



Review article

The psychological impact of quarantine due to COVID-19: A systematic review of risk, protective factors and interventions using socio-ecological model framework



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ABSTRACT

Background: Though quarantine is a pertinent control measure for the spread of COVID-19, it is equally important to consider its negative impacts, as it causes severe psychological, emotional, and financial problems not only for those who are quarantined but also for many others who are directly or indirectly connected to those who are quarantined. There appears to be a need to synthesise the available literature evidence on the psychological impact of quarantine experience, especially the multilevel risk factors that make individuals vulnerable to psychological impact and the protective factors to deal with the negative effects of quarantine.

Objective: This systematic review attempted to identify the various psychological impacts associated with the experience of quarantine, the risk and protective factors and list out various psycho-social interventions that can minimise the risks and facilitate the protective factors associated with the experience of quarantine.

Methods: A systematic search adhering to the PRISMA guidelines was performed in four databases PubMed, Scopus, PsycNet, Web of Science and 10518 articles related to COVID-19 and quarantine were obtained. After screening processes and quality assessment using standard checklist 74 articles that fulfilled the eligibility criteria were chosen for the final review.

Findings: Individuals subjected to quarantine had anxiety, depression, post-traumatic stress symptoms, sleep problems, and somatic difficulties. Some of the key risk factors during quarantine are young age, female gender, low money, fear of infection, poor sleep quality, reduced physical activity, increased sedentary behaviours, and a lack of social support. Financial difficulties and stigma remained risk factors even after the quarantine period had ended. Key protective factors were coping skills, home based exercise, leisure, recreational activities, maintaining relationships using social media and availability of mental health services. The findings also highlight the necessity for tele mental health interventions to address the psychological effects of quarantine.

Conclusion: Multilevel interventions are required to minimise the impact of risk factors and enhance protective factors.

1. Introduction

In December 2019, Wuhan, China witnessed the major outbreak of a pandemic, COVID-19, caused by a novel coronavirus (SARS-CoV-2) and since then its prevalence is seen in many countries across the globe. According to the World Health Organization (WHO, 2020a), SARS-CoV-2 is mainly disseminated through saliva droplets or nasal discharges when

infected people cough or sneezes. Physical distancing initiatives are one of the public health measures to slow down the transmission rate and mortality rate associated with COVID-19. Individuals, communities, specific portions of the population, or the entire population who have contacted infected individuals are quarantined to see if they develop the illness (WHO, 2020b; Centre for Disease Control and Prevention, 2017). Quarantine is a condition in which individuals who had exposure to a

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communicable disease are asked to keep themselves away from others for the disease's incubation period (Centers for Disease Control and Prevention, Quarantine and Isolation, 2020). The International Health Regulations (WHO, 2008) mentioned that suspected persons need to be quarantined to prevent the spread of infection. Timely implementation of quarantine measures during an outbreak delays the spread of the disease. Moreover, if the local transmission is ongoing, it can further delay or control the peak of the epidemic (Khanna et al., 2020). Mass quarantine is one of the measures that many governments worldwide imposed during the initial phase of the current COVID-19 pandemic (Chu et al., 2020).

It is equally important to understand the negative impacts of these control measures as quarantine experience contributes to serious psychological, emotional, and financial problems, not only for those who get quarantined but also for many others who are directly or indirectly connected to the quarantined individuals (Brooks et al., 2020; Shigemura et al., 2020). Quarantined people described it as an unpleasant experience. It leads to separation, isolation, boredom and a sense of uncertainty. Suicide has also been reported in previous outbreaks (Bai et al., 2004). It appears to be a matter of concern as preliminary research evidence reported that quarantine measures apparently posed a significant psychological burden on individuals (Bavel et al., 2020), and studies conducted in the context of SARS outbreak revealed that the quarantined individuals experienced substantial psychological distress (Lin et al., 2010; Hawryluck et al., 2004).

To enhance infectious disease containment and minimise negative effects on persons under quarantine, their families, and their social networks, it's critical to know and understand what they're going through (Hawryluck et al., 2004). A deeper understanding of the risk factors leading to the experience of psychological impacts of quarantine and the protective factors safeguarding against this could help in synthesising sound research evidence for the implementation of appropriate measures to tackle this issue. For a comprehensive understanding, the current systematic review takes a multi-level approach to identify these factors from the perspective of socio-ecological health promotion framework by McLeroy et al. (1988). This model is based on Bronfenbrenner's (1979) ecological systems theory. It identifies multi-level factors at an individual, interpersonal, organisational, community, and public policy levels. This model has been considered as a guiding framework for various action research studies, especially in complex situations. A prime reason for this is that, as the complexity of the situation increases, a multi-faceted approach serves to overcome the barriers from different angles. In the present scenario, the evaluation of the psychological impacts of quarantined individuals based on this theoretical framework can provide insights that can be implemented to improve the well-being of the people around the globe fighting the pandemic.

A systematic review of the available shred of literature will be helpful for health care professionals and future researchers obtain an updated, in-depth understanding of how quarantine is affecting people psychologically. Specifically, understanding the risk and protective factors will guide future researchers in planning appropriate multilevel interventions as they are few. To further understand the research gaps and future avenues of research, an in-depth systematic review of existing literature is needed. Hence the objectives of this systematic review are formulated based on the social-ecological model, and aims to understand the risk and protective factors during and after quarantine, operating from various levels. Further, the review explores various interventions that can help reduce risk factors and foster the protective factors.

1.1. Significance of the study

Though there is already a lot of research on the psychological impact of quarantine, synthesising the existing literature from socio-ecological theory remains significant, since this model has been considered as a guiding framework for various action research studies, especially in complex situations. This helps to develop appropriate intervention

strategies at individual, interpersonal, organisational, community, and public policy levels.

2. Methods

2.1. Eligibility criteria

The following inclusion criteria were used in the current review:(a) Participants: studies which focused on individuals who underwent quarantine period due to COVID-19 were included,(b) Predictors/exposures: Studies which focussed on quarantine period due to COVID-19 were only included (c) Outcome: studies reporting the risk factors making individual vulnerable to experience psychological impacts of quarantine ranging from anxiety, depression to severe psychotic symptoms were included; studies investigating the protective factors; and interventions to help individuals deal with the psychological impacts of quarantine were also included (d) studies published in the English language.

2.2. Information sources & search strategy

A systematic search was carried out electronically for the present study through the following four databases: PubMed, Scopus, PsycNet and Web of Science between April 2020 and August 2020. The search terms were "COVID" or "COVID-19", "quarantine" and "psychological impact". The search terms were kept as broad as possible to ensure maximum inclusion of relevant articles. A similar search strategy with appropriate Boolean operators was executed for identifying relevant articles in all the four databases.

2.3. Selection process

After preliminary reading of titles and abstracts of 10518 articles obtained from four database searches (PubMed- 2842; PsycNET-299; Scopus - 5611 and Web of Science- 1766), 6176 short listed articles were verified for full-text availability. Among the shortlisted articles, 6098 articles did not meet the inclusion criteria. The remaining 98 full-text articles were assessed for eligibility, among them, 24 were excluded due to either unavailability of full-texts or the content not fulfilling eligibility criteria after a thorough analysis. At both stages of screening, three authors had independently checked and confirmed the appropriateness of the choice of the articles being included and excluded. Any disagreements in the process were settled through discussion with the first author. Finally, 74 articles were considered for the final review. The included studies were heterogenous in terms of the study design, and hence the sample size of quarantined individuals in each study was not restricted to any particular range (Figure 1. PRISMA flow diagram).

2.4. Data extraction and analysis

Two authors extracted the data independently, and later the information extracted was cross-checked. Any discrepancies were settled through discussion. The information extracted were author/s, title, year of publication, geographical location, study design/type, participants, and the results related to this study's objectives. The classification of the identified factors was done on the theoretical basis of Socio-ecological framework. As per this framework, the interplay of individual, interpersonal, organizational, community and public level factors influences a phenomenon under study. The first level identified individual risk and protective factors such as age, gender, and education level, which contribute to the psychological impacts of quarantine. Interpersonal elements such as an individual's closest social circle—peers, lovers, and family members—influence, and contribute to their experience at the second level. The third level looked at the influences of the environments in which social relationships take place, such as schools, companies, and neighbourhoods. The fourth level classified factors based on the

influence of broader societal level factors such as community norms. Finally, In the fifth level factors identified from the review were classified based on public level policies, regulations and facilities that directly contributes to the experience of quarantine.

