the validity of the clusters, we repeated the calculations on a subsample randomly selected from a total study group (Clatworthy et al., 2010). Even on a sample that was twice as small, the cluster arrangement was analogous, with the silhouette value dropped to lower than 0.1. Nineteen participants did not fit into any cluster and were excluded from further analyses.

RESULTS

Descriptive Statistics

The distribution of sense of security before and after the pandemic changed from left-skewed to more symmetric (**Figure 1**). Average retrospective-perceived safety before the pandemic was much higher ($M = 5.81$, $SD = 1.48$) than at the beginning of the pandemic ($M = 3.82$, $SD = 2.17$), $Z = -13.48$; $p < 0.001$. A quarter of the group reported that they did not experience any changes (25.0%, $n = 86$); 1.8% of the participants ($n = 6$) experienced an increase in their sense of security by 1–3 points, but most of the group reported a drop in their sense of security by 1–6 points.

While there were no differences in the sense of security before and after the pandemic between Poles working in Poland and abroad (p's > 0.05), the former group reported a higher drop in their sense of security ($M = -2.15$, $SD = 1.77$) than the latter ($M = -1.70$, $SD = 1.86$), $Z = 2.59$, $p = 0.010$. We did not find gender differences with respect to the sense of security after the outbreak or with respect to the perceived change in the sense of security, while women scored higher on workplace security before COVID-19 ($M = 5.90$, $SD = 1.41$) than men ($M = 5.40$, $SD = 1.69$), $Z = -2.401$; $p = 0.016$. The age, seniority, and places of residence and work of an employee did not correlate with subjective security before and during the COVID-19 outbreak, but the higher levels of education were associated with a slightly higher subjective workplace security before and during the outbreak. We also found a very weak but significant correlation between security before the pandemic and company size. The descriptive statistics and correlations between variables are presented in **Table 2.**

Cluster Analysis

The detailed characteristics of four clusters are presented in **Table 3** and in **Figures 2**, **3**. We found significant differences between clusters with respect to all the variables that were used in the cluster analysis (see **Table 2**), while we did not find significant differences between the clusters in terms of gender, $\chi^2(3, n = 318) = 3.67$, $p = 0.299$, age, $H = -0.62$, $p = 0.534$, seniority, $H = -0.62$, $p = 0.535$, education, $\chi^2(12, n = 318) = 20.64$, $p = 0.056$, place of residence, $\chi^2(12, n = 318) = 13.10$, $p = 0.362$, place of work, $\chi^2(12, n = 318) = 4.50$, $p = 0.982$, and company size, $\chi^2(12, n = 318) = 11.71$, $p = 0.469$. Although clusters differed with respect to subjective sense of workplace security before and during the pandemic outbreak, the perceived management styles of supervisors and the abovementioned six work-related factors did not differ with respect to any of the sociodemographic variables that we measured in this study. In the following part of this section, we provided a description of the clusters that were found in the collected data.

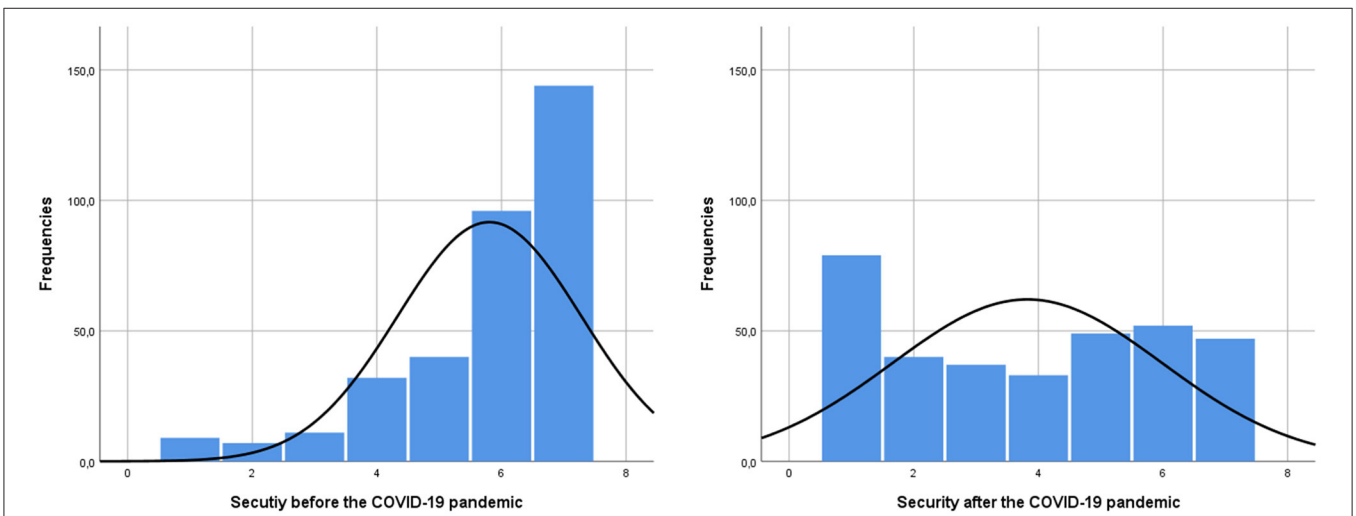

FIGURE 1 | The distribution of subjective sense of workplace security before and after the pandemic outbreak.

TABLE 3 | Characteristics of clusters.

Variables	Clusters				Cluster comparison
	1	2	3	4	*H(3)*
Subjective workplace security					
Before the pandemic	6.45 (1.03)[b]	6.05 (1.12)[a,b]	3.93 (1.58)	6.01 (1.04)[a]	110.84***
At the beginning of the pandemic	5.29 (1.69)[a]	4.90 (1.58)[a]	1.93 (1.22)[b]	2.16 (1.31)[b]	160.74***
Perceived change	−1.15 (1.34)[a]	−1.15 (1.60)[a]	−2.00 (1.41)	−3.85 (1.39)	119.20***
Leadership styles					
Deserter	0.08 (0.31)	0.40 (0.66)	0.83 (0.89)[a]	0.94 (1.04)[a]	70.66***
Missionary	0.98 (1.06)[c,e]	0.60 (0.82)[a,b,c]	0.60 (0.70)[b,d,e]	0.54 (0.81)[a,d]	12.36***
Autocrat	0.40 (0.63)	1.02 (0.99)[a]	2.51 (1.40)	1.49 (1.13)[a]	111.90***
Compromiser	0.36 (0.75)	1.68 (1.18)[a,b]	1.86 (1.52)[b,c]	2.45 (1.71)[a,c]	119.02***
Bureaucrat	0.36 (0.59)	1.84 (1.18)	0.91 (0.89)[a]	0.68 (0.77)[a]	84.28***
Developer	2.18 (1.41)	0.77 (0.74)[a]	0.32 (0.60)[b]	0.51 (0.80)[a,b]	128.58***
Benevolent autocrat	1.70 (1.12)	0.94 (1.04)[a,b]	0.63 (0.79)[b,c]	0.95 (1.18)[a,c]	47.20***
Executive	1.93 (1.34)	0.73 (0.96)[a,b]	0.32 (0.57)[b,c]	0.44 (0.71)[a,c]	110.50***
Subjective sense of:					
Work engagement	6.28 (0.82)[d]	5.74 (0.90)[a,b]	5.46 (1.51)[a,c]	6.04 (0.91)[b,c,d]	21.81***
Global work satisfaction	5.93 (1.01)	5.19 (0.85)	3.11 (1.33)	4.41 (1.38)	135.56***
Atmosphere satisfaction	6.22 (0.88)	5.50 (1.22)[a]	2.95 (1.37)	5.00 (1.17)[a]	145.09***
Trust in manager	6.24 (0.90)	4.97 (1.89)	2.67 (1.47)[a]	3.35 (1.36)[a]	196.08***
Manager acceptance	5.59 (1.35)	3.79 (1.60)	1.84 (1.33)[a]	2.19 (1.37)[a]	178.79***
Willingness to change work	2.23 (1.59)	3.89 (1.97)	6.11 (1.32)	4.99 (1.82)	138.59***

Raw scores with standard deviations in parentheses. Means with the same superscript do not differ at p = 0.05.
****p < 0.001.*

