Impact of COVID-19 on post-traumatic stress symptoms in the general population: An integrative review

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ABSTRACT: The coronavirus pandemic highlights the urgent need for increased support related to mental health concerns. This study aimed to synthesize the findings of empirical studies reporting the post-traumatic stress symptoms in the general population during the coronavirus pandemic. Whittemore and Knafl’s (Journal of Advanced Nursing, 52, 546, 2005) integrative review methodology was used to analyse and synthesize the peer-reviewed studies. Five electronic databases, PubMed, CINAHL, PsychINFO, Cochrane and Google Scholar were searched using terms related to the coronavirus pandemic and post-traumatic stress symptoms. The quality of the studies was screened and evaluated using the Mixed Methods Appraisal Tool. The sample size of the 16 studies included in this review ranged from 41 to 3480 participants, with a total of 18 039 participants. The majority of the participants’ ages ranged from 30 to 39 years, and 57% of the participants were female. The following factors related to post-traumatic stress symptoms during the coronavirus pandemic were identified as follows: (i) risk factors included social discrimination, fear of uncontrolled contagion and financial burden or economic instability; and, (ii) protective factors included social support and timely government action. A traumatic experience itself can trigger the onset of post-traumatic stress disorder; however, depending on the risk and protection factors, each individual can experience different post-traumatic stress symptoms. Thus, mental health nurses should comprehensively understand how to reduce the influence of risk factors and enhance protective factors when dealing with the pandemic and related trauma. This study’s findings are beneficial for identifying, preventing and managing post-traumatic stress symptoms associated with the coronavirus and future pandemics.

KEY WORDS: COVID-19, mental health, pandemics, post-traumatic stress disorders, psychological adaptation.
INTRODUCTION

The increasing global morbidity and mortality due to the coronavirus disease 2019 (COVID-19) have become a considerable concern for public health (World Health Organization [WHO] 2020a). In general, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the virus that causes acute respiratory illness (Valencia 2020). However, a new coronavirus was first recognized in Wuhan, China, in December 2019 (WHO 2020b), and the WHO declared the COVID-19 outbreak a pandemic in March 2020 (WHO 2020a). As of 11 October 2020, there are more than 37 million COVID-19 cases confirmed, and there have been about 1 million deaths worldwide (WHO 2020c). Currently, the WHO and the government of several countries have implemented strict surveillance and infection control, such as isolation of COVID-19-infected individuals, tracking those who have tested positive for COVID-19, public campaigns requesting the general public to wear masks in public places and the development of effective treatments and vaccinations against COVID-19 (WHO 2020c).

During these precautions, many of us have experienced psychological distress and significant disruption to our daily lives during the COVID-19 pandemic (Usher et al. 2020a). Losing a family member, limited mobility, physical social isolation, losing one’s job and fear of contagion may increase the vulnerability to mental health concerns (WHO 2020d). The experience of the COVID-19 pandemic may be associated with post-traumatic stress disorder (PTSD) or post-traumatic stress symptoms (PTSS) (Centers for Disease Control & Prevention 2020). PTSD is defined as a mental health disorder triggered by witnessing or experiencing a traumatic event, while PTSS is defined as a wide range of stress response symptoms that occur three months up to several years after the traumatic event (American Psychiatric Association 2013). PTSS may include flashbacks, avoidance of memories that cause distress, nightmares, feelings of guilt, sleep disturbances and unpleasant physical sensation (American Psychiatric Association 2013). In fact, it is reported that 26% of the general population had PTSD or PTSS during the COVID-19 pandemic in the United States (Centers for Disease Control & Prevention 2020). However, the number of PTSD patients is expected to increase significantly due to the global impact of COVID-19 (Centers for Disease Control & Prevention 2020). Thus, the COVID-19 pandemic increases the rate of PTSD as a traumatic event itself and may increase the secondary impact of risk factors overall.

The emerging focus on the relationship between COVID-19 and PTSD requires an evidence-based understanding of the factors associated with PTSD (WHO 2020d). Several studies (Preti et al. 2020; Usher et al. 2020b; Xiong et al. 2020) have explored the psychological effects of the COVID-19 pandemic. This review specifically focused on PTSD-related factors in the general population. COVID-19 is a highly contagious disease, and daily direct or indirect exposure to the virus might cause physical and mental stress, making individuals more vulnerable to mental health disorders (WHO 2020d). However, most studies have a limited understanding of the mental health problems suffered during the COVID-19 pandemic because these studies were not conducted among diverse populations and countries. The WHO emphasizes global cooperation and action against COVID-19 due to its rapid transmissibility among humans (WHO 2020a). To minimize the negative impacts of the present COVID-19 pandemic and prevent those of possible future pandemics, it is essential to examine and integrate the findings of various empirical studies to expand the understanding of new infectious diseases. Therefore, it is necessary to understand the relevant factors influencing PTSD from an integrative perspective and develop effective interventions related to those factors.