2.5. Quality assessment of the included studies

For the various study designs included in this review, three authors independently assessed the methodological quality of all the included studies using the Joanna Briggs Institute Critical Appraisal tools, which contain a set of standardised checklists. Any differences about the inclusion of studies during quality evaluation were discussed and resolved with the other authors, resulting in the elimination of any potential bias in study selection (Supplementary file: Quality assessment complete checklist file of all included articles).

3. Results

3.1. Study characteristics

The study characteristics are summarized in Table 1 highlighting the geographical location, study design/type, participants, and major findings. Major findings included the psychological impact of quarantine, risk, protective factors and interventions if any. The corresponding level of socio-ecological model with respect to each study findings was also included in the table. The review included 74 studies which were heterogeneous in terms of study designs. The studies reviewed were carried out among quarantined individuals, including

children, adolescents, the general public and older adults. Nine studies specifically focused on the children and adolescent population, three studies among the psychiatric population, five studies among health care workers, and two studies among sport persons such as athletes and chess players quarantine experience, respectively. Thirteen studies focussed on the need for developing interventions to tackle the psychological impacts of quarantine. Concerning their geographical location, there was representation from countries belonging to Asia, America, Europe, and Australia. However, studies from China dominated the review, followed by Italy, India, United States of America, and Spain.

3.2. Psychological impacts

Thirteen studies reported that the quarantine led to following psychological difficulties such as anxiety (El Keshky et al., 2020; Fernández et al., 2020; Fuentes-García et al., 2020; Giardino et al., 2020; Kılınc el et al., 2020; Khan et al., 2020; Lei et al., 2020; Massad et al., 2020; Pandey et al., 2020; Pérez-Fuentes et al., 2020; Ruggieri et al., 2020; Youssef et al., 2020; Wielgus et al., 2020). Ten studies reported the occurrence of depression during this period (El Keshky et al., 2020; Fernández et al., 2020; Giardino et al., 2020; Jurblum and Castle 2020; Khan et al., 2020; Lei et al., 2020; Pandey et al., 2020; Pérez-Fuentes et al., 2020; Tang et al., 2020a,b,c; Youssef et al., 2020). Nine studies reported individuals experiencing distress (Cineka and Raj, 2020; diCagno et al., 2020; Gan et al., 2020; Khan et al., 2020; Ribeiro et al., 2020; Ruggieri et al., 2020; Saurabh & Ranjan, 2020; Xin et al., 2020; Youssef et al., 2020).

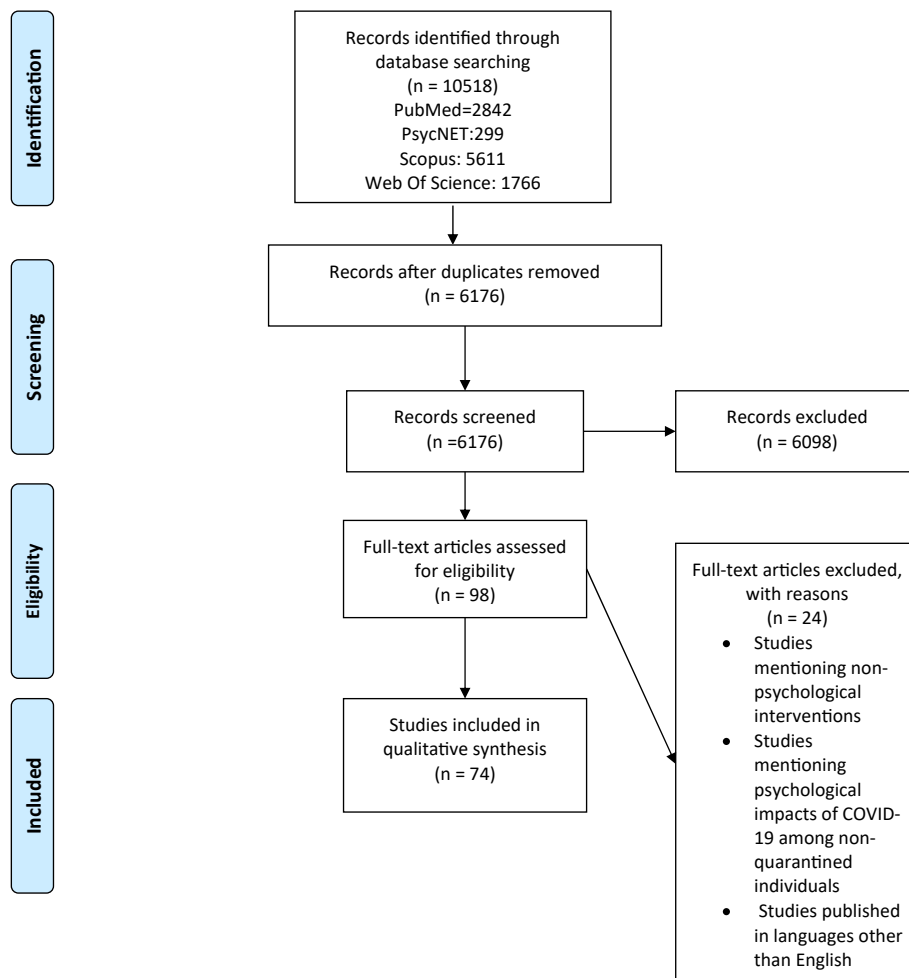


Figure 1. PRISMA Flow diagram illustrating study selection process.

Table 1. Study characteristics.

Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
1	Lei et al. (2020)	South-Western China	Comparative Study	Quarantined individuals and non-quarantined individuals	The study found the prevalence of anxiety and depression among quarantined individuals. The risk factors associated with this included low income, education, high self-evaluated level of knowledge, worry related to infection, having no social support, greater property damage and low perceived health condition.	Individual & Interpersonal
2	Finatti et al. (2020)	USA	Case Report	A 36-year-old COVID-19 affected woman	The findings reflected the risk of developing acute-onset psychosis among individuals without any prior psychiatric history which is correlated with the experience of quarantine.	Individual
3	Fawaz and Samaha (2020a),b	Lebanon	Quantitative Cross-Sectional study	Lebanese citizens	The results found the development of PTSD symptomatology among quarantined individual.	Individual & Public
4	Saurabh & Ranjan 2020	India	Qualitative	Children and Adolescents	The study found that the children and adolescent subjected to quarantine experienced greater psychological distress with worry, fear and hopelessness as the common feelings associated with quarantine experience.	Individual
5	Zanardo et al. (2020)	Italy	Non-concurrent case-control study	Mothers in the immediate post-partum period	The findings reflected the new mothers' concerns about the risk of exposure to virus infection and quarantine experience which resulted in the worsening of depressive symptoms among them.	Individual
6	Sacco et al. (2020)	China	Article review	Home quarantined individuals	The findings highlighted the risks associated with quarantine measures during the pandemic and suggest the measures to prevent and improve the reporting of abuse cases related to domestic violence.	Interpersonal
7	Liu et al. (2020)	China	Article review	Quarantined children	The article focused on the vulnerabilities children go through and the corresponding effective intervention to promote their mental health during challenging times like pandemic.	Individual
8	Davide et al. (2020)	Italy	Naturalistic observation	Outpatients diagnosed with OCD	The study found that quarantine experience significantly worsened the OCD symptoms among patients.	Individual
9	Casagrande et al. (2020)	Rome, Italy	Cross-sectional survey	Quarantined Adults	Pandemic experience is a risk factor for sleep disorders and development of other psychological issues among the Italian population.	Individual
10	Tang et al. (2020a),b,c	China	Survey	home-quarantined Chinese university students	The study found the prevalence of depression and PTSD among individuals. Extreme fear and short sleep duration acted as risk factors for these issues.	Individual
11	Benke et al. (2020)	Germany	Qualitative	Adults	The study found association between quarantine restrictions with higher mental health impairments.	Individual
12	Louvardi et al. (2020)	Greece	Quantitative	943 healthy individuals and 163 chronic patients	The study findings suggest that the main focus of interventional programs for chronic disease patients (specifically respiratory patients) amidst quarantine experience should be on distress and somatization instead of anxiety and depression.	Individual
13	Pérez-Fuentes et al. (2020)	Spain	Cross-Sectional study	Spanish Adults	The findings showed that the perception of pandemic related threat is associated with negative affect and emotional signs such as sadness to depression, anxiety, anger to hostility	Individual
14	Fawaz and Samaha (2020a),b	Lebanon	Qualitative	Health care workers	The study found the intense psychological challenges posed by quarantined health care workers. The risk factors associated with worsening these issues includes fear of contracting and spreading the virus, conflict between professional duty and family obligation, stigma of being infected and inadequate available information.	Individual, Interpersonal, Organizational, Community
15	Werneck et al. (2020)	Brazil	Survey	Brazilian Adults	The findings reflected the association of poor sleep quality, physical inactivity and sedentary behaviours to worsening of mental health related to pandemic quarantine.	Individual