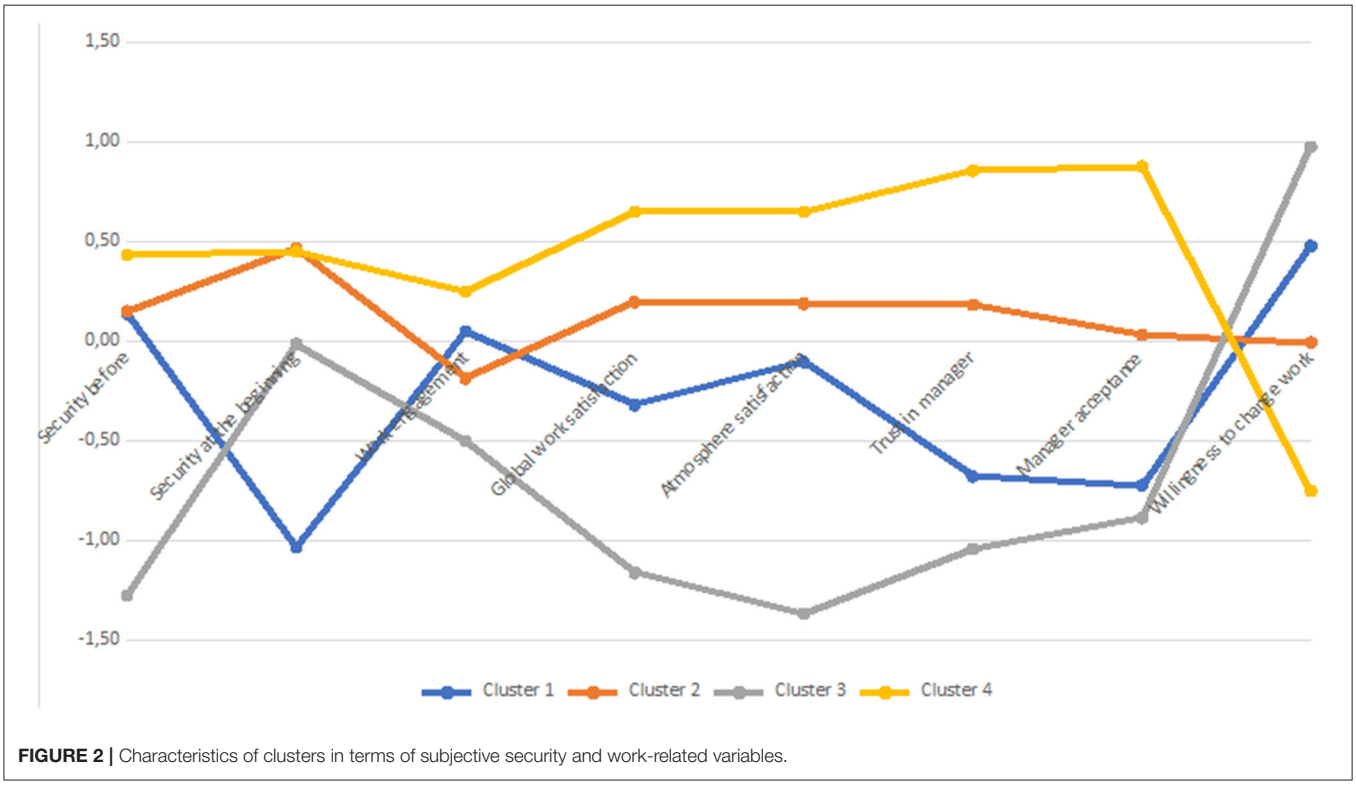

FIGURE 2 | Characteristics of clusters in terms of subjective security and work-related variables.

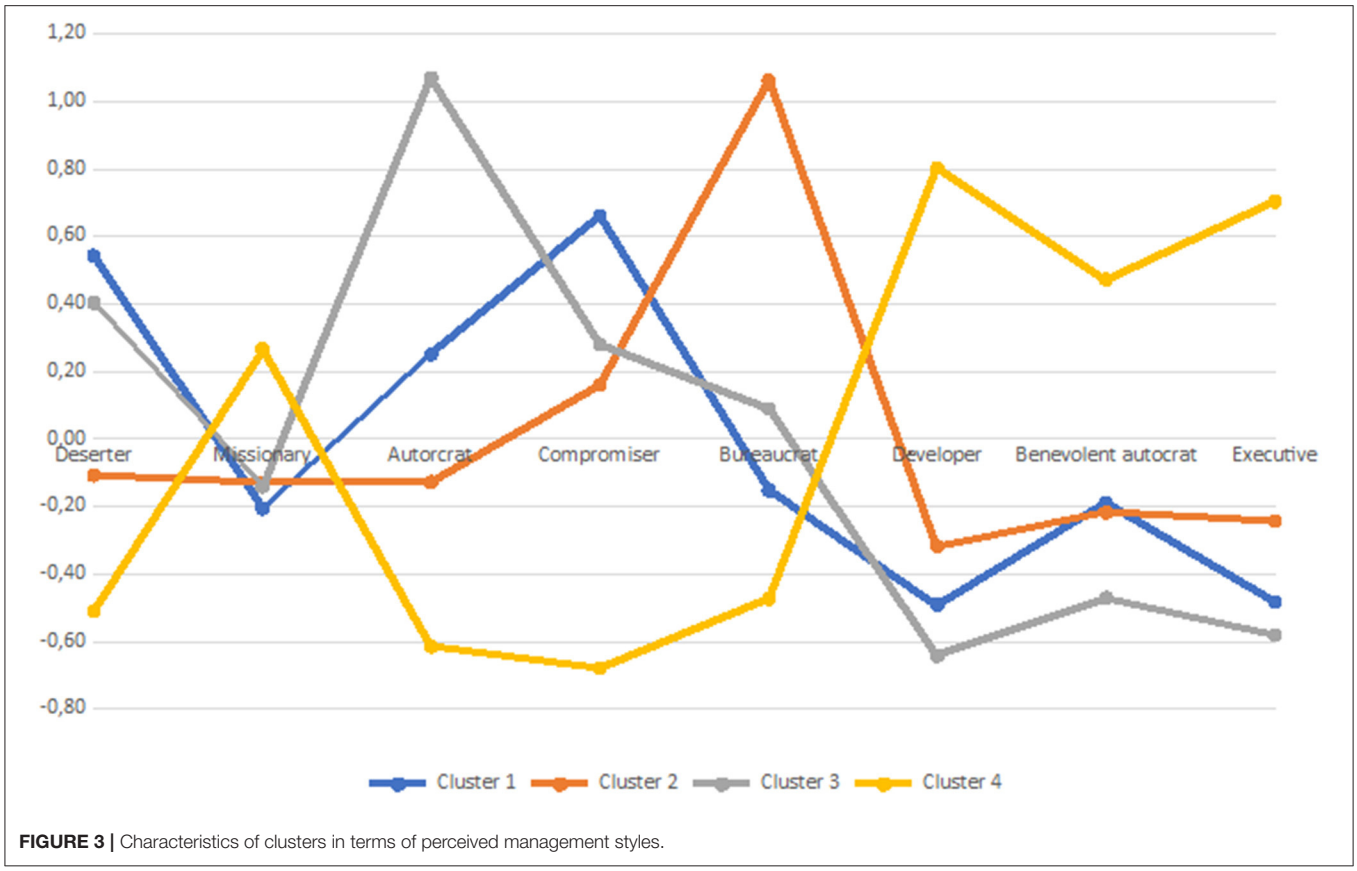

FIGURE 3 | Characteristics of clusters in terms of perceived management styles.

Cluster 1, consisting of $n = 119$ participants, was characterized by the highest level of the sense of security before the pandemic and the relatively smallest drop during the outbreak so that the subjective sense of workplace security in this cluster after the outbreak was the highest among all clusters. Participants in this cluster declared the highest level of work engagement, atmosphere and global work satisfaction, and the lowest level of turnover intention. They trusted their managers and accepted those managers to the highest extent among all four clusters. They perceived their managers as mainly demonstrating developer and executive styles of management, and also, to a lesser extent, they saw them as benevolent autocrats or missionaries. At the same time, they declared that their supervisors did not present such non-constructive styles as a compromiser, deserter, or autocrat.

Cluster 2, consisting of $n = 80$ participants, was similar to cluster 1 in terms of subjective sense of security before and after the outbreak of the COVID-19 pandemic. However, their work engagement, work satisfaction, and trust in the manager were lower than in the previous cluster, while their willingness to change job was significantly higher. They saw their managers not only as strongly bureaucratic and compromising, but also—to some extent—as autocratic or benevolently autocratic. Yet, they believed that their managers did not demonstrate deserter or missionary styles, so they did not avoid concentration on tasks, but they seemed to introduce strong norms and rules in order to minimize current problems rather than maximize the long-term benefits.

Participants from the following two clusters seemed to face difficulties despite pandemic. Participants from cluster 4 ($n = 57$) declared the lowest level of sense of security following the outbreak of the pandemic, and they did not report the highest drop in this variable only because they indicated it was already low before the pandemic. They saw their supervisors as autocratic compromisers, again lacking developer and executive behaviors. This is probably why their work engagement was the lowest among all clusters, the same as work satisfaction, trust in the manager, and acceptance of the manager, while their willingness to change job was the highest among all four investigated groups. Finally, those from cluster 3 ($n = 62$) retrospectively assessed their sense of security before the pandemic as very high—as high as in clusters 1 and 2—but experienced a serious drop in subjective security, such that they were similar in this respect to participants from cluster 4. Although they declared relatively high levels of work engagement and work satisfaction, they did not seem to trust their manager, and they declared a low level of acceptance of their supervisor and a relatively high turnover intention. They perceived their managers as compromisers and, to a lesser extent, as autocrats and deserters, which means that they believed that they could not make confident decisions and concentrated on employees who were helpful for their career or well-being, while they were ready to sacrifice those

who were more competent but also more demanding (Reddin, 1990). Yet, they presumed that their supervisor lacked developer and executive styles. The only work-related evaluation that was relatively high in this cluster was atmosphere satisfaction, which possibly means that although they could rely on their supervisor, they could rely on their coworkers.

