

The outbreak of post-traumatic stress disturbances during the COVID-19 pandemic: A systematic review

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ABSTRACT

Although almost three years have passed since the outbreak of the coronavirus (COVID-19), this unprecedented situation is still not under control. Since COVID-19 has the potential to harm the human body, this systematic review aimed to evaluate the outbreak of post-traumatic stress disturbance (PTSD) during the COVID-19 epidemic. We used the search strategy of “novel coronavirus” OR “2019 novel coronavirus” OR “novel coronavirus pneumonia” OR “new coronavirus” OR “coronavirus disease 2019” OR “SARS2” OR “2019-n CoV” OR “SARS-CoV-2” OR “COVID-19” AND “PTSD” OR “PTS” OR “post-traumatic stress” OR “mental disorders”. The exclusion criteria included: a) articles that were not in English or Persian language; b) articles whose full text was not available, c) articles that did not report the prevalence of PTSD, d) articles that were not specific to COVID-19 or included other diseases, e) duplicate publications; f) reviews, abstracts, case reports, case series, and g) studies with target groups other than healthcare workers (HCWs), patients with COVID-19 and general population. After reviewing the articles and checking the exclusion criteria, the full text of 27 articles was reviewed. The studies showed the prevalence of PTSD in the HCW, general population and COVID-19 patients varied from the lowest to the highest as 3.8% to 56.6%, 4.6% to 67.09% and 5.61% to 96.2%, respectively. Given the prevalence of PTSD associated to COVID-19 in the investigated groups, it is recommended to design and implement educational and interventional programs to manage stress and deal with stressful situations such as epidemics.

Keywords: COVID-19, PTSD, SARS-CoV-2.

Article type: Review Article.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an extremely epidemic infected respiratory illness related to the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2; Pan *et al.* 2021). At the end of December 2019, all the people of the world were in an unprecedented situation owing to the prevalence of this illness which started in Wuhan, China (Karimi *et al.* 2021). After almost three years this unprecedented condition, based on the latest data (September 14, 2022), the epidemic is still uncontrolled with 605 million approved infections and higher than 6.4 million deaths universal (Karimi *et al.* 2021; Sadighara *et al.* 2022). The COVID-19, along with severe health problems has imposed many psychological effects on people (Ansari *et al.* 2022). Stressful situations such as high prevalence and death caused by it (Sadighara *et al.* 2022), fear of contagion and risk of death, for oneself and loved ones (Sadighara *et al.* 2022), hospitalization and intensive care unit (ICU; Ansari *et al.* 2022), and

subsequent quarantine and social distancing policies (Hosseininejad *et al.* 2019), forced and drastic alterations in daily life with uncertain financial and future prospects (Ansari *et al.* 2022), social isolation, unemployment, and the stigma of contaminating others (Sadighara *et al.* 2022), along with insufficient skills and strategies to manage stress, can have a significant effect on people's mental health and cause widespread fear, stress, anxiety and depression. As a result, it can be said that these factors together can enhance the outbreak of PTSD produced by experiences related to the COVID-19 pandemic (Agorastos *et al.* 2021). In the fifth edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5), PTSD is associated with the classification of trauma and stressor related to the stress disturbances (Agorastos *et al.* 2021). This emotional disturbance, which is associated with fear and anxiety, can cause unhappiness, feebleness, memory injury and reduced work excellence (Pan *et al.* 2021). Although the exact mechanisms of neurological symptoms associated with COVID-19 are not fully understood, the neurotropic activity of this virus is hypothesized to happen through 2 feasible ways: 1) A haematogenous path, that could contain the infection of BBB endothelial cells, infection of the blood ; 2) a neuronal transport path that utilizes retrograde axonal transport by the olfactory, the respiratory and the enteric nervous system (Rege *et al.* 2020). CNS invasion can also happen by dysregulation inflammatory responses, including neuro-inflammation, or as a secondary impact of other organ failure, including cardiorespiratory failure, or secondary to the embolic process lead by SARS-CoV-2 (Sadighara *et al.* 2022). Since the COVID-19 pandemic is a highly harmful illness due to its attributes (changeable, severe, continued, based on an unknown/unfamiliar risk, threat of death) and also due to the experience of MERS and SARS showing symptoms and diagnosis of PTSD in their survivors (Sadighara *et al.* 2022), conducting research in this field to provide scientific evidence to develop strategies for inhibition and management of psychological problems in the length of current and future epidemics is essential (Hosseininejad *et al.* 2019). In fact, receiving sufficient information about the disease of COVID-19 and its psychological consequences can help in planning to deal with epidemics and their harmful effects. Therefore, the present review was performed by the aim of reviewing the prevalence of PTSD during the COVID-19 epidemic in different populations.