A traumatic experience itself can trigger the onset of PTSD; however, there may be additional risk and protective factors to consider (Kobayashi et al. 2019; Tang et al. 2017). Even when faced with the same traumatic event, each individual can experience different PTSS (Tedeschi & Calhoun 2004). PTSD is associated with sociodemographic factors such as age, gender, lower household income, and lower education levels (Kobayashi et al. 2019; Tang et al. 2017). A previous study found that women are twice as likely to be diagnosed with PTSD compared to men, after having experienced a traumatic event (Hu et al. 2017). In addition, insufficient social support is frequently reported as a risk factor (Dworkin et al. 2018).

According to the uncertainty reduction theory (Berger & Calabrese 1974), in unpredictable situations, people may feel unpleasant and experience cognitive stress (Berger & Calabrese 1974). The COVID-19 pandemic may increase physical social isolation and self-isolation, rendering the perception of belonging uncertain (Centers for Disease Control & Prevention 2020). This can help explain COVID-19 as a traumatic event that causes emotional damage and traumatic stress.
Uncertainty about COVID-19 can increase levels of anxiety and stress, and prolonged periods of experiencing the same stress can cause mental health problems such as depression (Centers for Disease Control & Prevention 2020; Khademi et al. 2020). In addition, the uncertainty reduction theory emphasizes the provision of information to reduce people’s uncertainty (Berger & Calabrese 1974). Thus, the current study is theoretically based on the uncertainty reduction theory: to address the risks and protective factors of mental health problems caused by uncertainties associated with the COVID-19 pandemic.

AIMS

The purpose of this study was to explore and synthesize empirical studies that reported the symptoms of PTSD and PTSS in the general population during the COVID-19 pandemic. The following research questions guided the review: (i) what is the relationship between COVID-19 and pandemic-related psychological outcomes including PTSS? and (ii) what are the risk and protective factors associated with PTSS in the general population?

METHODS

Whittemore and Knafl’s (2005) integrative review methodology was used to analyse and synthesize the literature. Whittemore and Knafl’s methodology (2005) revised and extended the work of Ganong (1987), a rigorous and widely used approach to summarizing and analysing literature with various methodologies. This methodology recommends that all relevant studies be included in the review; however, quality scores can be used to support data interpretation of the literature (Whittemore & Knafl 2005).

Search methods

A literature review was conducted with the assistance of medical research librarians (specializing in literature search) and two researchers. The initial screening was conducted using EndNote library (version X9). An electronic keyword search was conducted using PubMed, CINAHL, PsychINFO and Cochrane databases from journal inception to October 2020. A manual search on Google Scholar was conducted based on a retrieved reference list. The search included a combination of MeSH terms, CINAHL Headings and Index Terms. We used the following search terms: (COVID OR COVID-19 OR Coronavirus* OR Coronavirus Infections) AND (posttraumatic* OR post-traumatic stress* OR posttraumatic stress disorder OR posttraumatic stress disorder symptoms OR Stress Disorders, Post-Traumatic OR PTSD OR PTSS OR trauma). All electronic databases used syntax search as detailed in Table 1. We modified the search terms for each database as needed and selected eligible studies based on the inclusion and exclusion criteria (Table 2). The final references from the selected articles were manually examined, and the manual search of Google Scholar was conducted. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) framework (Moher et al. 2015) as shown in Figure 1.

Quality appraisal

The Mixed Methods Appraisal Tool (MMAT, version 2018) was used for quality assessment of the included studies. This tool was developed to evaluate the methodological quality of qualitative, quantitative and mixed methods studies (Hong et al. 2018). Two researchers independently appraised the articles for the methodology criteria and five quality criteria on the MMAT. The scores meeting one criterion were represented by (*), and those meeting all criteria were represented by (*****). In cases of score discrepancies, consensus was reached through discussion. Overall, the
methodological quality of the review articles was acceptable, and six studies that did not meet two or more criteria were excluded. The quality scores are shown in Table 3.

**Data abstraction and synthesis**

This study extracted relevant data from the included articles, for the analysis using Whittemore and Knafl’s (2005) methodology. Researchers extracted and coded data from each article. Key concepts were collected by comparing and contrasting codes. The extracted data were discussed by the researchers until consensus was reached. The results of this study integrated the key categories and subcategories of the data. The data were included only if there was a consensus. The total number of articles finally included for the review was 16 (Appendix S1).