DISCUSSION

Work environment, being one of the most important areas of self-expression for adults, can modulate the responses of employees to global crises. The quickly developing pandemic caused by a completely new and still incurable coronavirus demanded immediate reactions tailored to unique socioeconomic circumstances, cultural norms, and work-style preferences and requires knowledge, skills, and adequate tools to be used by leaders, as well providing up-to-date information about the virus. However, at the beginning of the crisis, it was extremely difficult—both for employers and employees—to implement effective countermeasures. For example, Kandel et al. (2020) found that 28% of a total of 182 examined countries had insufficient preventive capacities for dealing with the COVID-19 outbreak, while for 33%, these capacities were very low. Some countries did not manage to implement adequate preventive measures or provide clear information to the public, which in turn resulted in panic (Wenliang and Ghebreyesys, 2020). These difficulties were unavoidable at the beginning of the crisis, but we still need to develop effective coping strategies for now and for the future. Pacheco et al. (2020) indicated that during the COVID-19 pandemic, employees who worked in a workplace "prepared for disaster" exhibited subjective workplace security and higher well-being. In this work, we presumed that successful leaders may decrease both objective danger and the subjective sense thereof, protecting the physical and mental health and the economic condition of employees. During the COVID-19 pandemic, the managers can greatly influence organizational attitudes, such as organizational trust (Guzzo et al., 2021), and hence become one of the tools for global protection of citizens.

In this research study, we analyzed a snapshot of the situation at the beginning of the COVID-19 pandemic. The data collection started on March 13, 2020, when 132,758 people globally had been infected and 4,695 had died. In Poland, only 49 cases and 5 deaths had been confirmed at the beginning of the data collection process (WHO, 2020), so that the COVID-19 pandemic was more a subjective than an objective threat. We investigated subjective sense of workplace security at this time and retrospectively assessed the subjective sense of workplace security before the pandemic. Using the cluster analysis, we were able to connect it to work-related attitudes, such as work engagement, satisfaction and trust in manager, turnover intention, and to the perceived leadership styles ascribed to the managers of the participants. We found that the compilation of highly constructive and lowly ineffective management styles observed in supervisors was linked to a greater work engagement, satisfaction, manager assessment, lower turnover intention, and the highest levels of subjective workplace security. However, similar but weaker effects may exist among those who are led by managers focused on bureaucratic procedures: scheduled and formally controlled actions may also produce a sense of control over uncertain circumstance and hence sustain a relative sense of security, but they do not provide employees with the highest level of work satisfaction. Finally, participants who were supervised by compromising autocrats expressed the highest drop in security at the beginning of the crisis, but whether their level of work satisfaction was low seems to be linked with atmosphere satisfaction and trust in manager.

Our results support the concept of situational management, indicating that whether a specific management style is effective or not depends on external conditions, transient needs, and the situational context. The bureaucratic style—sometimes perceived as negative—can indeed have a positive effect on the subjective sense of security in critical situations because of its strong concentration on formal rules and because of a constant control. In unpredictable circumstances, the employees may show a strong preference for strict hierarchies (Friesen et al., 2014), rules, and order (Kay et al., 2009), and when led by bureaucratic supervisors, they may feel safer than others—although they would be less comfortable with such managers under standard conditions. Finally, autocratic and compromising styles are connected with the lowest sense of workplace security, a lack of trust in the manager, and the most negative work attitudes—they potentially result in the lowest employee well-being. However, a good work atmosphere might work as a protective buffer against these negative outcomes. Indeed, job demands–resources model (Demerouti et al., 2001) posits that support from colleagues can serve as a job resource that reduces the negative psychological consequences of job demands, such as work overload, role conflict, role stress, shift work, time pressures, or emotionally demanding work (Bakker and Demerouti, 2017). Job resources, such as a good work atmosphere, create opportunities for the development and personal growth and initiate motivational processes that may lead to a higher work engagement (Bakker and Demerouti, 2017).

We believed that our findings correspond to the observation that combining concentration on relations with executive determination may play a main role in the crisis management. After the SARS epidemic, 17 years ago, Smith (2006) observed disproportions between scales of health risk and economic costs and raised concerns that outbreaks of more serious diseases could cause catastrophic impacts on the global economy. He concluded that "serious infectious disease outbreaks need to be identified and dealt with quickly. Adverse health and economic effects can be reduced by early detection and response" (p. 3120). He especially stressed the importance of individual adequate risk perception, risk communication, and tailored management—factors that can be easily implemented as crisis management strategies in different types of work environments—as critically important predictors of constructive pandemic responses. The actions that seem to be the most important tools for coping with a pandemic in the workplace include not only a reducing contact with the virus (e.g., providing personal protective equipment and allowing working from home) but also providing

informational support (e.g., open communication, including employees in the decision-making process) (Smith, 2006). Tseng et al. (2005), also drawing lessons from the SARS epidemic, identified five determinants of successful coping with global infections, namely, appropriate timing for crisis management (the earlier the better), careful decision-making (including employees in the process), thorough implementation, effective communication, and trust between management and employees. Highly stressful circumstances may increase the frequency of conflicts between employees and worsen the atmosphere, but implementing an executive and developer leadership style might be helpful in coping with the effects of a crisis in the workplace (Limbare, 2012). An efficient crisis management has been also found to correlate with charismatic leadership and, even more strongly, with transformational leadership (Sorsa, 2015). This may suggest that cognitive and behavioral flexibility is an essential managerial skill for coping with an unknown danger.

LIMITATIONS AND FUTURE DIRECTIONS

One of the obvious limitations of our study is its cross-sectional design, making it impossible to derive causal statements about the relation between our variables of interest. Furthermore, our sample was relatively small and not representative even of the Polish population, which limits the ability to generalize our results to a wider range of employees representing diverse professions, work environments, relations between employees and managers, etc. Although it could be worthwhile to replicate our results in a bigger sample, preferably including employees from diverse countries and a more systematic way of recruiting them to participate in the study to confirm the robustness of the effects, it would not be possible to do so. Since the beginning of 2020, circumstances change so fast that the situations of employees might be completely different each month, and we could not replicate data collection for the very early stage of pandemic. Future research should collect the longitudinal data to better understand the causality of the effects we investigated. Additionally, our study was based on self-report questionnaires. Even though the perceptions of employees of their managers are an important source of information, these perceptions might not reflect the objective work reality, as they might be affected by many additional factors, like general work satisfaction, personal likes and dislikes, recently received rewards and benefits, length of time working for the company or position, and the characteristics of employees, such as psychological capital[1]. Another limitation comes from the methods we applied to measure our variables of interest. Although the theory of Reddin (1967, 1990) is classic and widely used, the nature of the questionnaire gives limited possibilities for the analysis since the number of points always adds up to 8 for all the dimensions and because the reliability of measurement operationalized as internal consistency might be low. However, such a method gives clear information about the dominant leadership style perceived in the supervisor, and it is very easy for the respondents to comprehend. Finally, our other variables were measured with single items, and although they seem straightforward, their actual validity and reliability are unknown. Hence, there is a need to collect additional data, using well-established psychological methods measuring sense of security, work satisfaction, work attitudes, as well as supervisor management style, most preferably collecting the data from various employees working under the same manager and analyzing the data in a nested design.

[1]Penza A., and Gasiorowska, A. (under review). Linking work events with work engagement: Mediating role of emotions and moderating role of psychological capital. *J. Pers. Psychol.*

FINAL CONCLUSION

Almost 15 years ago, Smith (2006) stated that the 2001 SARS pandemic was the most striking example of a global socioeconomic solution to a widespread threat that we have observed in modern times. This statement now seems extremely outdated. We hope that our study provides some information about the importance of leadership skills and styles for managing in the time of a pandemic outbreak. It is also a good starting point for further research on the role of human resources management as well as the importance of work-related factors in successful leadership during global health crises, which might recur in the near and/or distant future. The study encourages further research involving representative groups of participants from various countries in Europe and the world, also taking into account the importance of national strategies for counteracting the spread of the coronavirus and reducing the negative effects of the pandemic.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding authors.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AW was the principal coordinator of the project, was involved in the methodology design, managed the data collection process, wrote the manuscript, and performed the entire statistical analysis and interpretation of results. ET was involved in the data collecting, and writing the manuscript. KS was involved in the study design and data collecting process. AG supervised statistical analyzes and wrote the manuscript. All the authors had a significant and substantive contribution to the publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Collaborative Innovation Network, Knowledge Base, and Technological Innovation Performance-Thinking in Response to COVID-19

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Amid the pandemic of COVID-19, the collaborative innovation network of enterprises is conducive to the sharing of innovation resources, knowledge transfer, and technology diffusion, which is closely related to the improvement of corporate technological innovation performance. Based on the patent application data of listed enterprises in Jiangsu, Zhejiang, and Shanghai in China, this study constructs a cooperation matrix, describes the characteristics of collaborative innovation network from two dimensions of network structure and network relationship, introduces the breadth of the knowledge base as a moderating variable, and analyzes the nexus between characteristics of a collaborative innovation network and technological innovation performance. Based on the panel data of 193 listed companies in Jiangsu, Zhejiang, and Shanghai, this study uses a multiple linear regression model for empirical analysis. The results show a U-shaped relationship between clustering coefficient and technological innovation performance. The breadth of knowledge base strengthens the positive relationship between the structural hole and technological innovation performance. In contrast, the breadth of knowledge base weakens the positive relationship between network relationships strength and technological innovation performance. The study findings will enhance enterprises' participation in a suitable collaborative innovation according to their knowledge-based characteristics and improve the technological innovation performance.