MATERIALS AND METHODS

In this systematic review, all original studies conducted in the field of PTSD during the epidemic of the COVID-19 virus from the date of the beginning of its epidemic (March 11, 2020) to September 17, 2022 were reviewed by searching Magiran, PubMed, SID, Science Direct, Google Scholar, Scopus, and ISI databases. The search strategy used was as follow: ("novel coronavirus" OR "2019 novel coronavirus" OR "novel coronavirus pneumonia" OR "new coronavirus" OR "coronavirus disease 2019" OR "SARS2" OR "2019-nCoV" OR "SARS-CoV-2" OR "COVID-19") AND ("PTSD" OR "PTS" OR "post-traumatic stress" OR "mental disorders"). The exclusion criteria of our study included: a) articles that were not in English or Persian language; b) articles whose full text was not available, c) articles that did not report the prevalence of PTSD, d) articles that were not specific to COVID-19 or included other diseases, e) duplicate publications; f) reviews, abstracts, case reports, case series; and g) studies with target groups other than HCWs, general population and patients with COVID-19. Using the abovementioned search strategy, 14,000 articles were found. After rereading the titles and summaries of the articles, as well as checking the exclusion criteria, the full texts of 27 articles were reviewed. No Persian language studies were found according to the study criteria and all the articles were in English. The sample size in reviewed studies ranged from 64 to 14,825 participants. Also, regarding the research setting, seventeen were from China, seven from Italy, three from Norway, two from Spain, one from Saudi Arabia, Suez Canal, Cyprus, Canada, France, Jordan, Greece, Ireland, five western countries, India, Singapore and India, Iran, United States, Malatya/Turkey, Taiwan, South Korea and Ethiopia.

RESULTS AND DISCUSSION

Table 1. General characteristics of the reviewed studies.

Author	Year	Type of study	Study samples	Results	Ref
Healthcare workers					
Pan	2021	cross-sectional study	659 HCWs having cared for COVID-19 patients in Wuhan, China	13.7% "PTSD"	(Pan <i>et al.</i> 2021)

Asnakew	2021	A multicentered cross-sectional study	396 HCWs in Amhara Ethiopia	55.1% “PTSD”	(Hosseininejad et al. 2019)
Lu	2021	cross-sectional study	500 COVID-19 frontline HCWs in Taiwan	15.4% “PTSD symptoms”	(Lu et al. 2021)
Gabra	2022	A cross-sectional study	102 nursing staff in Suez Canal University Teaching Hospital	51% “PTSD in COVID-dealing nursing staff” and 27/5% “PTSD in Non-COVID dealing nursing staff”	(Gabra et al. 2022)
Chatzittofis	2021	A cross-sectional study	424 among HCWs in Cyprus	14.6% “PTSD symptoms”	(Chatzittofis et al. 2021)
Qutishat	2021	A cross-sectional study	259 Jordanian Nurses	37.1% “PTSD”	(Qutishat et al. 2021)
Riello	2020	A survey-based cross-sectional epidemiological study	1071 residential nursing and care home workers in Northern Italy	40% “PTSD”	(Riello et al. 2020)
Laurent	2022	The PsyCOVID-ICU study in 2 Phase	2153 intensive care professionals in France	20.6% “potential PTSD”	(Behroozi-Lak et al. 2017)
Wang	2020	A cross-sectional study	202 Nurses exposed to COVID-19 in China	16.83% “PTSD”	(Zarei et al. 2017)
Johnson	2020	A cross-sectional, survey-based study	1773 health workers and public service providers throughout Norway	28.9% “clinical or subclinical symptoms of PTSD”	(Johnson et al. 2020)
Chew	2020	A multinational, multicentre study	906 HCWs in Singapore and India	7.4% “PTSD”	(Chew et al. 2020)
Blekas	2020	A cross-sectional study	270 Greek health care professionals	16.7% “Probable PTSD”	(Blekas et al. 2020)
Si	2020	A cross-sectional study	863 medical care workers from seven provinces in China	40.2% “PTSD”	(Si et al. 2020)
Luceño-Moreno	2020	A cross-sectional study	1422 Spanish HCWs	56.6% “PTSD symptoms”	(Luceño-Moreno et al. 2020)
Song	2020	A cross-sectional study	14,825 medical staff in 31 provinces of mainland China	9.1% “PTSD”	(Song et al. 2020)
Yin	2020	A cross-sectional study	371 HCWs in China General population	3.8% “Posttraumatic stress Symptoms”	(Yin et al. 2020)
Bonsaksen	2020	cross-sectional survey	4527 Norwegian citizens aged 18 years or older	18.4% “PTSD” ((12.5% for men and 19.5% for women))	(Sadighara et al. 2022)
Alshehri	2020	An observational cross-sectional study	1374 participant aged 18 years or older in Saudi Arabia	22.63% “PTSD cut-off score”, 24/8% “PTSD criteria” and 19/6% “PTSD combined”	(Alshehri et al. 2020)
González-Sanguino	2020	A cross-sectional study	3480 from the Spanish general population and various specific groups aged 18 years or older	15.8% “PTSD symptoms”	(González-Sanguino et al. 2020)