**RESULTS**

**Study characteristics**

The characteristics and main findings of the studies are summarized in Table 3.

The sample size of the 16 studies included in this review ranged from 41 to 3480 participants with a total of 18,039 participants. All participants were adults aged 18 years or older. Ten studies (n = 15,202) included general citizens (Di Crosta et al. 2020; Forte et al. 2020; González-Sanguino et al. 2020; Guo et al. 2020a; Karatzias et al. 2020; Li 2020; Liu et al. 2020a; Liu et al. 2020b; Wang et al. 2020; Wytrychiewicz et al. 2020). Four studies (n = 1636) included patients diagnosed with COVID-19 (Bo et al. 2020; Guo et al.
| Author(s), year (country) | Study aim | Study design | Time of measurement | Participants | Quality rating |
|--------------------------|-----------|--------------|---------------------|--------------|---------------|
| Bo, 2020 (China)          | To examine the pattern of PTSS and patients’ attitude towards crisis mental health services | Cross-sectional | Online assessment prior to their discharge from quarantine facilities | 714 adult patients diagnosed with clinically stable COVID-19 | MMAT**           |
| Di Crosta, 2020 (Italy)   | To examine the prevalence of high psychological impact due to the COVID-19 on the general population | Cross-sectional | During the COVID-19 outbreak | 1253 Italian adults between 18 and 64 years old | MMAT****         |
| Forte, 2020 (Italy)       | To examine the psychological impact of the COVID-19 and the psychopathological outcomes related to the first phase of this emergency | Cross-sectional | During the COVID-19 outbreak | 2286 citizens aged ≥18 years old | MMAT****         |
| González-Sanguino, 2020 (Spain) | To examine the psychological impact of the COVID-19 in the Spanish population | Cross-sectional | During the COVID-19 outbreak | 3480 citizens aged ≥18 years old | MMAT****         |
| Guo, 2020a (China)        | To examine sleep problems, depression, and PTSS among the general population during the COVID-19, and coping behaviours | Cross-sectional | During the COVID-19 outbreak | 2441 citizens aged ≥18 years old | MMAT****         |
| Guo, 2020b (China)        | To examine the psychological impact of hospitalized patients with COVID-19 and how it relates to the presence bio-markers of peripheral inflammation | Cross-sectional methods approach Mixed-method triangulation design | During the COVID-19 outbreak | 206 patients diagnosed with mild cases of COVID-19 | MMAT***          |
| Hamam, 2020 (Israeli)     | To examine the relation between PTG and PTSS attributed to prior exposure | Cross-sectional | During the COVID-19 outbreak | 528 Israeli trauma survivors | MMAT***          |
| Karatzias, 2020 (Ireland) | To examine the level of comorbidity with depression and anxiety and the sociodemographic risk factors associated with COVID-19 related PTSD in the general population | Cross-sectional | 31 days after the first confirmed case of COVID-19 in the Republic of Ireland was reported | 1041 citizens aged ≥18 years old | MMAT****         |
| Li, 2020 (China)          | To examine the psychological impact and PTSD and association with the coping strategy types | Cross-sectional | During the COVID-19 outbreak | 1109 citizens aged ≥18 years old | MMAT****         |
| Liu, 2020a (USA)          | To examine factors associated with depression, anxiety, and PTSS in young adults | Cross-sectional | 1 month after the United States declared a state of emergency due to COVID-19 | 898 citizens 18–30 years old | MMAT***          |
| Liu, 2020b (China)        | To examine the prevalence, predictors, gender difference existing of PTSD in China hardest hit areas during COVID-19 | Cross-sectional | COVID-19 outbreak announced by World Health Organization | 285 citizens aged >18 years old | MMAT***          |
| Liu, 2020c (China)        | To examine the prevalence and risk factors for mental health problems among discharged COVID-19 patients | Cross-sectional | Hospital discharged COVID-19 patients | 675 adult patients diagnosed with COVID-19 | MMAT****         |
| Qi, 2020 (China)          | To examine the prevalence and associated risk factors for psychological impact and fatigue in COVID-19 patients | Cross-sectional | During the COVID-19 outbreak | 41 patients diagnosed with non-severe types of COVID-19 | MMAT**           |
| Tan, 2020 (China)         | To examine the psychological impact and psychoneuro immunity prevention measures of a workforce returning to work | Cross-sectional | During the COVID-19 outbreak | 673 workforce | MMAT***         |