Keywords: COVID-19, collaborative innovation network, network relationship strength, knowledge base breadth, technological innovation performance

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INTRODUCTION

The outbreak and spread of COVID-19 have brought considerable challenges to our economic and social activities. It threatens the lives and health of people, and brings significant impacts on economies, finance, industries, regions, and business. According to the latest statistics data updated in the National Bureau of Statistics of China,[1] from January to

[1]www.stats.gov.cn

February in 2020, the overall value-added of industries above the scale experienced a significant decline of 13.5% year-on-year, in sharp contrast to the figures of 5.3% growth in the same period of 2019 (Wang and Gao, 2020). Under such a severe background, enterprises must carry out cooperative innovation to reduce transaction costs and gain a competitive advantage. In fighting the COVID-19 epidemic in China, the collaborative innovation of the entire industry has played an active role. Scientific and technological forces, innovation, and industry-university-research collaboration have played an integration and a substantial supporting role (Ke, 2020).

Collaborative innovation in response to the COVID-19 pandemic has accelerated the development of the global biomedical industry and related research fields, and pharmaceutical companies have received unprecedented attention (Sampat and Shadlen, 2021). At the same time, industry-university-research cooperation has brought them significant development opportunities. The biopharmaceutical industry has the intensification of economic globalization nowadays, but any industry's progress and development are inseparable from collaborative innovation. Enterprises try to form collaborative innovation networks with other external enterprises. The existence of a collaborative innovation network presents many competitive advantages to the participating enterprises, which can reduce the transaction costs in Research and Development (R&D) and promote the sharing of innovation resources, knowledge transfer, and technology diffusion among enterprises and related fields. However, cooperative innovation between enterprises and universities is not always smooth. Inventors in firms face a large burden given their limited involvement with academia (Murray, 2002; Agrawal and Henderson, 2009). In other words, it is difficult for firms to choose suitable cooperative partners. The problem of selecting suitable joint partners raises a key question regarding the cooperation between academia and industry: What kind of collaborative innovation network can facilitate the flow of knowledge from academia to the industry that will drive and improve the technological innovation performance of enterprises? In addition, what role do the knowledge base play between the characteristics of a collaborative innovation network and enterprise technological innovation performance?

In the process of cooperation, not only the network characteristics can affect the innovation performance of enterprises, but also the nature of knowledge recombination in firms is vital to innovation (Bikard and Marx, 2020). In an environment of effective and efficient cooperation, enterprises with a rich knowledge base are more likely to succeed in the process of collaborative innovation. In such circumstances, enterprises are more likely to recombine knowledge (Speldekamp et al., 2020). More and more enterprises are committed to cooperative innovation to adapt to the new environment during global pandemic, thus reducing environmental pollution (Sarfraz et al., 2020a). Building and participating in the appropriate collaborative innovation network based on enterprises' knowledge base to improve their innovation performance are a major issue worthy of attention in academia. However, existing researches pay more attention to the direct impact of network structure characteristics or enterprises' knowledge base on innovation performance, while most of them focus on the industrial level. This study employs the data of listed enterprises in Jiangsu, Zhejiang, and Shanghai and discusses the logical relationship and characteristics between collaborative innovation networks and technological innovation performance. This study includes the two dimensions of network structure and network relationship. The breadth of enterprises' knowledge base is added as a moderating variable to study its direct impact on technological innovation performance and its moderating role between various network characteristics and technological innovation performance. From the practical level, this study provides important management enlightenment for middle- and high-level managers, local governments, and research institutions of Chinese enterprises on how to improve innovation ability and achieve win-win cooperation. From the theoretical level, supported by social network theory, resource-based theory, and collaborative innovation-related theories, the researchers have expanded the related studies on collaborative innovation networks, enterprise cooperation networks, etc. This study contributes significantly to previous studies in terms of index measurement and theoretical model construction.

The study is organized as follows: the researchers summarize the related literature and put forward hypotheses in **Theoretical Development And Hypothesis Development**. We introduce the sample data and describe the variables in **Sample Data and Variable Description**. The empirical results and analysis are presented in **Empirical Results and Analysis**. We offer a discussion of the policy implications of our results and concludes the paper in **Discussion and Conclusion**.

THEORETICAL DEVELOPMENT AND HYPOTHESIS DEVELOPMENT

Granovetter (1985) divided network features into network structure and network relationship from embeddedness regarding the division of collaborative innovation network dimensions. He pointed out that the network relationship mainly refers to the content, direction, and strength of relationships. In contrast, the structure refers to the distribution of network relationships in the overall network, including location, scale, and density. These can all be the specific measurement indexes of network characteristics. Extant studies indicate that many scholars have independently studied the impact of network structure and network relationships on corporate innovation performance. However, few studies have combined the two dimensions of structure and relationship to explore the relationship between network characteristics and corporate innovation performance. In addition, with the increasingly frequent sharing and transfer of knowledge resources between different subjects, the scope of knowledge-based theories has gradually expanded, not limited to a single enterprise, which also provides a theoretical basis for collaborative innovation network research amid

the COVID-19 pandemic period. Based on this theoretical development, this article put forward relevant hypotheses to support the findings.

The Impact of Network Structure on Technological Innovation Performance of Enterprises

Firstly, the network clustering coefficient has an enormous impact on the technological innovation performance of enterprises. A higher degree of agglomeration can enhance the trust relationship between partners in a cooperative network with small-world characteristics. The network clustering coefficient may conduct more frequent interaction and cooperation, which effectively improve the efficiency and accuracy of communication while reducing the risk of information dissemination, minimizing the innovation cost of enterprises, and finally increasing the innovation output of enterprises (Xia et al., 2018; Zhang et al., 2020). However, the innovation network with a high clustering coefficient will make the information aspect homogeneous, resulting in the phenomenon of local information circulation and resource redundancy, which will damage the efficiency of the network. The damage of the efficiency of the network inhibits the innovation output of enterprises and preventing the entrance of new partners (Uzzi and Spiro, 2005; Jiang et al., 2018). Hui and Xiaomin (2017) used the data of the Shanghai pharmaceutical manufacturing industry as samples to explore the influence of network characteristics on enterprise innovation performance. The result indicated a negative correlation between the network's small-world characteristics (average path length and clustering coefficient) and enterprise innovation performance. Jieqiong et al. (2015) believed that at the initial stage of constructing a cooperative network, the main body in the network has less experience in cooperation and gradually enters the formation stage of cooperation practice and ability. During this period, the pattern of cooperation is highly uncertain, and the clustering coefficient negatively affects enterprise innovation performance. However, when the cooperation experience of the main body is gradually enriched and the cooperation network begins to take shape, the promotion of the clustering coefficient can also promote the innovation performance of enterprises.

Based on the above analysis, this study argues that at the inception of a collaborative innovation network, the subjects' lack of technical cooperation experience leads to a low degree of cooperation and coordination. Thus, there are few information resources in the network. The increase of the clustering coefficient is not conducive to information flow, which hinders the improvement of the technological innovation performance of enterprises. However, with the gradual increase of network scale, enterprises' accumulated innovation resources and cooperation experience increase daily. Therefore, it becomes convenient to exchange knowledge resources and to cooperate accurately and efficiently. The higher the degree of network aggregation, the easier it is to promote the technological innovation performance of enterprises. The following hypothesis is put forward:

H1a: *There is a U-shaped relationship between the clustering coefficient and technological innovation performance of enterprises.*

Secondly, the numbers of structural holes have an enormous impact on the technological innovation performance of enterprises.

Nodes with more structural holes often have greater power, especially control over the flow of resources in the network (Yan and Guan, 2018). Therefore, firms that occupy a higher number of structural holes are often considered to be focal firms, and they always benefit by being better informed about what is going on in the network (Macaulay et al., 2018; Watts and Koput, 2019) and by bringing in high-quality resources (Sullivan et al., 2007). Coleman (1998) put forward a critical point of view on the relationship between structural holes and enterprise innovation performance. He pointed out that enterprises with more structural holes can learn the latest market situation faster and adjust their innovation strategy to adapt to the new changes in the market. It also promotes the improvement of enterprise innovation performance. Zaheer and Bell (2005) found that enterprises in the intermediary position have more innovation opportunities to keep their competitive advantage all the time. Jianzhong and Yingying (2015)also found that structural holes significantly positively impact the enterprise innovation performance.

Further, Karamanos (2016) suggested that alliance partners' structural holes positively affect the focal firms' exploratory innovation. Zhang et al. (2020) found that a greater betweenness centrality means more structural holes can facilitate the transmission of complementary knowledge. Wang and Sun (2021) showed that structural holes have a positive impact on green technology innovation. However, Liu (2011) pointed out that when the overall network is sparse, the number of structural holes does not positively impact enterprise innovation performance. Chenlei et al. (2017) showed that structural holes are negatively correlated with enterprise innovation performance.

This study argues that enterprises with more structural holes can get more cooperation opportunities. In this direction, if the enterprises can accurately identify the innovative resources that are beneficial and use them, the technological innovation performance of the enterprises can be significantly improved. Thus, it is hypothesized that:

H1b: *There is a positive relationship between structural holes and the technological innovation performance of enterprises.*

The Impact of Network Relationship on Technological Innovation Performance of Enterprises

Network relationship strength refers to the connection strength between two network members. Ritter and Gemünden (2003) pointed out that when an enterprise has close ties with external subjects, it is possible to obtain a higher success rate of product

and process innovation. Hongming et al. (2012) found that the intensity of network relationships directly impacts the enterprises' technological innovation. An empirical study by Jianping and Xiaoyun (2019) showed that the intensity of network relationships has a positive effect on improving the innovation performance of enterprises. The high intensity of network relationships has driven the rapid development of the industry while driving companies' technological innovation. According to Sina Pharma's statistics, in the biopharmaceutical industry,[2] a total of 139 deals took place in the first 4 months of 2020 regarding R&D collaborations on COVID-19 drugs, with 55% of these deals being non-government led and funded mainly by corporate collaborations. However, some scholars have a different view; that is, there are many strong links in the network, which will hinder the growth of the whole network innovation standards. Just as people usually find strong connections in close social circles, the influence of these strong connections may always remain in the network, thus inhibiting the growth of innovation (Onnela et al., 2007).