Karatzias	2020	A Population-Based Study	1041 Irish general population aged 18 years or older	17.7% "COVID-19-related PTSD"	(Karatzias <i>et al.</i> 2020)
Li	2020	A cross-sectional study	1109 Chinese general population	67.09% "high PTSD level"	(Li <i>et al.</i> 2020)
Sun	2021	A cross-sectional online anonymous survey	2091 Chinese public	4.6% "PTSD"	(Sun <i>et al.</i> 2021)
Casagrande	2020	A web-based cross-sectional survey	2291 Italian population	7.6% "COVID-19-PTSD"	(Casagrande <i>et al.</i> 2020)
Liu	2020	A cross-sectional study	285 Wuhan and surrounding cities residents	7% "posttraumatic stress symptoms"	(Liu <i>et al.</i> 2020)
Patients with COVID-19					
Yuan	2021	A comparative, cross-sectional study	134 COVID-19 survivors and 214 non-infected controls in China	18.66% Among COVID-19 survivors and 5.61% in healthy controls	(Yuan <i>et al.</i> 2021)
Chang & Park	2020	A cross-sectional study	64 patients who were diagnosed with COVID-19 in Daegu, Korea	20.3% "PTSD"	(Chang <i>et al.</i> 2020)
Bo	2021	A cross-sectional study	714 COVID-19 patients in China	96.2% "Significant posttraumatic stress symptoms"	(Bo <i>et al.</i> 2020)

PTSD in Health care workers

Among the reviewed articles, 16 articles were related to the study on the prevalence of PTSD in health care workers (HCWs) and people who were working on the front line of dealing with COVID-19. The highest prevalence in HCWs was reported by Luceño-Moreno *et al.* (2020; 56.6% of PTSD symptoms in 1422 Spanish HCWs), while the lowest reported prevalence was 3.8% in 317 Chinese HCWs (Yin *et al.* 2020). In line with the study of Luceño-Moreno *et al.* (2020), Asnakew *et al.* (Hosseinejad *et al.* 2019) in Ethiopia, Si *et al.* (2020) in China, Crowe *et al.* (2021) in Canada, Riello *et al.* (2020) in Northern Italy reported a relatively high prevalence in health professionals. However, unlike the abovementioned studies, Chew *et al.* (2020) in Singapore and India, Song *et al.* (2020) in China, Pan *et al.* (2021) in China, Chatzittofis *et al.* (2021) in Cyprus, Lu *et al.* (2021) in Taiwan, Blekas *et al.* (2021) in Greece, Wang *et al.* in China (Zarei *et al.* 2017) as well as Yin *et al.* (2020) in China showed a lower prevalence of PTSD in HCWs. As known, different studies show very different PTSD prevalence in HCWs. Differences in the design of study, the tools for data collection, sample size, times of conducting studies after the epidemic of the COVID-19, setting the study, target groups of HCWs (nurses, physicians, etc.), culture and executive laws regarding disease prevention in different countries are the reasons for the large differences in reported results. Though the COVID-19 pandemic has similarities with that of the SARS virus, it is evident that this disease is much more severe than SARS, which is growing exponentially around the world and affecting most people, such as HCWs, in different ways daily (e.g. economic problems, over work, difficulty in receiving vital supplies, increasing social estrangement, distraction, etc.; Boyraz *et al.* 2020). In addition, the reduction of mental preparation and less qualified health nurses to deal with emergency situations including the fast spread of infectious diseases, along with the overstated role of the media and social interaction in discussing the facts of the disease and the exact number of cases of the disease are among the factors that have