(Continued)
TABLE 3  (Continued)

| Author(s), year (country) | Study aim | Study design | Time of measurement | Participants | Quality rating |
|---------------------------|-----------|--------------|---------------------|--------------|---------------|
| Wang, 2020 (China)        | To examine risk and protective factors, and the temporal psychological impact and adverse mental health status during the initial outbreak and peak of COVID-19 pandemic | Longitudinal study | During the initial outbreak and peak of COVID-19 outbreak | 1738 citizens | MMAT**** |
| Wytrychiewicz, 2020 (Poland) | To examine the psychological impact in coping context, and beliefs related to the pandemic situation, and stressors arising from the risk of infection, and lifestyle changes | Cross-sectional | 2 weeks after the first case occurred in Poland | 671 citizens aged >18 years old | MMAT*** |

COVID-19, coronavirus disease 19; MMAT, mixed methods appraisal tool; PTG, post-traumatic growth; PTSD, post-traumatic stress disorder; PTSS, post-traumatic stress symptoms.

The scores meeting one criterion were represented by (*), and those meeting all criteria were represented by (****).

Instruments used to assess PTSS and PTSD

A wide variety of instruments were used in the studies (n = 16) to assess PTSS and PTSD. Six articles (38%) used the PTSD Checklist from the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) (PCL-5, Weathers et al. 2013). The PCL-5 comprises 20 items assessing past-month experiences such as arousal, avoidance, intrusions and negative alterations in mood. Each item is assessed on a five-point Likert-type scale, with values ranging from 0 to 4 (0 = not at all to 4 = extremely). Five articles (31%) used the Impact of Event Scale-Revised (IES-R) (Weiss & Marmar 1997). The IES-R comprises 22 items to assess 3 domains (hyperarousal, avoidance and numbing and symptoms of intrusion). Each item is rated on a five-point Likert-type scale, with values ranging from 0 to 4 (0 = not at all to 4 = extremely). Three articles (19%) used the PTSD Checklist-Civilian version (PCL-C, Weathers et al. 1993). The PCL-C comprised 17 items, and each item was assessed on a five-point Likert-type scale, with values ranging from 0 to 4 (1 = not at all to 5 = extremely). One article used the Civilian version of the Post-Traumatic Stress Disorder Checklist-Reduced version (PCL-C-2, Lang & Stein 2005; Weathers et al. 1993). The PCL-C-2 comprises two items that measure the presence of specific phenomena related to a traumatic experience on a five-point Likert-type scale ranging from 0 to 4. One article used the International Trauma Questionnaire (ITQ, Cloitre et al. 2018). The ITQ initially measures index trauma and comprises six PTSS-related items measured on a five-point Likert-type scale ranging from 0 to 4 (0 = not at all to 4 = extremely).

Rate of PTSS and PTSD

PTSS were examined in four studies (Bo et al. 2020; Guo et al. 2020a; Guo et al. 2020b; Liu et al. 2020b). Table 4 shows detailed descriptions of the psychological outcomes included in each study and their findings. The rate of PTSS was between 1% and 96.2% depending on study samples. Bo et al. (2020) reported the highest rate, because 96.2% of the discharged COVID-19 patients having met the PCL-C criteria (≥50) after
| Author(s), year | Item | Measurement | Rates | Risk factors | Protection factors |
|----------------|------|-------------|-------|--------------|--------------------|
| Bo, 2020       | PTSS | PCL-C ≥ 50  | 96.2% | (a) Demeaning news coverage in communication programmes, (b) social discrimination |                     |
| Di Crosta, 2020| PTSD | IES-R ≥ 33 | 35.6% | (a) Fear of contagion, (b) female, (c) higher neuroticism, (d) lower levels of education, (e) lower perceived economic stability | (a) Neuroticism |
| Forte, 2020    | PTSD | IES-R ≥ 33 | 27.7% | (a) Aged 18 to 49, (b) female, (c) fear of contagion, (d) information of people infected by COVID-19, (e) information of people in ICU for COVID-19, (f) information of people died for COVID-19 |                     |
| González-Sanguino, 2020 | PTSD | PCL-C-2 | 15.8% | (a) COVID-19 symptoms/diagnosis, (b) discrimination, (c) employment during COVID-19, (d) female, (e) living with someone infected, (f) loneliness, (g) previous illness | (a) Aged 60 to 80, (b) good economic situation, (c) retired from work, (d) satisfaction with health information, (e) sense of belonging, (f) self-compassion, (g) social support, (h) spiritual well-being |
| Guo, 2020a     | PTSS | PCL-5      | 79.6% | (a) Emotion-focused coping, (b) lower perceived economic stability |                     |
| Guo, 2020b     | PTSS | PCL-5 ≥ 33 | 1.0%  | PTSS         | (a) Blaming others, having strong negative feelings (i.e. fear, guilt, and helplessness), (b) blaming of others, health authorities, (c) emotion-focused coping |                     |
| Hamam, 2020    | PTSD | PCL-5 ≥ 33 | 13.4% | PTSD          | (a) Female, (b) living alone, (c) lower levels of education, (d) poor health status, (e) younger age |                     |
| Karatzias, 2020| PTSD | ITQ        | 17.7% | PTSD         | (a) Anxiety, (b) depression, (c) fear of contagion, (d) living in a city, (e) living with children, (f) male, (g) younger age |                     |
| Li, 2020       | PTSD | IES-R ≥ 20 | 67.1% | PTSD         | (a) Problem-focused coping, (b) risk of psychiatric disorders |                     |
| Liu, 2020a     | PTSD | PCL-C ≥ 45 | 31.8% | PTSD         | (a) Distress tolerance, (b) loneliness, (c) fear of contagion | (a) Family social support, (b) instrumental social support |
| Liu, 2020b     | PTSS | PCL-5 ≥ 33 | 7%    | PTSS         | (a) Female, (b) living in a city, (c) poorer sleep quality (d) susceptible to infection |                     |
| Liu, 2020c     | PTSD | PCL-5      | 12.4% | PTSD         | (a) Discrimination, (b) family member died, (c) living with children, (d) severity level of COVID-19 pneumonia | (a) Social support |
| Qi, 2020       | PTSD | PCL-C ≥ 50 | 12.2% | PTSD         | (a) Emotion-focused coping, (b) social discrimination | (a) Always covered their mouths while coughing |
| Tan, 2020      | PTSD | IES-R ≥ 24 | 10.8% | PTSD         | (a) Divorced, separated, widowed, (b) poor health status | (a) Avoidance of sharing utensils during meals, (b) confidence doctor’s ability to diagnose or recognize COVID-19, (c) likelihood of survival, (d) observing better hygiene practices, (e) perceived likelihood of contracting COVID-19, (f) satisfaction with health information |
| Wang, 2020     | PTSD | IES-R > 24 | 22.7% | PTSD         | (a) Poor health status, (b) history of chronic illness | (a) Assessment of government actions to reduce the risk of infection, (b) food fully prepared |

