REVIEW

Prevalence and risk factors of posttraumatic stress disorder in COVID-19 [version 1; peer review: awaiting peer review]

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Abstract

Posttraumatic stress disorder (PTSD) has a prevalence of 2%–5% in the general population. COVID-19 is regarded as a traumatic agent that can increase the prevalence of this disorder to up to 30%. A documentary review was thus conducted, which included 13 studies on the presence of PTSD in patients who have survived COVID-19 infection and the possible associated factors. Female and young age, as well as other aspects associated with economic losses or living alone, could influence the appearance of this psychological sequela. A preventive mental healthcare program could be implemented during infection in such patients with COVID-19 who show the characteristics described in most studies.

Keywords

COVID-19, survivor, posttraumatic stress disorder, risk factors

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Any reports and responses or comments on the article can be found at the end of the article.

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Introduction

The World Health Organization (WHO) reported in 2017 that the prevalence of post-traumatic stress disorder (PTSD) in the non-psychiatric population was between 3.90 and 5.60%.[1]

It has been widely described that the fear of the spread of the novel severe acute respiratory syndrome coronavirus 2 and the associated consequences of COVID-19, such as social distancing and the implementation of stay-at-home prevention strategies, can be considered a traumatic stressor.[2,3]

In the past, disaster-related experiences of several types (terrorist, natural, and environmental attacks) have been associated with increased depression and anxiety, including PTSD, as well as substance abuse.[4] In addition, the fact that people follow 24-h mortality statistics through television news and other news programs may worsen the effects of trauma, with some studies suggesting that repeated exposure to the experience in the media can result in increased anxiety and intensify the stress response.[5–7]

Some mental health specialists are beginning to draw attention to PTSD as one of the major sequelae of the COVID-19 pandemic.[8] The measures to control the virus have possibly been very stressful, which could promote PTSD.[9,10] It is essential to remember that the beginning of the pandemic was potentially traumatic because no proper information was known about the virus and its propagation mechanisms;[8] therefore, the infection generated anxiety and a sense of threat, which could promote PTSD,[11] which usually develops after facing a dangerous situation that can put life at risk.[12]

Recent research has reported on PTSD related to the coronavirus outbreak, with a finding that the proportion ranges from 12.4% to 31.0% in patients recovering from the illness.[9,13–16]

The aim of this review was to report about the prevalence of PTSD in those patients who have survived the COVID-19 infection and to describe which associated factors may influence its occurrence.

Methods

PubMed, Science Direct, Scopus and Scielo databases were used to conduct a search for scientific articles using the keywords: *posttraumatic stress disorder, coronavirus, COVID-19, survivor, and patients,* both in Spanish and English, with a deadline of August 2021. Once the articles were selected, their references were additionally reviewed in search of other important studies related to the main objective of the study. On the first occasion, 38 studies were identified. Those whose sample consisted of physicians, nurses, and other healthcare workers, or in which other mental illnesses were described and in which the prevalence of PTSD was not reported were excluded. In the end, the sample consisted of 13 studies (Table 1).

Coronavirus Infection

Different viruses have caused the devastation of humanity throughout history; lately, novel diseases caused by Ebola, Zika, Nipah and Coronaviruses viruses have appeared in different parts of the world. Toward the end of 2019, a new coronavirus causing a particular type of pneumonia was identified in the city of Wuhan, China. The property of rapid transmission of this virus led to an epidemic in China, which soon spread to the rest of the world.[17]

By the beginning of 2020, WHO defined this pathology as COVID-19 because it was produced by a coronavirus identified in 2019. So far, more than 200 million people have been infected worldwide with this type of pneumonia[18]; therefore, COVID-19 was declared a pandemic by WHO in March 2020,[19] which initially began as a novel coronavirus in China.[20]

The incubation period of the disease is similar to that of other viruses. Symptoms usually appear 6 days after contact with another infected person, and the initial symptoms are fatigue, fever, and cough.[21,22] Several people would manifest only minor symptoms, but the condition of others will eventually become complicated and they would present major respiratory and cardiovascular diseases, which could lead to death.[23]

PTSD

PTSD is a mental disorder that is triggered after a traumatic experience, such as having an accident or being the victim of a violent act.[7] The emotions that were experienced at that moment are experienced again on several occasions and memories frequently appear, which interferes with daily life.[24] The coronavirus infection can act as a stressor of such magnitude as to trigger posttraumatic stress. This is because approximately 2%–5% of COVID-19 cases result in death caused by massive alveolar damage and progressive respiratory failure.[25]

Table 1. Studies on the prevalence and risk factors of PTSD in patients with COVID-19.