led to that the mental health impacts of the COVID-19 pandemic are high severe and serious than the SARS prevalence (Qutishat *et al.* 2021). What is certain is that health professionals are more exposed to mental disorders in the face of COVID-19 than other the general population. Likewise, even a low prevalence of mental disorders in health workers should be considered as a serious symptom. In fact, these results call for preventive measures in providing effective mental health amenities (e.g., relaxation treatment, desensitization, dealing with grief) to HCWs specially COVID-19 frontline workers, to help cope by the challenges attributed with COVID-19 (Hou *et al.* 2020).

Factors associated with PTSD in HCWs

The investigations expose the relationship among different factors (protective factors and risk factors) by COVID-19-related PTSD in HCWs. The risk factors reported in the reviewed studies were included: “having medical diseases (Marznaki *et al.* 2022)”, “experiencing social quarantine (Marznaki *et al.* 2022)”, “job dissatisfaction (Behroozi-Lak *et al.* 2017)”, “lack of standardized PPE supply, perceived stigma and history of mental illnesses (Hosseininejad *et al.* 2019)”, low social support (Marznaki *et al.* 2022), “employed in the emergency section within the COVID-19 pandemic, irregular work shifts and coming from a mental health department (Johnson *et al.* 2020)”, “direct contact with COVID-19 patients (Johnson *et al.* 2020)”, “reduction of short breaks, insufficient organizational backing and recompense and insufficient time off from work (Gabra *et al.* 2022)”, “being a nurse (Blekas *et al.* 2020)”, “less work experience (Song *et al.* 2020)”, “experiencing many difficult incidents during the crisis, having psychological distress and stress, high workload, emotional burden related to the patient and family, and specific stressors of COVID-19 during the first peak period of the crisis (Chew *et al.* 2020)”, “lower educational qualifications, working in the private sector, receiving COVID-19 cases at office, and being compelled to quarantine (Qutishat *et al.* 2021)”, “positive coping (Qutishat *et al.* 2021)”, “worries around occupation and negative metacognitions, economy, burnout, fewer emotional backing, and health concern (Johnson *et al.* 2020)”, “presence of physical symptoms (Qutishat *et al.* 2021)”, “negative emotion, and threatened or physical tension (Blekas *et al.* 2020)”, “perceived threat, passive coping strategies (Si *et al.* 2020)”, “emotional exhaustion, working in a hospital, and worrying about people who live with you contracting the COVID-19 (Luceño-Moreno *et al.* 2020)”, being middle aged, and have longer daily work time (Song *et al.* 2020)”, “older age (Crowe *et al.* 2021)”, “younger age (Crowe *et al.* 2021)”, being a male (Song *et al.* 2020)”, “female gender (Yin *et al.* 2020)”. The protective factors were included: “getting information related to COVID-19 in the right amount, good family functioning, working in well-prepared mobile cabin hospitals served (Yin *et al.* 2020).