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Table 1 (continued)

Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
16	Afzali et al. (2020)	Russia	Mixed -Method	International students in Russian Universities	The study developed and validated a scale measuring the relationship between factors such as financial stability, living, educational conditions, social life, physiological reactions and psychological stability with life satisfaction of international students during quarantine associated with COVID-19	Individual & Public
17	Xin et al. (2020)	China	Cross- Sectional survey	University students in China	The study found that quarantined individuals perceived discrimination more than others who weren't quarantined and exhibited mental distress.	Individual Community
18	Giardino et al. (2020)	Argentina	Survey	Health care workers	The results showed that a very high proportion of health care workers suffered from symptoms of anxiety, depression and sleep problems.	Organizational
19	López-Carral et al. (2020)	Spain	Online experimental study	Adults	The findings suggest that quarantine impacts mood negatively, resulting in a negatively biased perception of emotive stimuli.	Individual
20	Shariat et al. (2020)	U.S.A	Article Commentary	Office Workers	Home -based exercise can in help alleviate the physical and psychological issues followed by quarantine related restrictions.	Individual
21	Fernández et al. (2020)	Argentina	Cross-sectional study	Quarantined individuals	Results reflected the association of quarantine with intense psychological distress and high prevalence of symptoms such as Phobia, Anxiety, Depression, Obsession-Compulsion and hostility. Attention to coping skills is implicated as a potential mediator for quarantine related emotional sufferings.	Individual
22	Massad et al. (2020)	Jordan	Cross -Sectional study	Jordan citizens above 18 years of age	Findings showed that quarantine related anxiety is found among four out of every ten participants, especially young women and people with poor social support.	Community & Public
23	Khan et al. (2020)	Bangladesh	Cross-Sectional study	University Students	The results showed a high prevalence of mild to extremely severe depression, stress and anxiety among participants. The risk factors leading to these included financial uncertainty, inadequate food supply, fear of infection, absence of physical exercise and other recreational activities.	Individual& Public
24	Youssef et al. (2020)	Egypt	Cross- Sectional survey	Health care professionals	Females and younger age health care professionals are found to be more prone to adverse psychological symptoms such as stress, anxiety, insomnia and depression.	Individual
25	Jurblum et al. (2020)	Australia	Article review	Quarantined individuals	Quarantine has been associated with increased rates of suicide, anger, acute stress disorder, depression and post-traumatic stress disorder	Individual
26	Pandey et al., 2020	India	Cross- Sectional survey	General population	Results suggest a progressively detrimental impact of lockdown on various aspects of psychological health. Found around eight-to-ten-fold increase in the prevalence of depression (30.5%) and anxiety (22.4%) during lockdown, as compared to baseline statistics in Indian population (3.1–3.6% for depressive disorders and 3.0–3.5% for anxiety disorders).	Individual
27	Chen et al., 2020a, b	China	Qualitative descriptive study	Quarantined individuals in close contact with COVID-19 patients	The following five themes emerged: (1) experience in the early stage of quarantine; (2) experience in the middle stage of quarantine; (3) experience in the late stage of quarantine; (4) self-coping persisted throughout the quarantine period; and (5) external support was evident throughout the quarantine period.	Individual & Interpersonal
28	Peng et al., 2020	Shenzhen, China	Cross- Sectional study	Quarantined general individuals	The depressed group experienced more avoidance, intrusion and hyperarousal symptoms than the non-depressed group. The findings suggest an elevated prevalence of depressive symptom in quarantined general individuals in Shenzhen.	Individual
29	Aquila et al. (2020)	Italy	Case report	Forensic case	This study analysed the psychological autopsy method's application to evaluate the pandemic's impact and the associated restriction factors on suicide cases and its management.	Individual & Community
30	Brooks et al. (2020)	U. K	Systematic review	Quarantined individuals	Most reviewed studies reported negative psychological effects including post-traumatic stress symptoms, confusion, and anger. Stressors	Individual, Community & Public

Table 1 (continued)

Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
					included longer quarantine duration, infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma.	
31	diCagno et al., 2020	Italy	Quantitative study	Athletes	There are significant differences in perceived stress and avoidance behaviour regarding gender. Women were reported to be more stressful. Between individual and team sport, significant differences were found in team sport and hyperarousal, with higher results in individual. Adult elite athletes showed significantly higher scores in hyperarousal than amateurs. Significant differences were found between gender in adolescents for avoidance, and between competitive levels in children, for intrusion.	Individual
32	Wu et al., 2020	China	Quantitative study	Quarantined and non-quarantined individuals	There was a significant difference in PTSD Checklist for DSM-5 scores between the quarantine and non-quarantine group.	Individual
33	Viana & de Lira, 2020	Brazil	Article review	Quarantined individuals	The exergame appears to be an enjoyable easy-to-use tool for reducing social isolation, and an interesting mode of home-based exercise for tackling anxiety disorders and sedentary behaviour.	Individual
34	Ng (2020)	New Zealand	Article review	Quarantined individuals	The discussion suggested that the exceptional circumstances of a national lockdown provided an opportunity to develop mental health literacy in the form of psychological first aid, to enable wider awareness of how individuals can contribute to listening and supporting others psychologically.	Public
35	Guo et al. (2020)	China	Cross- Sectional study	Quarantined individuals above 18 years of age	The findings reflected that the nine risk factors associated with anxiety or depressive symptoms included younger age, reduced income, having cancer or other chronic diseases, having family members living with cancer, concerns related to COVID-19 infection for themselves or family members, living alone, having family conflicts, having <3 or >8 h of sedentary time per day, and worsened sleep quality.	Individual & Interpersonal
36	Jiménez-Pavón et al., 2020	Spain	Article review	Older People	The study found that during quarantine times, moderate intensity exercise is the ideal choice for older people as a therapy to fight against the mental and physical consequences of COVID-19 quarantine".	Individual
37	Samrah et al., 2020	Jordan	Cross- Sectional study	Hospital quarantined individuals	Depression symptoms were significantly more common among females than males. Insufficient involvement in making treatment decisions was the most commonly reported concern. Patients who reported problems in maintaining privacy, reaching out to their physicians, or receiving conflicting information from the medical staff, had more symptoms of depression compared with the satisfied ones. Symptoms of depression were less in patients who stayed in touch with others using phone calls, texting, or social media.	Individual & Interpersonal
38	Tang et al. (2020a),b,c	China	Quantitative study	Quarantined and non-quarantined individuals	Quarantined respondents reported a higher likelihood to exhibit symptoms of depression and anxiety than those not quarantined. Respondents living in communities where screening for COVID-19 was required were less likely to report depression and anxiety symptoms.	Individual Community
39	Panda et al., (2020)	India	Systematic review and Meta-analysis	Children, Adolescents and caregivers	Anxiety, depression, irritability, boredom, inattention and fear of COVID-19 are predominant new-onset psychological problems in children during the COVID-19 pandemic. Children with pre-existing behavioral problems like autism and attention deficit hyperactivity disorder have a high probability of worsening of their behavioral symptoms. Similarly, 52.3% and 27.4% of caregivers developed anxiety and depression, respectively, while being in isolation with children.	Individual & Interpersonal

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Table 1 (continued)

Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
40	Malkawi et al., 2020	Jordan	Cross- Sectional study	Mothers	This study found that mothers with lower income, lower education, not employed, or living in cities outside the capital of Jordan reported having more depression, anxiety, and stress symptoms. Changes in their lifestyle practices included weight gain, increased time allocated for teaching children at home, increased familial violence at home, and increased time allocated for caring for their family members	Individual & Interpersonal
41	Alkhamees et al., (2020)	Saudi Arabia	Cross- Sectional study	Individuals in involuntary quarantine institutions	Female gender, self-reported history of psychiatric disorder, and average health status were significantly associated with negative psychological impact and depression, anxiety, and stress symptoms. Watching television was found to be a factor in reducing these symptoms.	Individual
42	Ripon et al., 2020	Bangladesh	Quantitative study	Quarantined individuals	The most PTSD symptoms had on the male (75.7%) who had institutional quarantine. The most depression symptoms were on the female (72.8%) whose income was more than 75000 takas in Bangladeshi currency. The prevalence of depression and PTSD of the quarantined people higher than that of the affected group during the outbreak of COVID-19 in Bangladesh.	Individual
43	Kumar et al., 2020	India	Qualitative study	Health care workers	The study has shown leniency among HCWs in adhering to infection control and personal protective measures resulting in an increased quarantine and infection rate and loss of manpower. The findings thus suggest that the safety of HCWs must be given paramount importance during this pandemic and should be ensured by educating them about infection control, and persistently reinforcing and strictly adhering to standard precautions.	Organizational
44	Singh and Khokhar (2020)	India	Survey	General quarantined population	A prevalence of 28.2% for PTSD and 14.1% for depression was observed. A significant association was reported between depression and number of household members, and between depression and occupation. PTSD and depression are common during home quarantine.	Individual& Interpersonal
45	Canet-Juric et al. (2020)	Argentina	Survey	Argentinian general population	The study found that depression tends to increase slightly due to lockdown restrictions, while levels of anxiety and affect (positive and negative) tend to decrease. Sustaining the lockdown measures could have a larger effect on mental health in the long term.	Individual, Public
46	Mousavi (2020)	Iran	Survey	Parents	The results showed that the effect of home quarantine on Marital Satisfaction and Parental Burnout was not significant in parents. The interactive effect of home quarantine and gender was insignificant on MS and PB. In addition, the mothers significantly reported higher PB than the fathers, but the fathers had higher scores in MS and psychological well-being.	Individual & Interpersonal
47	Prati (2020)	Italy	Survey	General Population	Gender (men), higher age, socioeconomic status, occupational status (unemployed), higher coping efficacy and trust in institutions, and positive attitudes toward quarantine measures predicted well-being. The estimated prevalence of common mental disorders was 31.7% among men and 52.3% among women.	Individual & Organization
48	Burke et al., 2020	Ireland	Cross- Sectional survey	Members of Irish public	Entry into COVID-19 quarantine was associated with significant increases in clinically significant symptoms of depression, stress, and anxiety.	Individual
49	Qanash et al. (2020)	Saudi Arabia	Cross-Sectional Survey	Health Science students	Healthcare students had high levels of anxiety and depression during the COVID-19 pandemic. General knowledge of the pandemic is not associated with the psychological impact. Programs to help students overcome the psychological impact of COVID-19 are highly recommended.	Individual

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Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
50	Francisco et al. (2020)	Spain, Italy and Portugal	Survey	Quarantined Children & Adolescents	The results revealed an increase in children's psychological and behavioral symptoms, increased screen-time, reduced physical activity, and more sleep hours/night. Italian children presented less psychological and behavioral symptoms than Portuguese and Spanish children. Having an outdoor exit in the house (e.g., garden, terrace) contributed to lower levels of psychological and behavioral symptomatology.	Individual
51	Meo et al., (2020)	Saudi Arabia	Descriptive study	Medical Students	The quarantine has resulted in emotional detachment and decrease in overall work performance, long term effects of quarantine may affect the learning behaviours.	Individual
52	Gan et al. (2020)	China	Qualitative study	Quarantined Chinese residents	The delayed effects of lockdown and quarantine on psychological distress were observed, and self-stigma, social support, and perceived control moderate the relationships.	Individual & Interpersonal
53	Chen et al., 2020a, b	China	Survey	Self – quarantined individuals	The results showed that media was positively associated with death anxiety. Empathy, sympathy and negative affect were playing the mediating roles.	Individual & Public
54	Kılınç et al., 2020	Turkey	Cross-sectional study	Adolescents	The sudden closure and quarantine lead to feelings of anxiety and loneliness hence identifying the risk groups could help in providing them required support.	Individual
55	Giallonardo et al. (2020)	Italy	Cross-Sectional Population trial	Quarantined individuals and health care staff	Helps to recognize the effect of the pandemic on the mental health and what kind of interventions could be possibly developed in order to provide the needed help by the mental health professionals.	Individual & Community
56	Commodari and La Rosa (2020)	Italy	Mixed method	Quarantined Adolescents	The adolescents have low risk perception, and good knowledge regarding the COVID-19 protocols, steps taken by government but there was no significant difference in terms of the negative feelings between more affected and less affected areas, which could also lead to predict that the considerable negative feelings might be because of the adolescent age rather than pandemic period.	Individual & Public
57	Tang et al. (2020a),b,c	China	Quantitative study	University students	The results help to understand the importance of developing strategies for youngsters to identify and recognize their emotions and also help people around them which could be used in combating many mental health problems in the society.	Individual
58	Zhu et al. (2020)	China	Survey	Quarantined individuals	The results show a mild psychological influence on all the people experiencing quarantine, besides varying in the degree of severity depending upon the form, rules and regulations of the quarantine.	Individual & Public
59	Orgilés et al., 2020	Italy and Spain	Survey	Parents & Children	The study showed considerable effects of quarantine on the emotional wellbeing of the children due to family coexistence, more use of monitor, no physical activity hence there is a need for the parents to identify and report the children with emotional problems in order to help them gain psychological wellbeing.	Individual & Interpersonal
60	Graber et al. (2020)	U.S.A	Systematic review	Reviews on quarantined children	The study identified a gap in understanding of restrictions to play behaviour of the children due to the pandemic and its robust effect on their overall development.	Individual & Interpersonal
61	Ruggieri et al. (2020)	Italy	Longitudinal survey	Quarantined general population	The results supported increased levels of anxiety, loneliness and psychological distress and decreased levels of life satisfaction and also indicated the positive effects of online social comparison in reducing psychological distress during times of pandemic.	Individual & Interpersonal

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Table 1 (continued)

Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
62	Cooper et al. (2020)	U.S. A	Literature review	Individuals diagnosed with eating disorders	The findings suggest that there is significant risk for the people with eating disorders through online stigmatization and also points the need to develop novel intervention strategies for the people at risk at such times.	Individual, interpersonal & community
63	López Steinmetz et al. (2020)	Argentina	Cross- Sectional design	General quarantined population	The findings show negative influence of the quarantine and lockdown on the psychological wellbeing and directs that there is need to focus on risk groups such young women and people already with any mental disorders.	Individual
64	Jain et al. (2020)	U.S. A	Article	Quarantined general population	The authors added their findings to an already published article, including the fact that pandemic can worsen people's condition with pre-existing psychological issues. In addition, time-bound behavioral therapy should be provided to persons who exhibit signs of mental disorders to reduce the cognitive effects of the pandemic. Psychiatrists and psychotherapists should maximize the use of telemedicine services use to connect to their patients	Individual & Public
65	Dagnino et al. (2020)	Chile	Exploratory study	General Latin American population	The results of the study indicate significant impact of the pandemic related quarantine on the presence of perceived negative emotional impact of the future and also the risk groups that were interrupted.	Individuals
66	Fuentes-García et al., 2020	Spain	Quantitative study	Chess Players	The study findings suggest that chess players with higher academic levels showed higher personal concern and increased anxiety due to pandemic.	Individual
67	Zhuo and Zacharias (2020)	China	Survey	Young adults	The study highlights the role of leisure activities in improving well-being in times of pandemic and pointed out that active individuals tend to explore and plan out new activities to do during quarantine activities prior to heighten their social well-being.	Individual
68	Somma et al. (2020)	Italy	Quantitative study	Quarantined University students	The study highlights that chances are higher in persons with dysfunctional personality traits to negatively perceive their sleep quality.	Individual
69	El Keshky et al. (2020)	Saudi Arabia	Survey	Quarantined general population	The results state that there increased levels of anxiety and depression especially in young people during quarantine hence pointed the need to incorporate continuous psychological assessment in health care protocols.	Individual & Community
70	Ribeiro et al. (2020)	Portugal	Opinion paper	Individuals dealing with psychological distress due to pandemic	The intervention programme developed using the major five crisis intervention models helps assist the individuals dealing with psychological distress due to the pandemic's immediate effects, hence helping the community deal with the long-term effects of such incidents.	Individual & Community
71	Inchausti et al. (2020)	Spain	Article review	Health care professionals, individuals who underwent traumatic experience during pandemic and those with existing psychopathology	The study pointed the need of providing psychological assistance to the frontline health workers, people who lose their closed ones and those with any psychological issues. Findings also highlighted the need to understand online delivery of psychological intervention to the individuals with existing vulnerabilities.	Individual & Community
72	Wielgus et al. (2020)	Poland	Quantitative study	Quarantined Adults	The study results suggested a positive significant relationship between the anxiety state and the somatic and psychological response to the pandemic and indicated that the psychological flexibility and mindfulness can be used to mediate the development of any mental health conditions in such times of restrictions.	Individual
73	Batra et al. (2020)	U.S. A	Article review	Older Adults	The review highlights the need to give importance to the psychological care and assistance among the older age people and to incorporate counselling services for the aging for a better a health care.	Community
74	Cineka and Raj (2020)	India	Survey	COVID-19 affected quarantined	The study findings state that the involvement of dance and music in everyday life brings out immense change in human emotions, thus	Individual

(continued on next page)

Table 1 (continued)

Sl. No.	Author/s & Year	Location	Study Design/ Type	Participants	Major Findings	Level as per socio-ecological model
					reducing stress and increasing psychological well-being. Hence, it directs the use of the same with people dealing with COVID-19 stress, which could give them better health more positivity.	