Authors	Country	Sample	Conclusions
Chang MC, Park D.[9]	Korea	64 patients in telephone interview, evaluated with PCL-5	PTSD = 20.3%, no differences in sex, age
Lahav Y.[10]	Israel	976 adults evaluated online using PCL-5	PTSD = 76.7% presented at least one symptom. Approximately 90.2% presented a previous trauma. Being young, female, single, at high-risk was associated with greater anxiety.
Liu D et al.[13]	China	675 patients discharged from quarantine for 28 days assessed online using PCL-5	PTSD = 12.4%. Risk factors: cough, fatigue, chronic chest pain ($p < 0.05$), corticosteroid treatment ($p = 0.016$), severity of illness and perceived stigma ($p < 0.001$), living with children ($p < 0.001$), and a relative having died ($p = 0.005$).
Cai X et al.[14]	China	126 COVID-19 survivors quarantined for 14 days after discharge assessed online using PTSD-22	PTSD = 31%. Risk factors: young ($p = 0.04$), being working ($p = 0.005$), being female ($p = 0.032$), poor social support ($p = 0.002$), infected relative ($p = 0.033$), and post-infection physical discomfort ($p = 0.045$).
Bonsaksen T et al.[58]	Norway	4527 subjects over 18 years of age with no exclusion criteria evaluated online using PCL-5	PTSD = 12.5% men and 19.5% women; risk factors: young age ($p < 0.001$), being female ($p < 0.001$), lack of social support ($p < 0.001$), financial concerns (OR: 2.23, $p < 0.001$), expectation of financial loss (OR: 1.39, $p < 0.01$), isolation (OR: 1.31, $p < 0.01$), risk of complications (OR: 1.77, $p < 0.001$), and worrying about relatives (OR: 1.83, $p < 0.001$)
Tarsitani Lorenzo et al.[55]	Italy	115 patients evaluated with PCL-5 3 months after discharge	PTSD = 10.4%; risk factors: obesity (OR: 3.51; $p = 0.03$), male sex ($p = 0.007$), previous psychiatric diagnosis (OR: 6.30; $p < 0.001$), and chronic respiratory disease (OR: 6.03; $p = 0.053$).
Salehi M et al.[35]	Iran	Systematic review and meta-analysis, 35 studies from November 2015 to May 2020 under PRISMA modality.	TEPT = 18%
Krishnamoorthy Y et al.[36]	India	Systematic review and meta-analysis, 50 publications based on the PRISMA model until April 2020.	TEPT = 21.94%–27.00%
Cooke J et al.[38]	Canada	Systematic review and meta-analysis, 14 studies under PRISMA guidelines.	TEPT = 26.2%
Simani Leilla et al.[40]	Iran	120 patients at 6 months after discharge between February and April 2020; evaluated using PCL-5.	TEPT = 5.8%
Eivink G et al.[54]	Norway	125 hospitalized and 458 non-hospitalized patients evaluated with PCL-5 at 8 weeks after discharge.	PTSD = 9.5% in hospitalized patients and 7% in non-hospitalized. Risk factors: female sex, living alone, and having dyspnea during COVID-19
Bo HX et al.[11]	China	714 patients evaluated with PCL-5 at the start of the pandemic	TEPT = 96.2%
Qiu D et al.[51]	China	Systematic review and meta-analysis, 76 articles under the PRISMA modality.	PTSD = 28.34 %, (23.03%–34.32%). Risk factors: being older than 51 years ($p < 0.001$), articles with larger sample size had lower prevalence ($p = 0.010$)

According to the 10th WHO classification of mental illnesses,[26] PTSD is a pathology that appears as a delayed response to a stressful situation (of short or long duration) of an exceptionally threatening or catastrophic nature, which is likely to cause generalized distress to nearly any person.