Pan *et al.* (2021) reported which contributors who did not have family support experienced social isolation and job dissatisfaction and were at greater risk of PTSD. This emphasizes the importance of backing from nurses, colleagues, family and community (Pan *et al.* 2021). The study by Asnakew *et al.* shows that lack of standardized PPE supply is associated with higher PTSD (Sadighara *et al.* 2022). In fact the lack of access to personal protective equipment causes health care workers to worry about contracting COVID-19 and other diseases, as well as transmitting it to their families and patients (Sadighara *et al.* 2022). Regarding the effect of the age factor, studies show conflicting results. Articles number (Sadighara *et al.* 2022) indicates which older age is a risk factor for PTSD. However, in the study of Luceño-Moreno *et al.* (2020), the younger age is a risk factor for PTSD. The existence of more PTSD in the elderly can be attributed to the fact that young people seek to know the disease of COVID-19 and, as a result, their awareness is more about the disease of COVID-19 and the ways to deal with it compared to those of older age. On the other hand, the possibility of chronic diseases is more in older people and this issue can lead to more fear and anxiety in dealing with this disease. On the other hands, in a primary stages of an infected epidemic, young nurses could not receive sufficient exposure alarm or protection, potentially placing themselves at greater physical or psychological risk. For young nurses who have a lot of experience in this field, they may refer to internet and television networks for more information, which can significantly increase their PTSD, stress and psychological problems (Qutishat *et al.* 2021). The results regarding the effect of gender are contradictory to each other like as age; in such a way that study of Song *et al.* (2020) show the negative effect of male gender on PTSD, while that of Qutishat *et al.* (2021) showed the negative effect of female gender on PTSD. Marcomini *et al.* stated that since women experience stronger and longer-lasting symptoms, therefore; this should be intently considered in schematization the contents of the psychological interposition and representation (Khadom *et al.* 2021). Some studies show that the risk of PTSD is higher in people with chronic diseases than others (Khadom *et al.* 2021). This could be since health care providers with chronic diseases know that their health

condition makes them more vulnerable to the COVID-19 and its ill effects. So, it makes them more psychologically affected (Khadom *et al.* 2021). For this reason, it is suggested to refrain from employing health care workers with chronic diseases in the departments related to the care of COVID-19 and another infectious illness. The study of Lu *et al.* in health workers on the frontline of COVID-19 in Taiwan shows which anxiety signs and anxiety of COVID-19 are prophesiers of PTSD. So, there may be the need to examine and offer appropriate mental HCWs services to these individuals to help manage or prevent future PTSD (Lu *et al.* 2021). Many investigations have shown that the outbreak of PTSD in nurses is greater than other health professionals. Stressful work shifts, lack of personal protective equipment, unsafe work environment, separation from family members and unknown fears, all have very negative effects on nurses mental state (Khadom *et al.* 2021).

PTSD in general population

In the general population setting, the cross-sectional study by Sun *et al.* (2021) shows the lowest prevalence among 2091 Chinese people (4.6%); while, Li in a cross-sectional study (Li *et al.* 2020) in 1109 Chinese people shows the highest outbreak of PTSD in general population (67.09%). The reports of other studies based on the PTSD prevalence from low to high are as follows: Liu *et al.* (7%) (Liu *et al.* 2020), Casagrande *et al.* (7.6%) (Casagrande *et al.* 2020), González-Sanguino *et al.* (15.8%) (González-Sanguino *et al.* 2020), Karatzias *et al.* (17.7%) (Karatzias *et al.* 2020), Bonsaksen *et al.* (18.4%) (3), Alshehri *et al.* (22.63% “PTSD cut-off score”, 24.8% “PTSD criteria” and 19.6% “PTSD combined” (Alshehri *et al.* 2020).