COVID-19, coronavirus disease 19; IES-R, Impact of Event Scale-Revised; ITQ, International Trauma Questionnaire; PCL-C, Post-traumatic Stress Disorder Checklist – Civilian version; PCL-C-2, Civilian version of the Post-traumatic Stress Disorder Checklist-Reduced version; PCL-5, Post-traumatic Stress Disorder Checklist for DSM-5; PTSD, post-traumatic stress disorder; PTSS, post-traumatic stress symptoms.
receiving inpatient treatment for COVID-19. By contrast, only 1% of the patients diagnosed with mild cases of COVID-19 met the PCL-5 criteria (≥33) for PTSS. However, the researchers emphasized that time constraints, geography and sociocultural context restricted the generalizability of this result (Guo et al. 2020b). A mixed-method study observed that COVID-19 patients showed significantly higher levels of PTSS than the non-COVID control group (Guo et al. 2020b).

PTSD was examined in 12 studies (Di Crosta et al. 2020; Forte et al. 2020; González-Sanguino et al. 2020; Hamam et al. 2020; Karatzias et al. 2020; Li 2020; Liu et al. 2020a; Liu et al. 2020c; Qi et al. 2020; Tan et al. 2020; Wang et al. 2020; Wytrychiewicz et al. 2020). During the COVID-19 outbreak, the rate of PTSD in the general population, observed in these studies, was between 10.8% and 67.1%. Li (2020) reported the highest rate of 67.1% was among Chinese adults, after the government formally announced severe interventions. In contrast, only 10.8% of the workforce living in China met the IES-R criteria (≥24) for PTSD. However, the researchers emphasized that return to work did not cause high levels of PTSD in the workplace (Tan et al. 2020). Liu et al. (2020c) reported a rate of 12.4% among individuals diagnosed with COVID-19 who met the criteria for PCL-5 (≥22). Similarly, Qi et al. (2020) reported that 12.4% of the patients diagnosed with non-severe types of COVID-19 met the PCL-C criteria (≥50). Two studies measuring the IES-R subscale (Forte et al. 2020; Li 2020) showed high scores related to avoidance, intrusion and hyperarousal. Most studies (Di Crosta et al. 2020; Forte et al. 2020; González-Sanguino et al. 2020; Hamam et al. 2020; Karatzias et al. 2020; Li 2020; Liu et al. 2020a; Liu et al. 2020c; Qi et al. 2020; Tan et al. 2020; Wang et al. 2020) except that of Wytrychiewicz et al. (2020) used the cut-off score of the screening tool to diagnose PTSD. However, these screening tools are not sufficient to assure an accurate PTSD diagnosis because they are used to classify individuals at high risk of PTSD or the probable PTSD individual. Thus, to diagnosis clinically significant PTSD and to do so accurately, the DSM-5 criteria and structured interviews by clinicians are required.