Among its most prominent manifestations are the presence of repeated episodes of fear where the trauma is experienced as if it was happening again, and during sleep nightmares are experienced within a framework of affective flattening that prevents the person from feeling empathy for others, or from leading a normal life under circumstances that could remind him/her of the traumatic event experienced.[27] Generally, the person remains in a constant state of alertness before a possible imaginary tragedy such as the incidence that has already happened, which produces autonomic discharges such as hypervigilance and insomnia that lead to anxiety and depression symptoms and even suicidal ideas.[28]

The time for the onset of PTSD after experiencing trauma can be anywhere between a few weeks and months. The course is not necessarily continuous, and symptoms can appear and disappear in periods or cycles. Without treatment, the disease may self-limit within two years, but a small group of patients continue to experience symptoms for a longer duration, resulting in a chronic pathology that may even affect the individual's personality.[29]

According to the DSM-5 classification, PTSD is clinically characterized by avoidance of stimuli reminiscent of the trauma, intrusive thoughts related to the disaster, cognitive and mood changes, as well as constant alertness that makes the person be reactive, all in association with the traumatic events that occurred.[29] PTSD causes clinical discomfort and alters the person's work performance and social relationships.[30]

PSTD and COVID-19

If COVID-19 diagnosis is suspected or confirmed, people may have traumatic psychological symptoms such as experiencing symptoms directly and undergoing invasive treatment (respiratory failure and tracheostomy)[10] or witnessing the suffering, struggle, and death of other patients.[31] People may fear infection, be hospitalized in isolation, and be rejected by medical staff or their friends and family.[32,33] It is likely that having this disease can be compared to a similar burden of that affecting people in any other type of disaster,[34] where the symptoms of PTSD are more frequent in those people who suffered the trauma directly.[4]

Prevalence of PTSD

The prevalence of posttraumatic stress among individuals exposed to COVID-19 varies greatly.[35–39]

The study showing the lowest figures is that of Simani Leilla *et al.*[40] who conducted a study in Iran to determine the prevalence of PTSD six months after discharge in 120 patients who had been hospitalized for COVID-19 between February and April 2020. After being assessed with the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) scale, which is based on the DSM-5 criteria for PTSD, 5.8% of the patients were found to have PTSD symptoms. It is likely that the low prevalence was conditioned by the time that had already passed after the infection at the time of applying the measurement instruments.

Since the start of the pandemic in 2019, several review papers have reported data linking PTSD symptoms to the COVID-19 epidemic. In the meta-analysis by Salehi *et al.*,[35] where 35 studies from November 2015 to May 2020 were included under Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), the prevalence of PTSD-related symptoms during coronavirus outbreaks (SARS, Middle East respiratory syndrome, and COVID-19) was estimated at 18%, and out of every 10 patients who survived COVID-19, three had PTSD-related symptoms.

Another systematic review by Krishnamoorthy *et al.*,[36,38] which includes 50 publications based on the PRISMA model up to April 2020, reported that the prevalence of PTSD during the COVID-19 outbreak ranged from 21.94% to 27.00%.[39]

The systematic review by Cooke *et al.*,[38] which includes 14 studies under the PRISMA guidelines, yielded data where the prevalence of post-traumatic stress for people who were exposed to the COVID-19 epidemic was 26.2%, which was higher than that observed in flood (15.74%) and hurricane (17.81%) survivors,[41,42] and similar to earthquake survivors (23.66%).[43] This may be because natural disasters, such as wildfires or tsunamis, can give people time to adapt, but infectious diseases such as COVID-19 often strike suddenly and unexpectedly, quickly becoming a threat factor that can put people at risk.[43] Therefore, outbreaks of infectious diseases can cause more disturbances in the psyche of people than many natural disasters.

The study that has shown the highest prevalence of PTSD following COVID-19 infection is that conducted by Bo *et al.*[11] at the onset of the pandemic, reporting up to 96.2% of 714 patients with PTSD symptoms assessed using PCL-5. The

researchers believed that the rapid transmission of COVID-19 along with distressing news coverage in widely used communication programs (e.g., WeChat and Weibo) and social discrimination toward patients with COVID-19 may have resulted in a higher prevalence of self-perceived COVID-19-associated posttraumatic stress symptoms in this study.

The perception and coping of COVID-19 may vary depending on where patients are evaluated. There are reports that show a prevalence of PTSD that varies greatly depending on the country where the study was carried out, giving figures ranging from 7% to 53%.[44] This could be due to different circumstances and the idiosyncrasy of each of the countries, such as the way in which their citizens perceive stress, the number of people who fell ill and died from the virus, the effectiveness of health programs, the distribution of information that is not true and is threatening, the handling of the epidemic by the health authorities and the trust of the people in the institutions.