Other than this, the common emotional effects found were anger (Brooks et al., 2020; Jurblum and Castle 2020; Pérez-Fuentes et al., 2020), hostility (Fernández et al., 2020; Pérez-Fuentes et al., 2020), loneliness (Kılıncıl et al., 2020; Ruggieri et al., 2020), sadness (Pérez-Fuentes et al., 2020), hopelessness (Saurabh & Ranjan, 2020), worry (Saurabh & Ranjan, 2020), fear (Saurabh & Ranjan, 2020), confusion (Brooks et al., 2020), irritability (Panda et al., 2020), inattention (Panda et al., 2020), boredom (Panda et al., 2020), emotional detachment (Meo et al., 2020), avoidance behaviour (diCagno et al., 2020; Peng et al., 2020), hyperarousal (diCagno et al., 2020; Peng et al., 2020) negative affect and long-term psychological difficulties (Pérez-Fuentes et al., 2020; Dagnino et al., 2020; Burke et al., 2020; Canet-Juric et al., 2020).

The experience of quarantine increased the vulnerability toward post-traumatic stress disorder (Brooks et al., 2020; Fawaz and Samaha, 2020a, b; Jurblum and Castle 2020; Tang et al., 2020a,b,c), phobia (Fernández et al., 2020), somatic problems (Wielgus et al., 2020), acute onset psychosis (Finatti et al., 2020), insomnia (Youssef et al., 2020) and sleep disorders (Casagrande et al., 2020; Giardino et al., 2020). Further, for those patients with psychiatric illnesses such as depression, obsessive compulsive disorder and eating disorders, it aggravated their pre-existing psychological problems (Cooper et al., 2020; Davide et al., 2020; Jain et al., 2020; Zanardo et al., 2020).

Three studies reported the impact quarantine had on children, specifically its impact on their emotional well-being (Orgilés et al., 2020; Graber et al., 2020; Panda et al., 2020), and one study reported that adolescents because of their age are more prone to the negative impacts of quarantine (Commodari and La Rosa, 2020). There was evidence of an increase in suicide rates (Jurblum and Castle 2020) and cases of domestic or familial violence (Sacco et al., 2020). Quarantined individuals also experienced death anxiety (Chen et al., 2020a,b), social isolation (de Lira, 2020), discrimination (Xin et al., 2020), stigmatization (Fawaz and Samaha, 2020a,b), decrease in work performance (Meo et al., 2020), poor life satisfaction (Ruggieri et al., 2020) life style changes (Malkawi et al., 2020) and higher-level mental impairments (Benke et al., 2020).

3.3. Risk factors

3.3.1. Individual level

The individual-level risk factors were identified from 16 studies. They were lower levels of education, unemployment, female gender, younger age, high self-evaluation on the knowledge about covid-19, history of psychiatric disorder, history of cancer or chronic diseases, low perceived health condition, reduced income, worry related to infection, fear of contracting and spreading the virus, poor sleep quality, absence of physical and recreational activities, sedentary behaviours, living alone, restrictions to play and increased screen-time, especially for children (Alkhamees et al., 2020; Brooks et al., 2020; Fawaz and Samaha, 2020a, b; Francisco et al., 2020; Graber et al., 2020; Guo et al., 2020; Khan et al., 2020; Lei et al., 2020; Malkawi et al., 2020; Massad et al., 2020; Prati, 2020; Ripon et al., 2020; Samrah et al., 2020; Tang et al., 2020a,b,c; Youssef et al., 2020; Werneck et al., 2020).

3.3.2. Interpersonal level

In four studies, interpersonal risk factors were identified, including a lack of social support, having family members with cancer, concerns about COVID-19 infection for family members, family conflicts, and a

larger number of household members (Guo et al., 2020; Lei et al., 2020; Massad et al., 2020; Singh and Khokhar, 2020).

3.3.3. Organizational level

Organizational risk factors were identified from five studies, and those included inadequate food and other supplies, inadequate information, form, rules and regulations of the quarantine, longer duration of quarantine, problems in maintaining privacy, difficulties in reaching out to their physicians, receiving conflicting information from the medical staff, insufficient involvement in making treatment decisions and conflict between professional duty and family obligation specifically among health care workers. The organizations included hospitals, universities, and quarantine centres where individuals spent their quarantine period (Brooks et al., 2020; Fawaz and Samaha, 2020a,b; Khan et al., 2020; Samrah et al., 2020; Zhu et al., 2020; Kumar et al., 2020).

3.3.4. Community level

Two major community-level risk factors identified in three studies are stigma and social life restrictions (Afzali et al., 2020; Brooks et al., 2020; Fawaz and Samaha, 2020a,b).

3.3.5. Public level

Two studies reported the public-level risk factors during and after the post quarantine period. The influence of media emerged as a public-level risk factor during the quarantine period (Chen et al., 2020a,b). Financial difficulties and stigma continued to be risk factors post quarantine period (Brooks et al., 2020). Table 2 summarises how each of these risk factors worsened the psychological difficulties experienced by the quarantined individuals.

3.4. Protective factors

3.4.1. Individual level

Individual-level protective factors identified from 8 studies were included in the review. Male gender, higher age, coping skills, positive attitudes towards quarantine, home-based exercise, and daily engagement in recreational activities were found (Alkhamees et al., 2020; Fernández et al., 2020; Chen et al., 2020a,b; Cineka and Raj, 2020; Prati, 2020; Shariat et al., 2020; Viana and de Lira, 2020; Zhuo et al., 2020).

3.4.2. Interpersonal level

The protective factors identified at the interpersonal level were social support, keeping in touch with others using social media, and online social comparison (Chen et al., 2020a,b; Samrah et al., 2020; Ruggieri et al., 2020).

3.4.3. Community and organizational level

The two studies identified organisational and community protective factors. They were trust in the institutions and community living, respectively (Prati, 2020; Tang et al., 2020a,b,c).

3.4.4. Public level

Availability of mental health services and enjoyable tools such as exergame were protective factors identified at public level from two studies (Cooper et al., 2020; Viana and de Lira, 2020). One study reported a protective factor for children, including having an outdoor exit in the house (e.g., garden, terrace) to reduce social isolation (Francisco

Table 2. Summary of observed associations of risk factors with various psychological impacts.