From the researchers' perspective, the enterprise collaborative innovation network emphasized that the strong relationship of enterprises has a higher degree of trust, which plays a positive role in reducing opportunistic threats, contributes to the resource sharing and further in-depth cooperation between the two partners, and can effectively improve the technological innovation performance of enterprises. Based on this, it is postulated that:

H2: *There is a positive relationship between the intensity of network relationships and the technological innovation performance of enterprises.*

The Direct Role and Regulatory Role of the Breadth of the Knowledge Base

1. The relationship between the breadth of knowledge base and technological innovation performance of enterprises. The breadth of knowledge base refers to the types of all knowledge elements owned by enterprises. In terms of enterprises, the more types there are, the wider technical fields there are. Studies have shown that if an enterprise can master knowledge in multiple technical fields, its absorptive capacity will be enhanced. In other words, the breadth of the enterprise knowledge base determines its ability to evaluate the scope of external knowledge (Cohen and Levinthal, 1990). Yan and Hong (2011) found that the breadth of knowledge base positively promotes the technological innovation performance of enterprises and formation of technological cooperation relations among enterprises (Hong et al., 2013). An empirical study by Chaoying and Lina (2017) showed that the diversity of enterprise knowledge base had a significant positive effect on knowledge innovation.

This study argues that the broader the knowledge base of enterprises, the stronger their absorptive capacity. They can learn more about the cooperative innovation network and then effectively improve their technological innovation performance. Based on this, the following assumption is put forward:

H3: *The breadth of the knowledge base is positively related to the technological innovation performance of enterprises.*

2. The adjustment of the breadth of knowledge base to the relationship between clustering coefficient and technological innovation performance of enterprises.

Laursen and Salter (2006) indicated that extensive and in-depth search through various search channels could provide ideas and resources that are helpful for enterprises to obtain and utilize innovation opportunities. However, with increased enterprise knowledge elements, the barriers to knowledge exchange between departments increase, inhibiting innovation performance improvement. Therefore, in a cooperative innovation network with a high degree of aggregation, frequent interaction between innovation subjects is beneficial to increase the knowledge base of enterprises. However, enterprises need to spend more time and energy to maintain and develop new knowledge elements to accumulate knowledge elements. At the same time, communication barriers between departments increase, resulting in a decrease in innovation output. Han and Yan (2017) took 171 enterprises in the information technology industry as research objects. The empirical results showed that the knowledge breadth had a negative moderating effect on the relationship between network clustering coefficient and enterprise innovation (number of granted patents). Based on this, the following assumption is put forward:

H4a: *The breadth of knowledge base negatively regulates the relationship between clustering coefficient and technological innovation performance of enterprises.*

3. The adjustment of knowledge breadth to the relationship between structural holes and technological innovation performance of enterprises.

Enterprises with more structural holes often have the advantage of resource control and can obtain abundant information resources. The knowledge breadth plays a vital role in the absorptive capacity of enterprises. Suppose enterprises with a wide knowledge base occupy the advantage of structural holes at the same time. In that case, they can screen out the ideas and knowledge in different markets quickly and accurately. This is conducive to opening up the connection channels between various knowledge elements and cooperation networks within enterprises, thus optimizing the allocation of knowledge resources within enterprises, improving utilization efficiency, and contributing to innovative achievements (Zhiming, 2016; Jiang et al., 2018). Hierarchical CEO succession is conducive to the improvement of SMEs performance through effective allocation of knowledge resources (Sarfraz et al., 2020b) and has positive impact on the innovation environment within the enterprise (Sarfraz et al., 2020c). On the contrary, if an enterprise has a narrow knowledge base and a large number of structural holes, it will be able to not only absorb the rich information resources in the network but also waste a lot of human and material resources of the enterprise. This inhibits the improvement of technological innovation performance because of blind technical cooperation. Based on this, this study puts forward the following assumption:

[2]https://view.inews.qq.com/a/20201016A009EC00, 2020-10-16.

H4b: *The knowledge breadth positively regulates the relationship between structural holes and the technological innovation performance of enterprises.*

4. The adjustment of the breadth of knowledge base to the relationship between network relationship strength and enterprise technological innovation performance.

Zhou and Li (2012) found that companies with an extensive knowledge base were more capable of developing fundamental innovation under the condition of internal knowledge sharing rather than external market knowledge acquisition. Yan et al. (2014) took the patent data of China's electronic information industry as research samples to explore the role of the knowledge base (including the breadth of knowledge base and consistency of knowledge base) between enterprises' technological cooperation and technological innovation performance. The study findings showed that there was a negative moderating effect. Therefore, enterprises can learn and absorb new knowledge stably for a long time and increase innovation output by deepening the intensity of network relations. However, when the enterprise's knowledge base is wide, the increase of network relationship strength does not necessarily promote the improvement of technological innovation performance. First, enterprises with a wide knowledge base may be too scattered in the technical fields of cooperation with external subjects because of their wide involvement. Increasing the intensity of network relations will lead to the inability to concentrate and consume vast amounts of workforce and materials but will not benefit enterprise innovation. Secondly, the communication barriers between technical departments of enterprises will increase with the widening of technical fields, and the cost of knowledge conversion will also increase. However, the high network relationship strength makes it impossible for enterprises to give up their existing partners easily; thus, the increased knowledge conversion cost and relationship maintenance cost are not conducive to enterprise performance improvement. Based on this, this study puts forward the following assumption:

H4c: *The breadth of knowledge base negatively regulates the relationship between the strength of network relationships and the technological innovation performance of enterprises.*

SAMPLE DATA AND VARIABLE DESCRIPTION

Sample Data

The samples used in this study are from the selected listed companies in Jiangsu, Zhejiang, and Shanghai in China. The intellectual property rights in Jiangsu, Zhejiang, and Shanghai are intensive, one of the regions with active innovation in China. The three places jointly build intellectual property protection policies to promote the integrated development of intellectual property rights. In this context, enterprises have high requirements for knowledge innovation. Enterprises begin to improve their competitive position through collaborative innovation due to increasingly fierce market competition.

In this study, the patent data used as research samples were jointly gathered from the A-share listed companies in Jiangsu, Zhejiang, and Shanghai, and other innovative subjects. The periods used were nearly 7 years. Since the study period started in 2010, to ensure the availability of relevant index data, 502 listed companies in operation before 2010 were selected as research objects. The patent applications data of each listed company were initially searched independently. After the listed companies without cooperative patents were excluded, then, based on listed companies' average annual cooperative patents, excluding the extreme values other than plus or minus three standard deviations, 193 A-share listed companies in Jiangsu, Zhejiang, and Shanghai were selected as the research objects. They comprised 58 listed companies in Jiangsu, 77 in Zhejiang, and 58 in Shanghai. The data of 193 listed companies applying for invention patents and utility model patents in China Patent Information Center (CNPAT[3]) were collected, and 7,563 remaining cooperative patents were also collected.

Most importantly, a patent cooperation matrix and the relevant network indicators are followed based on 7,511 cooperative patents after the patent data of duplicate applications were continuously eliminated. Furthermore, the design patents are not included in the research samples because of their low technical content and simple application process, which have little effect on reflecting the true technical level of enterprises. Besides, the time lag effect of R&D output is considered, and there is a lag period when the technological innovation performance of enterprises is measured. Patent data in this study are from Baiten.com,[4] financial data, and R&D data are from the annual reports of listed companies in Juchao.com.[5]

Variable Description

Firstly, the explained variable is the technological innovation performance of enterprises. In this study, data envelopment analysis (DEA) and MAXDEA software were used to measure the enterprises' technological innovation performance. On the part of regression analysis, the BCC model based on variable returns to scale is selected to measure the technological innovation performance of enterprises. In the robustness test, the SBM super-efficiency model is selected to measure the dependent variable. Concerning the selection of input–output indicators, the principles of objectiveness, systematicness, representativeness, and operability of the evaluation index system are followed. At the same time, the reliability of data sources and the feasibility of data collection are considered. R&D expenses and R&D personnel are selected as input indicators. The number of patent applications and the ratio of intangible assets to total assets are selected as output indicators. Intangible assets usually include patent rights, trademark rights, copyright, franchise, secret production method, formula, etc. The proportion of intangible assets can measure the technological innovation ability of enterprises (Hongtao and Xingzhuo, 2013). Considering

[3]http://www.cnpat.com.cn
[4]http://www.baiten.cn
[5]http://www.cninfo.com.cn

that there is a specific time lag in applying enterprise innovation resources, the input index of this study is the enterprise-related data in the current year, and the output index is the enterprise-related data 1 year behind.

Secondly, based on the two dimensions of network structure and network relationship, the clustering coefficient, structural hole, and network relationship strength are selected as explanatory variables. The clustering coefficient is an index of the ego-network structure, which represents the tightness of the ego-network. A structural hole is used to express the non-redundant connection. The most commonly used measures of the structural hole are limitation and effective scale. Because the restriction degree is a negative index and the effective scale is a positive index, this study uses the index of effective scale to measure the structural hole. The above two indexes are measured by UCINET software. According to Xinyue et al., 2018, the strength of the network relationship refers to measuring the average strength of all direct cooperative relationships of sample enterprises. The average value of each connection is directly connected with the enterprise in the collaborative innovation network.