Previous research has made it clear that patients with infectious diseases are often more vulnerable to social discrimination after they are cured,[4] and these experiences may result in increased PTSD symptomatology. PTSD levels in those who have dealt with the trauma of having COVID-19 disease have also been found to be highest immediately after the outbreak (0 to 4 weeks).[43,45,46]

Research papers report a high prevalence of mental illnesses after an outbreak of an infectious disease occurs.[47–49] Generally, psychiatric symptoms lose strength when the epidemic ends, but this is not the same for PTSD symptoms, which can remain present for a long time, generating anxiety and interfering with people's performance of daily life.[50] It is therefore important to consider ongoing surveillance and healthcare policies as a preventive strategy for PTSD in both the short and long term.

Risk Factors

Several risk factors have been identified such as gender, age, and degree of disease complication.[10,13,14] In the systematic review conducted by Qiu *et al.* under PRISMA standards that included 76 articles published up to October 2020, the prevalence of PTSD for people who were in contact with COVID-19 ranged from 23.03% to 34.32%[51] with an average of 28.34%, within a 95% confidence interval, much higher than that of the general population, which lies at 3%–5%. Subjects older than 51 years had more PTSD symptoms (62.16%) compared with those who were aged 18–20 years (2.70%) ($p < 0.001$). A statistically significant difference was observed for post-traumatic stress symptoms according to gender; the results indicated that studies with a higher percentage of male participants (>50%) showed a higher prevalence of PTSD (26.70 vs 41.79%; $Q = 5.31$; $p = 0.021$). Regarding regions where the studies were conducted, prevalence of posttraumatic stress symptoms was similar among people from Europe, America, Eastern Mediterranean, Western Pacific, and Southeast Asia (32.13%, 30.48%, 37.74%, 26.34%, and 17.16%, respectively), with no significant differences. Similarly, the prevalence of posttraumatic stress symptoms among people according to their economic income showed no significant differences (high 30.03%, upper middle 27.6% and lower middle 36.07%). A difference was observed between the studies according to the number of subjects included, therefore the articles with a larger sample size had a lower prevalence of PTSD (20.33 vs. 32.08%; $Q = 6.61$; $p = 0.010$).

Overall, the risk factors associated with the occurrence of PTSD following COVID-19 infection continue to vary widely. In the study by Lahav,[10] 976 adults in Israel were included, who were administered the PCL-5 scale for PTSD based on DSM-5 via online.[52] Most participants reported experiencing at least one PTSD symptom related to COVID-19 (76.7%). Being younger, female, not being in a formal relationship, belonging to a high-risk group, being diagnosed with the illness, living alone during the outbreak, having a close person in a high-risk group, and negative self-evaluation of their health status were associated with higher distress. An interesting finding of this study was that 90.2% of people who had prior exposure to previous trauma had a higher prevalence of PTSD.

Liu *et al.*[13] conducted a study on 675 patients discharged for COVID-19 who had to remain in quarantine for 28 days once they left Wuham Hospital and who were administered the online PCL-5 during their isolation period. Approximately 12.4% were diagnosed with PTSD and the COVID-19 symptoms that were associated with PTSD presented with cough, fatigue, and chronic chest pain ($p < 0.05$), corticosteroid treatment ($p = 0.016$), and severity of illness along with perceived stigma ($p < 0.001$). Other factors found to be associated with PTSD were living with children (OR: 6.71; $p < 0.001$) and a family member having died from coronavirus (OR: 7.05; $p = 0.005$). Sleeping problems, intrusive thoughts, feeling distant or isolated from people, and an inability to concentrate were the most prevalent PTSD symptoms due to COVID-19.

On the other hand, Cai *et al.*,[14] included in their study a total of 126 COVID-19 surviving patients from Senzhen Hospital, who were quarantined for 14 days after hospital discharge and who were evaluated with the PTSD-22 scale online. The prevalence of PTSD was 31% with a predominance of intrusive thoughts in 41.2% and avoidance in 27.7%. They found higher rates of PTSD among patients younger than 60 years ($p = 0.04$), those who were not retired ($p = 0.005$) and those

who were female (p = 0.032). Subjects who reported good social support were likely to have lower PTSD scores than those who reported poor social support (p = 0.002). The presence of infected family members or close relatives was significantly related to PTSD (p = 0.033) as was physical distress following COVID-19 infection (p = 0.045).