Levels of SE Model	Risk Factors	Psychological Impacts
<i>Individual</i>		
	Lower Education	<ul style="list-style-type: none"> • A risk factor for anxiety and depression (Lei et al., 2020) • Contributed to depression, anxiety, and stress symptoms (Malkavi et al., 2020)
	Unemployment	<ul style="list-style-type: none"> • Influenced the well-being (Prati, 2020)
	Female gender	<ul style="list-style-type: none"> • More stress, anxiety, insomnia and depression (Youssef et al., 2020) • More depressive symptoms (Samrah et al., 2020) • Vulnerable to negative psychological impact and depression, anxiety, and stress symptoms (Alkhamees et al., 2020) • Females reported more symptoms of depression (Ripon et al., 2020)
	Younger age	<ul style="list-style-type: none"> • More anxious behaviours (Massad et al., 2020) • More stress, anxiety, insomnia and depression (Youssef et al., 2020)
	High self-evaluated level of knowledge	<ul style="list-style-type: none"> • A risk factor for anxiety and depression (Lei et al., 2020)
	History of psychiatric disorder	<ul style="list-style-type: none"> • Vulnerable to negative psychological impact and depression, anxiety, and stress symptoms (Alkhamees et al., 2020)
	History of cancer or chronic diseases	<ul style="list-style-type: none"> • A risk factor for anxiety and depression (Guo et al., 2020)
	Low self-perceived health condition	<ul style="list-style-type: none"> • A risk factor for anxiety and depression (Lei et al., 2020)
	Reduced income	<ul style="list-style-type: none"> • A factor that led to depression, stress and anxiety (Khan et al., 2020) • Contributed to depression, anxiety, and stress symptoms (Malkavi et al., 2020) • A risk factor for anxiety and depression (Lei et al., 2020)
	Worry related to infection	<ul style="list-style-type: none"> • A risk factor for anxiety and depression (Lei et al., 2020)
	Fear of infection	<ul style="list-style-type: none"> • A factor that led to depression, stress and anxiety (Khan et al., 2020) • A risk factors for depression and PTSD (Tang et al., 2020a,b,c) • Fear of contracting and spreading the virus is one of the risk factors that worsened the psychological difficulties (Fawaz and Samaha, 2020a,b) • Increased depression, stress and anxiety (Khan et al., 2020) • One of the risk factors for post-traumatic stress symptoms, confusion, and anger (Brooks et al., 2020)
	Poor sleep quality	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Guo et al., 2020) • One of the risk factors for depression and PTSD (Tang et al., 2020a,b,c) • Affected the mental health (Werneck et al., 2020) • One of the risk factors for anxiety and depression (Guo et al., 2020)
	Absence of physical and recreational activities	<ul style="list-style-type: none"> • One of the factors that led to depression, stress and anxiety (Khan et al., 2020) • Affected the mental health (Werneck et al., 2020)
	Sedentary behaviours	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Guo et al., 2020) • Affected the mental health (Werneck et al., 2020)
	Living alone	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Guo et al., 2020)
	Increased screen-time	<ul style="list-style-type: none"> • Increased time spent on gadgets heightened behavioural issues in children and adolescents (Francisco et al., 2020)
	Restriction to play	<ul style="list-style-type: none"> • Negatively impacted children (Graber et al., 2020)
<i>Interpersonal</i>		
	Poor social support	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Lei et al., 2020) • More anxious behaviours (Massad et al., 2020)
	Having family members with cancer	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Guo et al., 2020)
	Concerns related to COVID-19 infection for family members	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Guo et al., 2020)
	Having family conflicts	<ul style="list-style-type: none"> • One of the risk factors for anxiety and depression (Guo et al., 2020)
	Number of household members	<ul style="list-style-type: none"> • Associated with depression (Singh and Khokhar, 2020)
<i>Organizational</i>		
	Inadequate food supply	<ul style="list-style-type: none"> • One of the factors that led to depression, stress and anxiety (Khan et al., 2020)
	Inadequate information	<ul style="list-style-type: none"> • One of the risk factors for “post-traumatic stress symptoms, confusion, and anger” (Brooks et al., 2020)
	Form, rules and regulations of the quarantine	<ul style="list-style-type: none"> • Psychological impact of quarantined differed with respect to its form, rules and regulations (Zhu et al., 2020).
	Longer duration of quarantine	<ul style="list-style-type: none"> • One of the risk factors for “post-traumatic stress symptoms, confusion, and anger” (Brooks et al., 2020)
	Inadequate supplies	<ul style="list-style-type: none"> • One of the risk factors for “post-traumatic stress symptoms, confusion, and anger” (Brooks et al., 2020)
	Problems in maintain privacy	<ul style="list-style-type: none"> • Aggravated the symptoms of depression (Samrah et al., 2020)
	Problems in reaching out to their physicians	<ul style="list-style-type: none"> • Aggravated the symptoms of depression (Samrah et al., 2020)
	Receiving conflicting information from the medical staff	<ul style="list-style-type: none"> • Aggravated the symptoms of depression (Samrah et al., 2020)
	Insufficient involvement in making treatment decisions	<ul style="list-style-type: none"> • Aggravated the symptoms of depression (Samrah et al., 2020)

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Table 2 (continued)

Levels of SE Model	Risk Factors	Psychological Impacts
	Conflict between professional duty and family obligation	<ul style="list-style-type: none"> Worsened the psychological difficulties among health care workers (Fawaz and Samaha, 2020a,b)
Community		
	Stigma	<ul style="list-style-type: none"> Stigma of being infected increased health care workers psychological difficulties (Fawaz and Samaha, 2020a,b) One of the risk factors for post-traumatic stress symptoms, confusion, and anger (Brooks et al., 2020) Self-stigma moderated the influence that the quarantine had on stress (Gan et al., 2020)
	Social life restrictions	<ul style="list-style-type: none"> Affected the life satisfaction of the students (Afzali et al., 2020)
Public		
	Media	<ul style="list-style-type: none"> Positive relationship with death anxiety (Chen et al., 2020a,b)
	Risk factors post quarantine	
	Financial difficulties	<ul style="list-style-type: none"> risk factor for anger, anxiety and other psychological problems (Brooks et al., 2020)
	Stigma	<ul style="list-style-type: none"> quarantined individuals continued to experience stigmatization in work place, neighbourhood which led to further distress (Brooks et al., 2020)

et al., 2020). Table 3 summarized how these factors helped the quarantined individuals to deal more effectively with the associated distress.

3.5. Interventions

Among the articles reviewed, thirteen studies highlighted the need for the mental health interventions. Specifically, the need for crisis intervention, guided self-help, behaviour therapy, emotional recognition strategies, moderate intensity physical exercise, psychological first aid, counselling services and community awareness programs were highlighted. The target populations for these interventions varied from children, adolescents, adults, older adults, university students, health care workers, patients with chronic disease, patients with eating disorders to quarantined individuals in general (Cooper et al., 2020; Batra et al., 2020; El Keshky et al., 2020; Giallonardo et al., 2020; Inchausti et al., 2020; Jain et al., 2020; Jiménez- Pavón et al., 2020; Ng, 2020; Liu et al., 2020; López Steinmetz et al., 2020; Louvardi et al., 2020; Ribeiro et al., 2020; Tang et al., 2020). One study reported the development of a telephone-based crisis intervention to provide brief assistance to the distressed individuals due to pandemic (Ribeiro et al., 2020).

4. Discussion

This systematic review attempted to comprehensively understand the psychological impact of quarantine associated with the COVID-19 pandemic. Though some rapid reviews and empirical papers have explored the psychological consequences of COVID-19 on the lives of individuals, this systematic review stands out from other studies with its special focus on the risk and protective factors associated with the psychological impact during and the post-quarantine period from a socio-ecological framework. Authors also tried to synthesize evidence on the intervention programs available to the public addressing the psychological impacts of quarantine. Figure 2 presents a synthesis of study findings based on the socio-ecological model of Bronfenbrenner (1979) and McLeroy et al. (1988).

4.1. Psychological impacts

The experience of quarantine was found to be emotionally overwhelming for the individuals. The findings revealed that anxiety, distress, and depression were the most frequently reported psychological difficulty experienced (El Keshky et al., 2020; Fernández et al., 2020; Fuentes-García et al., 2020; Giardino et al., 2020; Kılıncel et al., 2020; Khan et al., 2020; Lei et al., 2020; Massad et al., 2020; Pandey et al., 2020; Pérez-Fuentes et al., 2020; Ruggieri et al., 2020; Youssef et al., 2020; Wielgus et al., 2020; Jurblum and Castle 2020; Tang et al., 2020a, b,c; Cineka and Raj, 2020; diCagno et al., 2020; Gan et al., 2020; Ribeiro

Table 3. Summary of observed associations of protective factors with various psychological impacts.

Levels of SE Model	Protective factors	Associations
Individual		
	Gender (men)	<ul style="list-style-type: none"> Predicted the well-being (Prati, 2020)
	Higher age	<ul style="list-style-type: none"> Predicted the well-being (Prati, 2020)
	Positive attitudes towards quarantine	<ul style="list-style-type: none"> Predicted the well-being (Prati, 2020)
	Coping skills	<ul style="list-style-type: none"> mediated the emotional impact (Fernández et al., 2020) Predicted the well-being (Chen et al., 2020a,b; Prati, 2020)
	Home-based exercise	<ul style="list-style-type: none"> Alleviated physical and psychological issues (Shariat et al., 2020) Helpful in tackling anxiety, depression, sedentary behaviour, because of restrictions (Viana and de Lira, 2020)
	Daily engagement in leisure and recreational activities	<ul style="list-style-type: none"> Brings positivity and improves the health of COVID-19 patients (Cineka and Raj, 2020) Improved well-being (Zhuo and Zacharias, 2020)
	Watching television	<ul style="list-style-type: none"> Reduces depression, anxiety, and stress symptoms (Alkhamees et al., 2020)
Interpersonal		
Social support	Social support	<ul style="list-style-type: none"> Helped in dealing with distress (Chen et al., 2020a,b)
	Keeping in touch with others using social media	<ul style="list-style-type: none"> Lessened the symptoms of depression (Samrah et al., 2020)
	Online social comparison	<ul style="list-style-type: none"> Reduced psychological distress (Ruggieri et al., 2020)
Organizational		
	Trust in institutions	<ul style="list-style-type: none"> Predicted wellbeing (Prati, 2020)
Community		
	Community belongingness and support	<ul style="list-style-type: none"> Participants living in the community experienced lesser symptoms of depression and anxiety (Tang et al., 2020a,b,c)
Public		
	Availability of mental health services	<ul style="list-style-type: none"> Helped in dealing with depression and anxiety (Cooper et al., 2020)
	Enjoyable tools such as exergame	<ul style="list-style-type: none"> Effective in reducing social isolation (Viana and de Lira, 2020)
Beyond the levels of SE model		
	Having an outdoor exit in the house (e.g., garden, terrace)	<ul style="list-style-type: none"> Reduced the behavioural issues faced by quarantined individuals (Francisco et al., 2020)