Again, knowledge breadth is considered as the adjustment variable for this study. The breadth of knowledge base refers to all kinds of knowledge elements owned or controlled by an enterprise. This study referred to (Hong et al., 2013) measurement method of knowledge breadth and measures its knowledge breadth by the number of major categories of all international technology classifications involved in the application for invention patents in the first 5 years, that is, the number of non-duplicate International Patent Classification (IPC) numbers.

Finally, the control variables of this study are enumerated as follows:

- The age of listing is the difference between the date of listing and the data collection date. Generally speaking, enterprises listed earlier are well-known in the market. They always have stronger capital strength, richer material, human resources, and relatively complete R&D teams and equipment, making it easier to obtain more innovative output from innovation investment.
- The enterprise scale consists of the total assets at the end of each year. Generally speaking, the larger the scale of an enterprise, the stronger the financial strength, the more advanced the technology and equipment possessed, and the number of employees in the enterprise to a certain extent also took a big advantage; thus, the higher the absorption rate and utilization rate of innovative resources, the better the technological innovation performance.
- The degree of centrality, that is, the number of partners directly connected with the enterprise. Enterprises with a high degree of centrality can obtain more innovation resources to promote the improvement of the technological innovation performance of enterprises. Also, such enterprises often have a better reputation in their industries to more easily win partners' trust and attract more partners.
- The network centrality, that is, the overall centrality of the network. Wang et al.'s (2019) research showed that enterprise network centrality had a negative impact on exploratory innovation performance. Therefore, this study considers it as one of the control variables.
- R&D investment consists of the annual expenses the enterprises incurred in relation to R&D. Most scholars believe that R&D investment plays a positive role in improving the technological innovation performance of enterprises. However, a few scholars demonstrate an inverted U-shaped relationship between R&D investment and enterprise innovation performance and assert that over-emphasizing the high intensity of enterprise innovation investment is not conducive to the improvement of enterprise innovation performance (Zhiyong, 2013). Therefore, this study takes R&D investment as one of the control variables.

TABLE 1 | Description of variables.

Variable type	Name	Symbol	Measure index
Interpreted variable	Technological innovation performance	C	The efficiency of technological innovation
Explanatory variable	Clustering coefficient	CC	Network clustering coefficient
	Structural hole	SH	Effective scale
	Network relationship strength	RE	The average value of the values of each connection directly connected to the node
Control variable	Listing age	time	Number of listed years
	Enterprise scale	firm size	LN (total assets at the end of the period)
	Point degree center degree	DC	Relative pointwise centrality
	Network-centric potential	NC	Network-centric potential
	R&D investment	INV	LN (total R&D investment of enterprises)
Regulated variable	The breadth of knowledge base	KW	Number of non-duplicate IPC classification numbers

To sum up, this study investigates the technological innovation performance of enterprises. The clustering coefficient, structural hole, and network relationship strength were considered as explanatory variables. The breadth of knowledge base as moderating variable specifically analyzes the relationship between collaborative innovation network characteristics, knowledge breadth, and technological innovation performance of listed enterprises in Jiangsu, Zhejiang, and Shanghai. The variables described are shown in **Table 1**.

EMPIRICAL RESULTS AND ANALYSIS

Descriptive Statistical Analysis

In this section, we use SPSS software to complete the descriptive statistics and regression analysis. **Table 2** shows the mean

TABLE 2 | Descriptive statistics and correlation coefficient.

	1	2	3	4	5	6	7	8	9	10
1. C	1									
2. Time	−0.234***	1								
3. Firm size	−0.386***	0.441***	1							
4.DC	−0.013	0.039	0.119**	1						
5.NC	−0.210***	0.186***	0.143***	−0.004	1					
6.INV	−0.566***	0.298***	0.617***	0.078**	0.209***	1				
7.CC	−0.303***	0.224***	0.159***	−0.103**	0.080**	0.160***	1			
8.SH	0.004	0.140***	0.406***	0.406***	0.008	0.292***	0.014	1		
9.RE	−0.032	0.090**	0.019	0.564***	0.038	0.007	0.114**	−0.048	1	
10.KW	−0.085**	0.249***	0.517***	0.226***	0.091**	0.437**	0.101**	0.601***	0.014	1
Mean	0.738	10.499	22.537	0.080	0.872	9.455	0.686	2.319	5.272	7.617
SD	0.120	5.768	1.280	0.138	0.372	1.706	0.036	3.227	8.897	7.807

*Correlation is significant at the 0.1 level (two-tailed); **Correlation is significant at the 0.05 level (two-tailed); ***Correlation is significant at the 0.01 level (two-tailed).

deviation, standard deviation, and correlation coefficient of all involved variables. It can be observed from **Table 2** that the average value of technological innovation performance is 0.7381, and the standard deviation is 0.1203, indicating that the technological innovation performance of most enterprises is close to the overall average value. The average value of structural hole, network relationship strength, and knowledge breadth is minimal. The standard deviation is large, which indicates that the variable value is relatively discrete. There are great differences among enterprises in terms of patent cooperation and knowledge base.

Correlation analysis was performed to determine the strength of the linear relationship between two variables. This study preliminarily examines the linear relationship between variables by measuring the correlation coefficient. It can be observed from **Table 2** that the clustering coefficient, network relationship strength, and technological innovation performance of enterprises in the network have a negative correlation. In contrast, the structural hole has a positive correlation. The knowledge breadth positively affects the clustering coefficient and structural hole network relationship strength while negatively affecting technological innovation performance. However, the correlation analysis does not consider the mutual influence among multiple variables. As far as the correlation coefficient is concerned, it may not be the true embodiment of the linear correlation. Therefore, to clarify the relationship between variables, further regression analysis is needed.

Regression Analysis

Before the regression analysis is done, all the variables involved in the interaction should be mean-centered to avoid the potential collinearity problem. Followed by hierarchical regression analysis, all regression results are shown in **Table 3**. It can be seen from each table that the F-statistics of all regression models have passed the significance test at 1%, which proves that the model has a good fitting degree. The linear regression model can describe and reflect the relationship among independent variables, regulating variables, and dependent variables.

Model 1 contains only control variables. From **Table 3**, it can be seen that listing age (*time*), enterprise scale (*firm size*), and point degree center degree (*DC*) have no significant influence on the technological innovation performance of enterprises (p-values are 0.158, 0.354, and 0.299, respectively). The network-centric potential (*NC*) negatively affects the technological innovation performance of enterprises, and it has passed the 1% significance level test. The reason is that the overall network-centric potential is low. The small groups in the network are relatively independent, which hinders the knowledge flow of the whole network, thus inhibiting the improvement of the technological innovation performance of enterprises. There is a negative relationship between R&D investment and technological innovation performance, and it has passed the 1% significance level test. Observing the technological innovation performance of enterprises, we can see that the overall average value is 0.738, which shows that most enterprises have redundancy in R&D investment. Listed companies are often more abundant in the capital market, and they have more R&D investment than non-listed companies. However, emphasizing the high intensity of R&D investment is not conducive to improving enterprise innovation performance (Kang, 2013). Felix Ayadi et al. (1996) thought that excessive R&D of enterprises reduced the return on investment, thus inhibiting innovation performance improvement. Therefore, the innovation activities of enterprises should follow the strategy of comparative advantage, not blindly invest in R&D, but promote technological innovation performance by improving their capabilities.

After adding independent variables in Model 2, $R^2 = 0.419$, which is significantly higher than 0.335 in Model 1, and $F = 61.330$, which has passed the 1% significance level test. Therefore, this result indicates that the influence of control variables can be eliminated, and independent variables have a strong explanatory effect on the technological innovation performance of enterprises. **Table 3** shows that the standardized coefficient value of the first term of the clustering coefficient is −0.226, which passes the 1% significance level test. Therefore, the clustering coefficient has a significant negative impact on technological innovation performance. To explore whether there is a curvilinear relationship between the clustering coefficient and the technological innovation performance of enterprises, this study adds the square variable of the clustering coefficient in Model 3. The regression coefficient of the quadratic term is 0.385, which is positive at the significance level of $p < 0.01$,

TABLE 3 | Results of hierarchical regression analysis.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Time	−0.050	−0.009	0.005	−0.001	−0.002	0.009	0.006
Firm size	−0.039	−0.115***	−0.114***	−0.153***	−0.152***	−0.137***	−0.155***
DC	0.033	−0.150***	−0.138***	−0.132***	−0.130***	−0.078*	−0.140***
NC	−0.089***	−0.074**	−0.097***	−0.100***	−0.099***	−0.100***	−0.100***
INV	−0.511***	−0.509***	−0.479***	−0.507***	−0.503***	−0.486***	−0.510***
CC		−0.226***	−0.567***	−0.567***	−0.569***	−0.562***	−0.567***
SH		0.270***	0.253***	0.166***	0.174***	−0.051	0.163***
RE		0.101**	0.091**	0.083**	0.083**	0.049	0.089**
CC2			0.385***	0.381***	0.382***	0.391***	0.378***
KW				0.182***	0.205***	0.139***	0.167***
KW*CC					0.081		
KW*CC2					−0.071		
KW*SH						0.242***	
KW*RE							−0.058*
R2	0.335	0.419	0.452	0.470	0.471	0.483	0.472
Adj-R2	0.330	0.412	0.445	0.462	0.462	0.475	0.464
F	68.82***	61.33***	62.30***	60.11***	50.25***	57.65***	55.21***

*Correlation is significant at the 0.1 level (two-tailed); **Correlation is significant at the 0.05 level (two-tailed); ***Correlation is significant at the 0.01 level (two-tailed).

indicating that the clustering coefficient in the patent cooperation network of listed enterprises presents a U-shaped relationship with technological innovation performance. That is to say, when the clustering coefficient in the network gradually increases, the technological innovation performance of enterprises first drops and then rises, which is consistent with the conclusion drawn by Wu and Wang (2018). And at this stage, the technological innovation performance of enterprises is decreasing with the clustering coefficient. The reason is that the construction of a collaborative innovation system of listed enterprises in China is at the initial stage, and there is still a lack of cooperation experience among enterprises, universities, and research institutes, which needs a long time to adapt. Once the cooperation subjects gather continuously, the frequency of knowledge exchange increases and the increase of clustering coefficient will promote the technological innovation performance of enterprises.