Risk and protective factors of PTSS and PTSD

We report detailed results regarding the risk and protective factors of PTSS and PTSD in terms of sociodemographic, cognitive, psychological and social levels in Table 4.

Sociodemographic level

Some studies investigated sociodemographic factors such as gender, age and economic status affecting PTSD. Five studies (Di Crosta et al. 2020; Forte et al. 2020; González-Sanguino et al. 2020; Hamam et al. 2020; Liu et al. 2020b) reported higher PTSD rates in women than men. PTSD is more common in younger age groups compared with the elderly (Forte et al. 2020; Hamam et al. 2020; Karatzias et al. 2020). Lower perceived economic stability (Di Crosta et al. 2020; Guo et al. 2020a), lower levels of education (Di Crosta et al. 2020; Hamam et al. 2020) and some living conditions were also identified as risk factors such as living alone (Hamam et al. 2020), living with children (Karatzias et al. 2020; Liu et al. 2020c) or living in a city (Karatzias et al. 2020; Liu et al. 2020b). However, some studies have shown protective factors with inverse relations with the risk factors associated with PTSS and PTSD, such as older age (González-Sanguino et al. 2020) and stable economic status (González-Sanguino et al. 2020); these are associated with lower levels of PTSD and PTSS.

Cognitive and psychological level

Several studies have measured psychological factors such as depression, anxiety, fear or loneliness. First, comorbidity of depression and anxiety was observed along with PTSD in 12 studies (Di Crosta et al. 2020; Forte et al. 2020; González-Sanguino et al. 2020; Hamam et al. 2020; Karatzias et al. 2020; Li 2020; Liu et al. 2020a; Liu et al. 2020c; Qi et al. 2020; Tan et al. 2020; Wang et al. 2020; Wytrychiewicz et al. 2020). Karatzias et al. (2020) suggested that anxiety or depression may be an additional risk factor for PTSD. Second, five studies (Di Crosta et al. 2020; Forte et al. 2020; Karatzias et al. 2020; Liu et al. 2020a; Wytrychiewicz et al. 2020) showed that a fear of contagion is associated with higher levels of PTSD in the population. Loneliness was the strongest predictor of PTSD (González-Sanguino et al. 2020; Liu et al. 2020a). Furthermore, loneliness may be particularly prevalent and distressing during the pandemic given the directives for physical social distancing and isolation. In a study of patients diagnosed with mild COVID-19, patients reported strong negative feelings towards others (i.e. healthcare professionals, neighbours and health authorities) that were associated with PTSD (Guo et al. 2020b). Third, lower fear of contagion (Tan et al. 2020; Wang et al. 2020; Wytrychiewicz et al. 2020) was negatively associated with PTSS and PTSD.
Some studies examined the coping strategies that individuals use to reduce stress; however, their findings were inconsistently reported. Three studies conducted in China during the COVID-19 pandemic (Guo et al. 2020a; Guo et al. 2020b; Qi et al. 2020) found that individuals who used emotional-focused coping were more vulnerable to PTSD than those using problem-focused coping. By contrast, Li (2020) found that higher problem-focused coping scores were associated with a greater vulnerability to PTSD.

Three studies found social support to be a protective factor (González-Sanguino et al. 2020; Liu et al. 2020a; Qi et al. 2020). These studies found that social support was associated with a decreased risk of impaired mental health such as anxiety, depression and PTSS (Guo et al. 2020a; Guo et al. 2020b; Qi et al. 2020). Guo et al. (2020b) showed that social support from family was associated with decreased risk of depression and PTSS, whereas support from friends or partners was not associated with mental health. Specifically, Guo et al. (2020a) found the need for greater psychological support in women, younger people and people with previous mental health diagnoses.

Interestingly, having more information related to COVID-19 is a risk factor associated with increased vulnerability to PTSD (Forte et al. 2020). Three types of information have been associated with vulnerability to PTSD: (i) information about individuals infected by COVID-19; (ii) information about individuals in the intensive care unit as a result of COVID-19; and (iii) information regarding individuals who have died due to COVID-19. By contrast, some studies (González-Sanguino et al. 2020; Wang et al. 2020) emphasized that satisfaction with health information was a protective factor for mental health. However, too much information increased anxiety, while an optimum amount of health information protected individuals from anxiety (González-Sanguino et al. 2020; Wang et al. 2020).