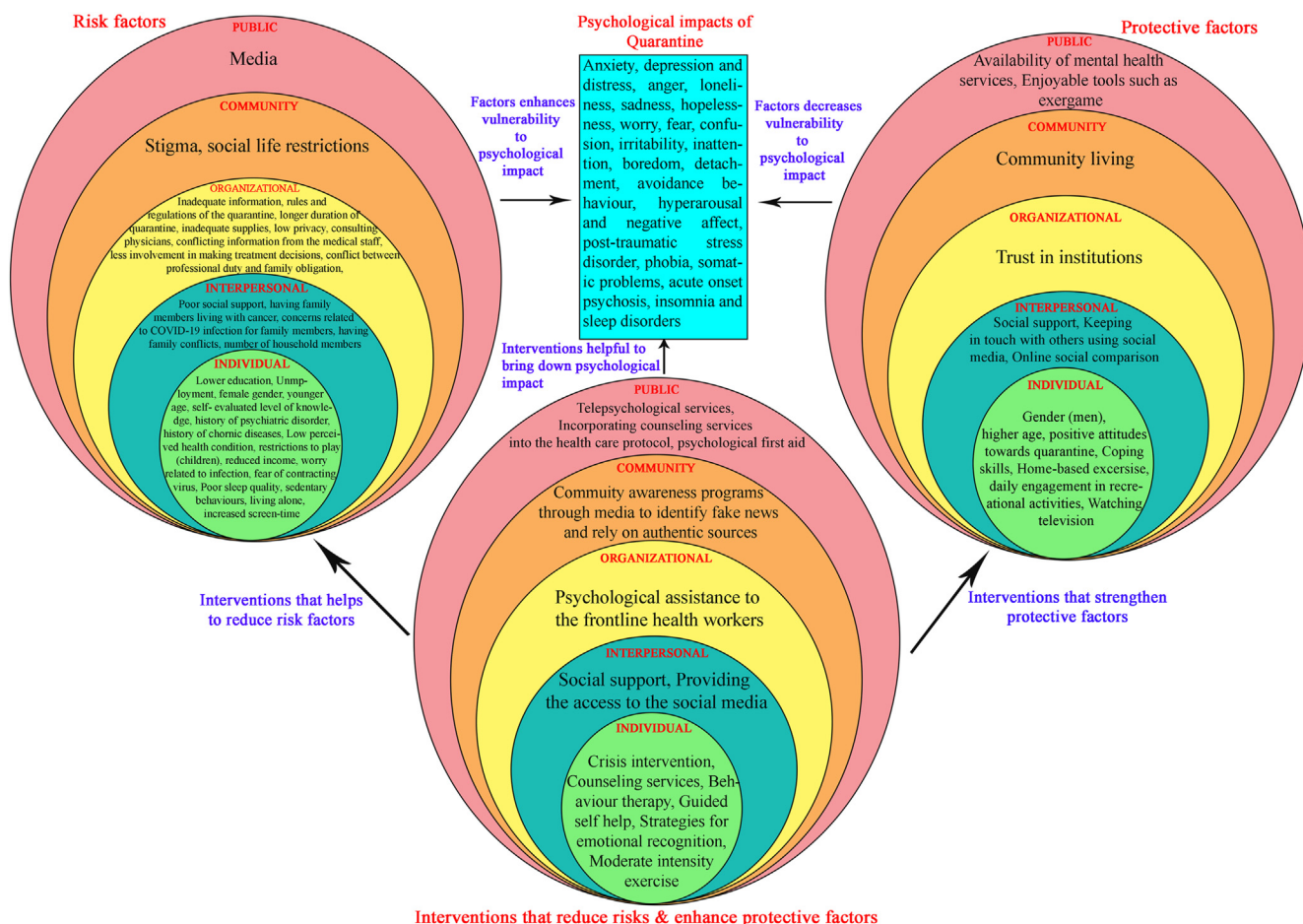


Figure 2. Conceptual framework of risk factors, protective factors, and interventions to reduce the impact of COVID-19. Source: Derived from the findings of the study.

et al., 2020; Saurabh & Ranjan, 2020; Xin et al., 2020; Malkavi et al., 2020; Samrah et al., 2020; Alkhamees et al., 2020; Guo et al., 2020; Singh and Khokhar, 2020). This finding is broadly in agreement with the patterns of findings reported among quarantined individuals during SARS and MERS (Hull, 2005; Hawryluck et al., 2004; Lee et al., 2018). It has also been found that females reported more symptoms of depression during this period (Ripon et al., 2020). This finding is consistent with the results of a recent mini-article review by Thibaut and van Wijngaarden-Cremers (2020), which found that females from the COVID-19 cohort groups as compared with pre-COVID-19 groups show higher levels of depressive and anxiety symptoms. Further, females with a previous psychiatric diagnosis or low income were at higher risk to report elevated distress and psychiatric symptoms during the COVID-19 pandemic. For patients with with psychiatric illnesses such as depression, obsessive-compulsive disorder, and eating disorders, quarantine experience aggravated their pre-existing psychological problems (Cooper et al., 2020; Davide et al., 2020; Jain et al., 2020; Zanardo et al., 2020). The experience of quarantine increased the vulnerability towards Post-Traumatic Stress Disorder (PTSD), phobia, somatic problems, behavioural issues, sleep disorders and even acute onset psychosis (Brooks et al., 2020; Fawaz and Samaha, 2020a,b; Jurblum and Castle 2020; Tang et al., 2020a,b,c; Fernández et al., 2020; Wielgus et al., 2020; Finatti et al., 2020; Youssef et al., 2020; Casagrande et al., 2020; Giardino et al., 2020). All these therefore highlights the need for more psychological help tailored to address the difficulties during quarantine as well as post-quarantine period, which otherwise would lead to serious consequences in the mental as well as physical health of people such as even the increased suicide rates which is already reported in a few studies (Jurblum and Castle 2020; Aquila et al., 2020).

The negative impact of quarantine affected children in a way that their overall development got hindered because of the imposed restriction in their play activities and increased screen time. The review findings revealed that the quarantine experience took a toll on their emotional well-being (Orgilés et al., 2020; Graber et al., 2020). The findings, therefore, reflect the need for developing more home-based activities which would help children tackle the negative emotional experience of quarantine, which otherwise would lead to long-term psychological complications. Health care professionals were among the most affected populations who had to experience psychological difficulties in the quarantine period mainly because of the conflicts between their professional duties and family obligations (Fawaz and Samaha, 2020a,b). Further the stigma of being infected also worsened psychological difficulties among them (Fawaz and Samaha, 2020a,b).

4.2. Risk and protective factors

The results revealed that risk factors operating from multiple levels contributed to these emotional difficulties whereas certain protective factors helped them to deal with these issues. These factors interact with each other and influence the individual's functioning. Some notable socio-demographic risk factors were identified at the individual level, such as lower levels of education, unemployment, female gender, younger age, and reduced income. The result is in line with the finding of a recent study done to assess the risk factor of psychological impact among college students during COVID-19 across seven U.S states which found that female students, of younger age (18–24), belonging to below-average relative family income were at greater risk of psychological impact (Browning et al., 2021). Community-level support programmes

and government initiatives aimed at the specific population at risk need to be planned to help in such unprecedented conditions in the future.

Apart from the socio-demographic risk factor, individual-level factors such as one's high self-evaluation on the knowledge about COVID-19, history of psychiatric disorder, history of cancer or other chronic diseases, low perceived health condition, worry related to infection, fear of contracting and spreading the virus, poor sleep quality would also make them vulnerable to experience the negative psychological impact due to quarantine (Lei et al., 2020; Alkhamees et al., 2020; Guo et al., 2020; Khan et al., 2020; Fawaz and Samaha, 2020a,b; Brooks et al., 2020; Tang et al., 2020a,b,c; Werneck et al., 2020). Telehealth services during a pandemic would be of great advantage for the chronically ill to keep timely consultation with their physicians as well as to general public to spread appropriate awareness to individuals amidst the pandemic-imposed fear (Monaghesh and Hajizadeh, 2020).