The regression coefficient of the structural hole is 0.270, which has passed the 1% significance level test. It shows a positive effect between the structural hole and technological innovation performance of enterprises. Thus hypothesis H1b is verified. In the collaborative innovation network, the formation of structural holes is conducive to enhancing the trust among enterprises. Enterprises occupying a large number of structural holes can learn more knowledge and acquire richer heterogeneous resources from the collaborative innovation network. Collaborative innovation networks can help discover new market opportunities and grasp new market conditions at the first time, promote their innovation to adapt to the new environment and improve their technological innovation performance. The regression coefficient of network relationship strength is 0.101, the *p*-value is 0.011 (less than 0.05), and the hypothesis H2 is supported. In this study, the index of network relationship strength is measured by the average patent cooperation times of enterprises. The higher the network relationship strength, the more patent cooperation times between enterprises and external innovation subjects, which also means that the higher level of trust and knowledge matches them. This is more conducive for enterprises to access mutual learning and imitate effective communication and information transmission. Thus reducing the cooperation risk brought by uncertainty and directly improving the technological innovation performance of enterprises.

Model 4 adds moderating variables based on Model 3, and it tests the direct effect of the knowledge breadth on technological innovation performance. From **Table 3**, it can be seen that the regression coefficient is 0.182, and the *p*-value is 0.000, which has passed the 1% significance level test. It shows a significant positive correlation between enterprises' knowledge breadth and technological innovation performance; hence, hypothesis H3 passes the verification.

In Model 5, the product of the knowledge breadth and the first term of clustering coefficient are added and the product of the knowledge breadth and the second term of the clustering coefficient. It can be observed from **Table 3** that the coefficients of the two product terms are 0.081 and −0.071, respectively, and the *p*-values are both greater than 0.1, which failed the significance test. Therefore, hypothesis H4a has not been verified. From the above analysis, the results portray that constructing a collaborative innovation system of listed enterprises in Jiangsu, Zhejiang, and Shanghai has not reached the maturity stage. There is still a lack of cooperation experience among partners. Due to inadequate knowledge mobility in the network during this adaptation period, the enterprise's knowledge breadth has not played a regulatory role between clustering coefficient and technological innovation performance.

In Model 6, the product term of the knowledge breadth and the structural hole is added. It can be observed from **Table 3** that the coefficient of the product term of the knowledge breadth and structure hole is 0.242, and the value of p is 0.000, which has passed the 1% significance level test. It portrays that the enterprise's knowledge breadth has a positive moderating effect on the relationship between enterprises' structural hole and technological innovation performance. The hypothesis H4b is verified accordingly. Therefore, when the knowledge base

of enterprises is wide, the impact of structural holes on technological innovation performance is more significant.

Model 7 examines the moderating role of knowledge breadth in the influence of network relationship strength on the technological innovation performance of enterprises. It can be seen from **Table 3**; the coefficient of the product term of regulatory variables and network relationship strength is −0.058, which has passed the 10% significance level test. It shows that the breadth of knowledge base weakens the positive impact of network relationship strength on technological innovation performance; hence, hypothesis H5 is verified. This is consistent with the research conclusion of Yan et al. (2014). The wider the technical field covered by the enterprise knowledge base, the more difficult for them to integrate it. In brief, it is difficult for the new knowledge obtained from outside to be transformed into the enterprises' innovation output. Strengthening the network relationship strength will cause enterprises to consume more human and material resources. The internal innovation resources cannot be concentrated; it will inhibit the improvement of technological innovation performance.

Robustness Test

To improve the validity of this study, a variable replacement method is used to test the robustness of the above regression model. In the part of regression analysis, the input-oriented BCC model is used to measure the technological innovation performance of the enterprise. The SBM super-efficiency model will be used to measure it and re-estimate the original regression model in the robustness test. It can be seen from **Table 4** that the F-statistics of all regression models pass the 1% significance test, indicating that the model has a good fitting degree.

It can be observed from **Table 4**; the regression coefficient of the structural hole is 0.268, which passes the 1% significance level test; and the hypothesis H1b is valid and passes the robustness test. Similarly, hypothesis H2 passes the robustness test too. The regression coefficient of the quadratic term of the clustering coefficient is 0.550, and the *p*-value is 0.000 (less than 0.1), which indicates that the clustering coefficient has a U-shaped relationship with the technological innovation performance of enterprises; the hypothesis H1a still passes the robustness test.

Based on Model 10, Model 11 adds the moderating variable. It can be seen from **Table 4** that hypothesis H3 passes the robustness test. Models 12 to 14 are robust tests of the moderating effect of knowledge breadth. Based on Model 12, it is observed that the coefficients of the first term and the second term of the knowledge breadth and the clustering coefficient are 0.069 and −0.038, respectively, consistent with the previous conclusions. According to Model 13, it can be found that hypothesis H4b passes the robustness test. Model 14 verifies the moderating effect of the knowledge breadth between network relationship strength and technological innovation performance. The regression coefficient of the product term is −0.07, which has passed the 5% significance level test. Thus hypothesis H4c passes the robustness test.

To sum up, each hypothesis test is consistent with the original regression model, which shows that the linear multiple regression model established in this study is robust. The empirical analysis results are summarized as shown in **Table 5**.

Research Findings

This study investigated the influence of collaborative innovation network structure and network relationship on the technological innovation performance of listed enterprises in Jiangsu, Zhejiang, and Shanghai. And this study, at the same time, analyzes the moderating effect of the enterprise's knowledge breadth between network characteristics and technological innovation performance and draws corresponding research conclusions.

It was found that:

1. There is a U-shaped relationship between the clustering coefficient and technological innovation performance of enterprises. The main reason is that the collaborative innovation

TABLE 4 | Robustness test.

Variable	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Time	−0.031	0.011	0.030	0.024	0.023	0.034	0.033
Firm size	−0.035	−0.113***	−0.112***	−0.146***	−0.145***	−0.132***	−0.148***
DC	0.047	−0.119***	−0.102***	−0.097***	−0.093**	−0.048	−0.106**
NC	−0.091***	−0.077**	−0.109***	−0.112***	−0.110***	−0.112***	−0.112***
INV	−0.496***	−0.495***	−0.451***	−0.476***	−0.472***	−0.458***	−0.481***
CC		−0.216***	−0.702***	−0.702***	−0.703***	−0.698***	−0.702***
SH		0.268***	0.244***	0.166***	0.175***	−0.027	0.162***
RE		0.076*	0.062	0.055	0.054	0.024	0.062
CC^2			0.550***	0.546***	0.544***	0.555***	0.543***
KW				0.163***	0.167***	0.124***	0.145***
KW*CC					0.069		
$KW*CC^2$					−0.038		
KW*SH						0.216***	
KW*RE							−0.070**
R^2	0.307	0.389	0.456	0.470	0.472	0.481	0.475
Adj-R^2	0.302	0.382	0.449	0.463	0.463	0.473	0.466
F	60.58***	54.15***	63.42***	60.31***	50.47***	57.20***	55.67***

*Correlation is significant at the 0.1 level (two-tailed); **Correlation is significant at the 0.05 level (two-tailed); ***Correlation is significant at the 0.01 level (two-tailed).

TABLE 5 | Hypothesis results.