**Social level**

Four studies showed that the fear of social discrimination has been associated with PTSS and PTSD (Bo et al. 2020; González-Sanguino et al. 2020; Liu et al. 2020c; Qi et al. 2020). As there is some amount of blame being placed on COVID-19 patients by the news or social media, the fear of discrimination was also associated with PTSS and PTSD (Bo et al. 2020; Liu et al. 2020c; Qi et al. 2020). Some studies revealed that patients diagnosed with mild COVID-19 were more prone to be blamed by others including healthcare professionals, neighbours and healthcare authorities (González-Sanguino et al. 2020; Guo et al. 2020b). Qi et al. (2020) found significantly higher perceived social stigma and negative coping styles among COVID-19 patients with PTSD, compared to COVID-19 patients without PTSD.

**Other factors**

The individual’s present health conditions, specifically, a poor health status (Haman et al. 2020; Tan et al. 2020; Wang et al. 2020), previous illnesses (González-Sanguino et al. 2020), having a history of chronic illness (Wang et al. 2020) and poor sleep quality (Liu et al. 2020b) also increased the likelihood of experiencing PTSS and PTSD.

**DISCUSSION**

Through this review, we systematically analysed and synthesised COVID-19 and PTSS- and PTSD-related literature, to check the impact of COVID-19 on PTSD and identify the associated risks and protective factors. The evidence reviewed clearly confirms that COVID-19 is a traumatic event that can increase the general population’s vulnerability to PTSD. Differences in rates among studies may result from various study designs and measures, specifically inconsistencies in the cut-off points. Risk factors associated with PTSS and PTSD include social discrimination, fear of contagion, poor health status, living alone and lower perceived economic stability. Protective factors include social support, satisfaction with health information and an assessment of government actions that aim to reduce the risk of infection.

During the COVID-19 pandemic, in the general population, the rate of PTSS was 1–96.2% and the rate of PTSD was 10.8–67.1%. The symptoms of PTSS and PTSD were commonly observable in COVID-19 patients. The rate of PTSD found in this study was higher than its known lifetime rate (6% in men and 10% in women) (Breslau et al. 1999; Kessler et al. 1995). Moreover, the rate of PTSD during COVID-19 was higher than that reported during epidemics in the past; for example, the rate reported for SARS was 25.5% (Mak et al. 2009), for Ebola was 21% (Hugo et al. 2015), and for MERS was 26.9–42.3% (Lee et al. 2019). However, in previous studies, the survivors were diagnosed with PTSD at the end of the epidemic, so it might be more accurate to compare rates after the COVID-19 pandemic ends. Therefore, we predict that the COVID-19 pandemic will have a lasting psychological impact on the general population. These results...
highlight the need to enhance the preparation and competence of the healthcare teams to detect and manage the psychological effects of the COVID-19 pandemic (Qi et al. 2020).

Since the beginning of COVID-19 pandemic, the general population has been exposed to situations that cause psychological reactions every day (Usher et al. 2020a). Through this study, we provide evidence of individual and situational factors that appear to influence the levels of PTSS and PTSD. As a result of reviewing research related to sociodemographic factors, such as gender, age, economic and living conditions (living alone and living with children), we found evidence that these factors can influence the psychological responses of the general population. In particular, a risk factor associated with PTSD was living with a child, which can be attributed to the parental stress related to protecting the child from COVID-19 (Centers for Disease Control & Prevention 2020). The COVID-19 pandemic can be stressful for the general population. Therefore, it is important to provide parents with information and guidelines to help protect their children from disease and to provide a medical system that can ease the parents' burden (Centers for Disease Control & Prevention 2020).

This study found that psychological factors were directly associated with PTSD in the general population. This finding is consistent with those of a systematic review that identified poor psychological factors as antecedents to poor mental health (Preti et al. 2020; Usher et al. 2020b; Xiong et al. 2020). Loneliness is a public health concern, relates to poor physical and mental health and can lead to extreme consequences including death (Holt-Lunstad et al. 2015; WHO 2020d). COVID-19 has made it difficult to maintain social relationships. Physical contact with family and friends is continuously restricted, and social and leisure activities are limited, which can cause loneliness (Groarke et al. 2020). In a cross-sectional online survey, 49–70% of participants reported feeling isolated or lonely and having insufficient social relationships during the COVID-19 pandemic (Groarke et al. 2020). The risk factors for loneliness were depression, poor sleep quality, and protective factors were marriage, living with a larger number of adults, and social support (Groarke et al. 2020), which is similar to the results of our study. Screening could be performed to identify individuals that are vulnerable to experiencing loneliness and priority mental health services should be provided (WHO 2020d). Specifically, those living alone and/or older adults, care providers, those in self-quarantine and people with underlying health conditions need to be monitored with regard to their mental health, and psychological interventions using phone calls and video chat can help social closeness or connectedness (Centers for Disease Control & Prevention 2020).