In general, individual's experience of confining themselves to living alone, the absence of physical and recreational activities leading to a sedentary lifestyle are also major risk factors leading to negative psychological impacts (Khan et al., 2020; Werneck et al., 2020; Guo et al., 2020). Hammami et al., 2020 suggested in their commentary that the best way to tackle these problems includes replacing outdoor activities with home-based activities. These are engaging in bodyweight training, dance-based aerobic exercise, and adhering to self-paced protocols.

The interpersonal level risk factors found in the review include having family members with serious illnesses, more family members confined to quarantine experience, family conflicts, and mutual concerns and fear about each other's health (Lei et al., 2020; Massad et al., 2020; Guo et al., 2020; Singh and Khokhar, 2020). From the protective factors identified in order to overcome these influencing factors, keeping in touch with others using social media, engaging in online social comparison and enhanced social support would reduce psychological distress during this period (Chen et al., 2020a,b; Samrah et al., 2020; Ruggieri et al., 2020). According to research carried out by Li et al., 2021 individuals should build a social support system to cope with the negative impact of the pandemic. They also discovered that resilience is a good predictor of mental health throughout the pandemic, and that social support can help mitigate the negative effects of low resilience on mental health.

At the organizational level, the results majorly showed the difficulties individuals had to face from hospital service providers during the quarantine period as the major risk factor making them vulnerable to severe psychological impacts. Quarantined individuals experienced post-traumatic stress symptoms, anger, confusion, and depression as a result of difficulties reaching out to physicians, insufficient information about forms, regulations, and rules of quarantine, receiving conflicting information from the medical staff, and insufficient involvement in treatment decisions (Brooks et al., 2020; Samrah et al., 2020; Zhu et al., 2020). The protective factor found from the result to overcome these issues and which could predict well-being is to have trust in these organizations (Prati, 2020). It is to be pointed out that healthcare professionals working in a hospital during pandemic outbreak also find it difficult to manage between professional duties and family obligation, which aggravates their psychological difficulties (Fawaz and Samaha, 2020a,b). Therefore, organizational level support systems need to be strengthened to improve health care professionals' well-being during and post quarantine period in terms of medical leave, reduced number of working hours, and necessary psychological first aid services. Also, if other professionals face problems in their workplace, receiving adequate supplies or medical help can make them less vulnerable to experience psychological difficulties (Khan et al., 2020). Organizations should make every effort to shape and maintain employee happiness during quarantine periods since it has a detrimental influence on employees, causing tension and a lack of security. According to studies, Human Resource Management (HRM) specialists are playing an increasingly important role in developing Human Resource Management (HRM) strategies that can positively impact job-related attitudes, resulting in improved job performance during these trying times (Bieñkowska et al., 2022).

The stigma that COVID affected individuals face during the quarantine, the social life restrictions in general and increased exposure to COVID-19-related information can worsen psychological difficulties and were the major two risk factors identified at the community level (Fawaz and Samaha, 2020a,b; Brooks et al., 2020; Afzali et al., 2020). The protective factor which helps individuals to cope with this as identified from the results, is through developing a sense of community belongingness and enhancing social support (Tang et al., 2020a,b,c). This will be possible only if proper awareness regarding the virus infection and guidelines are provided to communities, enabling them to refrain from stigmatizing other community members and dealing with the social life restrictions.

At the public level, the influence of media was found to be the major risk factor for individuals to experience psychological difficulties during quarantine. Chen et al. (2020a),b found that there is a positive relationship between exposure to fearful content regarding virus infection in media and death anxiety among quarantined individuals. During the pandemic, negative news dramatically diminishes positive emotions and resilience, while positive news significantly reduces negative emotions and vice versa. Therefore, it is the responsibility of mass media to take this seriously and cover pandemic news keeping in mind how it affects individuals' mental health. The government should take necessary actions to ban contents which aggravates psychological difficulties among majority of the public (Giri and Maurya, 2021). The review findings also reported other general public-level risk factors evoking psychological difficulties among individuals post quarantine. These are financial difficulties and stigma they face from neighbourhood and workplace (Brooks et al., 2020). Therefore, the availability of mental health services to public free of cost is a protective factor at the public level, safeguarding individuals dealing with depression and anxiety (Cooper et al., 2020). Virtual reality (VR) is a virtual experience that can be both comparable and distinct to the actual world. Virtual reality has a variety of uses such as entertainment, particularly through video games. Virtual reality allows users to look about, move around, and interact with virtual elements and objects (Pallavicini and Pepe, 2020). Exergame refers to using video games for exercise with the aid of technology that can track body movements (Benzing and Schmidt, 2018) and the review findings showed that designing more virtual games and exergames for the public during pandemic also proved to be a strong protective factor in reducing feelings of social isolation among quarantined individuals (Viana and de Lira, 2020). Furthermore, the review revealed that having an external exit at home, such as a terrace or garden, could lessen behaviour concerns that occur during quarantine (Francisco et al., 2020).

The study also aimed to identify specific interventions from various levels that could help manage the risk factors and enhance the protective factors. The results highlighted the need for tele mental health interventions (Cooper et al., 2020; Batra et al., 2020; El Keshky et al., 2020; Giallonardo et al., 2020; Inchausti et al., 2020; Jain et al., 2020; Jiménez-Pavón et al., 2020; Ng, 2020; Liu et al., 2020; López Steinmetz et al., 2020; Louvardi et al., 2020; Ribeiro et al., 2020; Tang et al., 2020a,b,c). Specifically, the need for crisis intervention, guided self-help, behaviour therapy, emotional recognition strategies, moderate intensity physical exercise, psychological first aid, counselling services and community awareness programs. One study reported the development of a telephone-based crisis intervention to provide brief assistance to the distressed individuals due to pandemic. This intervention focused on helping them to deal with anxiety, domestic violence, issues related to unemployment, and difficulties with pregnancy, dealing with children or adolescent's behaviours (Ribeiro et al., 2020). In the context of pandemic, multilevel interventions would be appropriate as they would help the individuals to better deal with the crisis. For example, the availability and accessibility of mental health services that caters to the needs of various sections of the population, employee friendly organizational policies, healthy media exposure etc. can aid the individuals in managing the pandemic related mental health issues.

The review findings imply that the quarantine is a psychologically taxing experience that makes the individual more vulnerable to anxiety, stress, depression, Post Traumatic Stress Disorder (PTSD) and other psychological issues. Hence it is important to incorporate psychological intervention as part of the treatment protocol. The depth of psychological impact also calls for the need for wide implementation of mental health policies to ensure the mental health of all sections of the society. Majority of the studies focused on risk factors, specifically risk factors operating from an individual level. A similar trend is also observed in the context of few protective factors that emerged in the review. Future studies can address this by incorporating both risk and protective factors from various levels. There is a dearth of intervention studies incorporating these inputs to help the individuals going through quarantine. The available interventions focused on individual level elements. Future studies can focus on alleviating the risks identified and enhancing the protective elements to reduce the psychological difficulties. Moreover, the focus of intervention varies across specific groups in the population. Hence studies focusing on tailor-made interventions for children, adolescents, adults, the elderly, mothers and patients with physical illness, terminal illness and those with the previous history of psychological illness are needed.

4.3. Limitations

The current review has some limitations related to restricting the search to studies published in the English language, and therefore, the relevant findings published in other languages are not synthesised through this review. The inclusion of studies published in different countries tried to generalise the psychological impact of quarantine, ignoring the cultural difference, which could largely impact individuals in different ways. Further studies could be conducted specifically to each country, taking into account the country wise quarantine regulations and providing insights on how to tackle the psychological impacts of the quarantine experience. For this review, we have included studies focusing on quarantined populations irrespective of age and pre-existing vulnerabilities, such as those with psychiatric illness; further studies could target such specific populations to come up with in-depth population specific results.

5. Conclusion

This systematic review revealed the range of psychological difficulties experienced by quarantined individuals. Distress, anxiety, and depression are the major psychological effects. Quarantined individuals go through various emotional experiences ranging from fear, anger, sadness, loneliness, and hyperarousal. Further, quarantine makes them more prone to psychological disorders, e.g., PTSD, depressive disorders, insomnia, and sleep disorders. The current review also found a range of risk and protective factors operating from an individual, interpersonal, organizational, community and public levels. The review also highlighted the need for tele mental health interventions to deal with the quarantine associated psychological issues.

Patient and public involvement

Patient and/or the public were not involved in the design or conduct or reporting or dissemination plans of research.

Declarations

Author contribution statement

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