Hypothesis	Hypothetical content	Passed situation
H1a	There is a U-shaped relationship between network clustering coefficient and technological innovation performance of enterprises; that is, with the increase of network clustering coefficient, technological innovation performance first drops and then rises	Pass
H1b	There is a positive relationship between network structure hole and technological innovation performance of enterprises	Pass
H2	There is a positive relationship between the intensity of network relationship and the technological innovation performance of enterprises	Pass
H3	The breadth of knowledge base has a significant positive impact on the technological innovation performance of enterprises	Pass
H4a	The breadth of knowledge base weakens the U-shaped relationship between clustering coefficient and technological innovation performance; that is, the wider the knowledge breadth, the flatter the U-shaped relationship between clustering coefficient and technological innovation performance	Not through
H4b	The breadth of knowledge base strengthens the positive influence of the structural hole on the technological innovation performance of enterprises	Pass
H4c	The breadth of knowledge base weakens the positive influence of network relationship strength on an enterprise's technological innovation performance	Pass

system in Jiangsu, Zhejiang, and Shanghai is still at the initial stage, which is not yet matured. Therefore, most of the innovation subjects lack cooperation experience or even cooperation consciousness. It takes a long time for each collaborative innovation subject to adapt to the changes before reaching the substantive stage of knowledge transfer

2. Structural holes positively affect the technological innovation performance of enterprises. In the collaborative innovation network, enterprises with more structural holes can have more opportunities to obtain resource heterogeneity and adjust their development strategies according to the market to improve their technological innovation performance. Therefore, enterprises with more structural holes have more advantages in technological innovation performance than the collaborative innovation network of listed enterprises in Jiangsu, Zhejiang, and Shanghai
3. The strength of network relationships positively affects the technological innovation performance of enterprises. From the perspective of trust and resource flow, a closer network relationship can bring rich emotional resources to enterprises to a certain extent, promote trust among enterprises, and be more conducive to knowledge sharing and transmission, thus improving the technological innovation performance of enterprises.
4. The knowledge breadth has no moderating effect on the relationship between clustering coefficient and technological innovation performance of enterprises. From the above analysis, it can be seen that the subjects in the cooperation network of listed enterprises in Jiangsu, Zhejiang, and Shanghai are scattered. And the degree of agglomeration is low, which is in the initial stage of building a collaborative innovation system. Enterprises lack cooperation experience and have not established a perfect trust mechanism, which leads to the fact that the breadth of their knowledge base does not play a regulatory role between them.
5. The knowledge breadth positively regulates the impact of structural holes on the technological innovation performance of enterprises. When the number of structural holes in enterprises gradually increases, the resource heterogeneity of those enterprises can also be improved. At this time, enterprises with a wide knowledge base have greater advantages in absorbing this resource heterogeneity because of their strong absorptive capacity, which is conducive to increased innovation output.
6. The knowledge breadth negatively regulates the influence of network relationship strength on the technological innovation performance of enterprises. The wider the technical fields owned by enterprises, the greater the possibility of reorganizing essential knowledge elements. Confronted with obstacles in some technical fields, enterprises can absorb relevant knowledge through collaborative innovation to make up for their shortcomings, broaden their knowledge base, and promote the improvement of technological innovation performance. However, when an enterprise tries to operate a network-wide knowledge base independently, it may lose more than it gains by choosing to strengthen cooperation intensity because it is more cumbersome for an enterprise to integrate internal innovation resources owing to extensive technical fields.

DISCUSSION AND CONCLUSION

Discussion

Extant studies on collaborative innovation networks and firms' innovation performance have unilaterally focused on network structure or network relationships (Anqi and Shengxu, 2020; Wang and Sun, 2021). This study fills this gap by exploring the effects of collaborative innovation network structure and network relationships on technological innovation performance of listed enterprises in Jiangsu, Zhejiang, and Shanghai. In addition, this study analyzes the moderating role of enterprise's knowledge breadth between network characteristics and technological innovation performance and draws corresponding conclusions.

Zhang et al. (2020) showed a positive relationship between clustering coefficient and focal firm innovation performance,

and most studies consider a linear relationship between them (Hui and Xiaomin, 2017). However, it is arguably a bit different from our findings. Our study further suggests that a U-shaped relationship between clustering coefficient and firm technology innovation performance exists. The reason lies in that their research results can only focus on the static network. However, the corporate-related collaborative innovation networks are evolving dynamically, which is different from the relationships between clustering coefficient and technological innovation performance in different periods.

Furthermore, Wang et al. (2019) found that network relationship strength positively enhances firms' innovation performance. Our study held that the breadth of knowledge base negatively regulates the influence of network relationship strength on the technological innovation performance of enterprises. So it is consistent with the findings of Speldekamp et al. (2020).

Finally, Yingying et al. (2020) explored the influencing factors of enterprises' collaborative innovation under the background of COVID-19 by constructing an evolutionary game model. The research showed that the number of cooperation had a positive impact on promoting open innovation of enterprises, consistent with the research conclusions. The enhancement of network relationship strength consolidates the trust between enterprises and further promotes long-term cooperation, conducive to the steady improvement of enterprises' technological innovation performance.

Practical Implementations

The findings of this study bring forth practical implications. Managers can rely on internal firm resources and external networks, and institutional conditions to enhance the network collaboration efforts of their companies. Through the in-depth analysis of this study, the following vital enlightenments are obtained:

1. At the formation stage of a collaborative innovation network, enterprises participating in the network with a high degree of agglomeration will not find it conducive to their innovation because the network with a high degree of agglomeration makes the relationship between subjects more complicated and it is not easy to establish a trust relationship. Therefore, presently listed enterprises in Jiangsu, Zhejiang, and Shanghai should embed into collaborative innovation networks with moderate aggregation. Networks with different aggregation levels have different resource circulation states. Enterprises should avoid embedding networks with excessive aggregation and redundant information to integrate their resources and improve their technological innovation performance
2. From the perspective of collaborative innovation in response to the COVID-19 pandemic, the successful advancement of industry-university-research cooperation requires the guidance of the governments of the respective countries and support of the outside world. Local governments should actively build a platform for industry-university-research cooperation conducive to local economic development based on their industrial characteristics. They can also cooperate with universities to build a research base and conduct demand research and demand docking in the base, to establish a long-term cooperative relationship, which will not only improve the technological innovation performance of enterprises but also effectively improve the conversion rate of scientific and technological achievements of universities, and achieve win-win cooperation finally
3. During the pandemic, many listed companies helped fight the COVID-19. The social value generated was much higher than the economic value, which brought an excellent reputation to these companies and laid a solid foundation for long-term development. Such companies are often more responsible and should be preferred partners. Therefore, it is suggested that innovation subjects should choose responsible and trusted R&D partners in collaborative innovation. It is important for enterprises to seize the opportunity of collaborative innovation, deepen cooperative relations, gradually accumulate cooperation experience in cooperation, enhance mutual trust, establish long-term cooperation plans or build strategic alliances, and enhance cooperation ability and technological innovation performance
4. Enterprises should pay more attention to their knowledge base from the strategic level and choose to embed them into the appropriate collaborative innovation network according to the characteristics of their knowledge base. According to this study, the breadth of knowledge base significantly enhances the positive impact of structural holes on technological innovation performance, but it inhibits the positive relationship between network relationship strength and technological innovation performance. When an enterprise has a wide knowledge base, its ability to perceive and utilize innovative resources is vital. However, enterprises with a wide knowledge base often have scattered innovation resources. Too much attention to the intensity of cooperation with external subjects is not conducive to resource concentration. It consumes too much manpower and material capital, which invariably hinders new technological innovation. It will be more beneficial for enterprises to choose key areas to deepen cooperation with external bodies and pay more attention to integrating and developing internal resources in other fields. Therefore, with the rapid change of technology, it is easy for enterprises to ignore the changes in the surrounding technical environment if they only focus on the technical fields that they have specialized in. Through knowledge sharing and technical cooperation with the outside, enterprises can acquire new knowledge to maintain technical sensitivity, which positively impacts the fundamental innovation of enterprises. To enable enterprises to carry out external cooperation more effectively, enterprise managers must first check their knowledge base and determine its nature. When choosing external technical cooperation, they can fully consider the complementary degree of their original knowledge elements.

Secondly, managers should adjust their knowledge integration mechanism and strive to cultivate their knowledge integration ability to better adapt to the existing knowledge base of enterprises. To maximize the benefits brought by accumulated knowledge resources and strengthen innovation, enterprises with a vast knowledge base should strengthen their knowledge-sharing process and procedures. Enterprises with a deep knowledge base should make joint efforts to establish and improve the knowledge integration mechanism.

CONCLUSION

This study takes A-share listed companies in Jiangsu, Zhejiang, and Shanghai as the research objects, constructs a theoretical model based on the two dimensions of network structure and network relationship, and constructs an empirical analysis on the relationship between the characteristics of a collaborative innovation network and the technological innovation performance of enterprises, and tests the moderating effect of the knowledge breadth between them.

The study found that the dominant position of enterprises in the collaborative innovation network can promote technological innovation performance. For example, the increase in the number of structural holes and the strengthening of network relationships improves the collaboration strength of enterprises. Simultaneously, the breadth of enterprise knowledge base plays a critical role between network characteristics and technological innovation performance. Enterprises need to choose suitable network partners according to the features of the knowledge base.

Finally, it is worth mentioning that in response to the COVID-19, the researchers find that cooperative innovation has become an inevitable trend.

The contributions of this study lie in: (1) Measuring the strength of network relations with statistical data, which makes up for the defect that questionnaire data is subjective. (2) Using DEA to measure technological innovation performance is more objective than using patent quantity to measure technological innovation performance. (3) From the regional level, the relationship between the network and technological innovation performance is studied, and the key findings are universal. They can be applied in many fields instead of specific industries.

LIMITATION OF THE STUDY

The researchers identified the following study limitations: In the dimension of network relationship, only the strength of the network relationship is measured, and the indicators, such as network reciprocity, are not included. As for the adjustment variables, only the adjustment effect of knowledge breadth is verified, but the knowledge depth is not explored. Future studies would be conducted to increase the complexity of the model and look for other possible regulatory variables or intermediary variables. Secondly, only listed companies are selected in this study to ensure data availability, while other small- and medium-sized enterprises were not considered. Further research would consider expanding the scope of research objects.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

MZ contributed to the conception of the study. SJ performed the data analyses and wrote the manuscript. ZB helped perform the analysis with constructive discussions. XH helped collect data. All authors contributed to the article and approved the submitted version.

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