Generally, individuals use problem- and emotion-focused coping strategies in stressful situations, such as the COVID-19 pandemic (Lazarus & Folkman 1984). Problem-focused coping refers to a direct approach to change or eliminate the source of stress, while emotion-focused coping is a response that controls stress-related emotional distress (Lazarus & Folkman 1984). The studies we reviewed reported conflicting results regarding coping strategies. Some studies found emotion-focused coping to be a risk factor associated with PTSD. In these studies, problem-focused coping was a positive strategy involving active methods, such as finding other ways to solve problems or asking for advice from relatives or friends. By contrast, emotion-focused coping tends to emphasize passivity and helplessness, strengthening anxiety and depressive feelings. These findings are consistent with a previous PTSD-related study (Snyder et al. 2015). However, a study found that individuals using problem-focused coping were more vulnerable to PTSD than those using emotion-focused coping strategies. It should be considered that the effect of the same coping strategy may change with time due to the COVID-19 outbreak situation (Qian et al. 2005). Thus, further studies should be conducted using the same instruments to identify an effective coping strategy for improving mental health. This can provide evidence of mental health interventions and develop guidelines for healthcare professionals.

The uncertainty reduction theory emphasized the importance of providing information because, in unpredictable situations, people may feel unpleasant and this may cause undue cognitive stress (Berger & Calabrese 1974). We believe this theory can be applied to the present COVID-19 pandemic. Our results showed that the feeling of receiving too much information increases anxiety while having the right amount of information protects against the existence of anxiety (Forte et al. 2020; González-Sanguino et al. 2020; Wang et al. 2020). These findings could help governments and health authorities around the world to modify and strengthen the current information delivery system. Therefore, the government must increase awareness of the importance of obtaining information from formal information channels and limit information from informal channels, especially too much information, uncertain information and stimulating graphics.
Limitations

This study has several limitations. First, most of the studies we reviewed are cross-sectional studies, making it difficult to draw conclusions about the long-term consequences of PTSD in individuals. Second, the rate of this study should be carefully interpreted considering the participants of different countries, the measuring instruments and the cut-off points. Third, all studies relied on self-report measures; therefore, they were more likely to identify acute symptoms than PTSD which could occur weeks or months later. Fourth, the study excluded the grey literature to focus on peer-reviewed journals. However, for future study, this could also be included as a valuable source of information for a review. Despite these identified limitations, COVID-19 is a problem causing PTSD in the general population, and there is sufficient evidence that PTSS will continue as COVID-19 persists. The results of this study may be useful for identifying, preventing and managing PTSS associated with COVID-19, at the community level.

CONCLUSIONS

This study examined the status of mental health in the general population during the COVID-19 pandemic and addressed the factors associated with PTSD and PTSS. A high and wide range of rate of PTSD was reported in most studies. It is clear that PTSS affects the general population exposed to the COVID-19 pandemic, similar to the results of studies related to other infectious diseases. COVID-19-related PTSD is associated with sociodemographic, cognitive and psychological, risk and protective factors.

RELEVANCE FOR CLINICAL PRACTICE

Our findings confirmed risk and protective factors needed to deal with negative psychological outcomes. Based on our findings, the study highlights the importance of understanding how the uncertainty about COVID-19 can explain COVID-19 as a traumatic event that causes emotional damage and traumatic stress. The study suggests that healthcare professionals should increase comprehensive intervention and prevention efforts during the COVID-19 pandemic to address associated psychological impacts. First, our findings can help healthcare professionals take steps to prevent PTSS in patients with COVID-19 who have experienced criticism or discrimination. Specifically, optimal health information and guidelines should be shared to address social discrimination (WHO 2020e). Regular social media campaigns are needed to raise awareness of social discrimination (WHO 2020e), and long-term follow-up mental health assessments should be immediately initiated for COVID-19 patients (WHO 2020e). Second, our findings can be used by healthcare professionals to select vulnerable groups and provide mental health services and social support. For example, healthcare professionals should prioritize provide food delivery and medical services to vulnerable people such as elderly people living alone, people in poor health and people vulnerable to infection (WHO 2020f). Regular social networking through telephone, social media, emails or videos can greatly help in reducing loneliness (WHO 2020f), and healthcare professionals need to improve their coping strategies by providing virtual mental health services (WHO 2020f). Thus, the results of this study can be used in public health to address the assessment of PTSD or PTSS experienced by the general population and to make specific suggestions for improving mental health.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher’s web-site:

Appendix S1. The list of articles includes Tables 3 and 4.