Factors associated with PTSD in general population

Reviewing the studies that have reported the factors related to PTSD in the general population shows that the age (González-Sanguino *et al.* 2020), sex (González-Sanguino *et al.* 2020), and having mental health problems (Casagrande *et al.* 2020) are the most important factors affecting the outbreak of PTSD in the general population. In study by Alshehri (Alshehri *et al.* 2020), González-Sanguino (González-Sanguino *et al.* 2020), Sun (Sun *et al.* 2021), and Liu (Liu *et al.* 2020), women had more PTSD than men, while in other studies (Karatzias *et al.* 2020), men reported a higher prevalence. One reason for the observed difference is that women respond otherwise to greatly worrying happenings compared to men: women with PTSD experience higher brainstem activation in response to threats (i.e., may be more intense and sudden in these situations and respond less reflectively), though men indicated high ability to contextualize fear-related stimuli (Alshehri *et al.* 2020). Other reasons such as hormonal variances among them. Younger age was described as a risk factor for PTSD in all general population studies (Alshehri *et al.* 2020). Bonsaksen *et al.* concluded that though younger people may have a lot of worry about family and economic problems, however, the inverse relationship between young age and PTSD was maintained when these factors were controlled. Thus, in some contexts, old age may serve as an autonomous source for dealing with life's problems (Alshehri *et al.* 2020). Regarding mental problems, Karatzias *et al.* in their study reported that having screening positive for anxiety or depression was related with meeting the diagnostic requirement for COVID-19–related PTSD (Karatzias *et al.* 2020). In Italian population, a notable relationship among sleep quality, generalized worry, and psychological confusion by PTSD signs associated with COVID-19 was shown (Casagrande *et al.* 2020) and in Wuhan and surrounding cities residents, individuals who had better sleep quality indicated lower PTSS (Casagrande *et al.* 2020). Occupational and efficient mental health services should be planned to help the psychological health of the society in affected regions, particularly those living in hardest-hit regions, females and people by low sleep quality (Casagrande *et al.* 2020). The results of a study show that PTSD was related to the absence of social backing, and a range of pandemic-related variables including economic worries, expecting economic damage, being in quarantine, at high risk for complications from COVID-19 infection, and worrying for family and close friends (Casagrande *et al.* 2020). In the study of Alshehri *et al.*, individuals who were tested positive or suspected of being infected had a higher outbreak of PTSD and higher flexibility was related to a lesser PTSD outbreak (Alshehri *et al.* 2020). González-Sanguino *et al.* (2020) in their study on the Spanish general population reported that having a good financial situation and believing that there is enough information about the epidemic of this virus will reduce PTSD signs. Whereas, previous diagnoses of mental health problems or neurological disorders, having symptoms related to the virus, having a loved one affected by the virus were associated with more symptoms in PTSD. The predictive models showed that the greatest protective factor was spiritual well-being, while loneliness was the strongest PTSD exacerbating factor (González-Sanguino *et al.* 2020). In a study on the Irish general population, conference the diagnostic need for

COVID-19–related PTSD was attributed to the living in a city, living with children, moderate and high perceived risk of COVID-19 infection, and screening positive for anxiety or depression (Karatzias *et al.* 2020).

PTSD in patients with COVID-19

The study by Bo *et al.* (2021) shows a very high prevalence of PTSD (96.2%) in patients with COVID-19 in China, however, on the contrary, the results of the study in 120 COVID-19 survivors from the university-affiliated hospital of Tehran, Iran showed a low prevalence of PTSD (5.8%) in Iranian patients (Hou *et al.* 2020).

Factors associated with PTSD in patients with COVID-19

Few of the reviewed articles reported the factors affecting PTSD in the COVID-19 patients and this issue makes the discussion in this field difficult. For this reason, we have given a brief description of the articles in this section below. In comparative, in a cross-sectional study in Yuan, the PTSS prevalence among COVID-19 survivors was considerably greater than that of healthy controls and more severe depressive signs were considerably related to PTSS in COVID-19 survivors (Hou *et al.* 2020). Among patients with approved COVID-19 infection in China, the negative coping inclination were related to an enhanced risk of PTSD signs and in Norwegian patients, born outside of Norway, female sex and dyspnoea during COVID-19 were risk factors for persistent PTSD symptoms (Hou *et al.* 2020). In China, the hospitalized patients who were high affected with negative news, were more exposed to traumatic experiences, and had less social support reported higher PTSD (Boyras *et al.* 2020). However, in Norway, in non-hospitalized topics, former depression and COVID-19 sign load were also related to continuous PTSD signs (Hou *et al.* 2020). Finally, in a study by Chang & Park in Korea, no noteworthy differences were seen in demographic properties, such as, hospitalization time, duration after discharge age and, sex, between patients with PTSD and those without PTSD (Chang *et al.* 2020).

CONCLUSION

Considering the prevalence of PTSD associated with COVID-19 in the investigated groups, it is recommended to design and implement educational and interventional programs to manage stress and deal with stressful situations such as epidemics.

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