The study by Bonsaksen T *et al.*[53] is one that provides more information. It was conducted in Norway between April and May 2020 by means of a nationwide survey on social networks (Facebook, Twitter, LinkedIn and Instagram), which included 4527 subjects over 18 years and without any exclusion criteria, aimed to examine posttraumatic stress reactions due to COVID-19, the prevalence of PTSD and factors associated with posttraumatic stress during the early stages of the COVID-19 outbreak by means of the PCL-5 scale. The prevalence of PTSD was 12.5% for males and 19.5% for females. PTSD was associated with younger age ($p < 0.001$), female gender ($p < 0.001$), lack of social support ($p < 0.001$) and a group of pandemic-related variables, such as economic concerns (OR: 2.23, $p < 0.001$), expectation of financial loss (OR: 1.39; $p < 0.01$), having been in quarantine or isolation (OR: 1.31; $p < 0.01$), being at high risk of complications from COVID-19 infection (OR: 1.77; p < 0,001) and worrying about family and close friends (OR: 1.83; $p < 0.001$).

Another study by Eivink G *et al.*,[54] also in a Norwegian population, included subjects discharged before June 1, 2020; it determined the prevalence and risk factors for PTSD among patients who were hospitalized (n=125) and non-hospitalized (n=458) for COVID-19 and who had a positive polymerase chain reaction test for severe acute respiratory syndrome. They were invited to answer the PCL-5 for PTSD electronically or on paper four to eight weeks after discharge and receive a clinic visit at approximately 3 months. Hospitalized patients had higher rate of asthma, diabetes, hypertension, dyspnea, and fever than non-hospitalized patients. PTSD was present in 9.5% of hospitalized patients and 7% of non-hospitalized patients. The disease was more predominant in women, even though no significant differences were found, and PCL-5 score was higher in hospitalized than in non-hospitalized patients (p=0.042). Female sex, being born outside Norway, living alone, and having dyspnea during COVID-19 were associated with higher PCL-5 scores, whereas being hospitalized by COVID-19 was not.

PTSD is a disease that can manifest at a later stage and not necessarily at the time of hospital discharge. A study conducted in Italy by Tarsitani Lorenzo *et al.*,[55] whose aim was to determine the prevalence of PTSD three months after discharge in patients who had survived COVID-19, showed that of 115 subjects included, 10.4% had a diagnosis of PTSD based on the PCL-5 scale. Body mass index greater than 30 (OR:3.51; P=0.03), male sex (P=0.007), having a previous psychiatric diagnosis (OR: 6.30; P<0.001) and suffering from any chronic respiratory disease (OR: 6.03; P=0.053), were the main risk factors.

Age is a relevant factor that should be considered when it comes to applying preventive measures against PTSD. It has been found that the prevalence of PTSD in older adult survivors of road traffic accidents is significantly higher than that of younger people.[56] The finding that young people are more likely to have symptoms of PTSD is described in several studies from China,[14] but others have found different results.[57] However, it is likely that depending on the situation, old age could be a factor that favors facing problems related to death, presenting with less depression[58] and anxiety[59] among older people. Based on these findings, primary care physicians should be more attentive to early symptoms of trauma among older patients with COVID-19 and implement rapid psychological interventions. Similarly, in this type of accident, women are more likely to develop PTSD.[56] However, in the case of COVID-19 infection, some studies have associated men with a higher prevalence of PTSD during the pandemic. It is possible that this is due to the fact that men and older people are more likely to get sick with COVID-19 and have a higher mortality rate,[60] and therefore experience increased severity when exposed to trauma.

The finding that young people are more likely to have symptoms of PTSD is described in several studies from China,[14] but others have found different results.[57] However, it is likely that depending on the situation, old age could be a factor that favors facing problems related to death, presenting with less depression[58] and anxiety[59] among older people.

Risk factors for PTSD in COVID-19 survivors are not exclusively generated by the fear of dying or the severity of the illness; they may be triggered by other circumstances. It should be remembered that people were encouraged to take refuge at home, and that educational institutions at all levels stopped working in person, as did as businesses that offered personalized treatment, and tourism, concerts and theater were also affected. This resulted in the economic failure of many companies, wo were forced to lay off their workers.[61] Thus, the pandemic and the measures to combat it have raised concerns about public mental health, which can be considered a factor associated with PTSD and other anxiety disorders.[62–66]

Therefore, quarantine and isolation have also been associated with PTSD.[67,68] Isolation triggers negative ideas and thoughts about the disease, and the misfortune it can cause in people, which can result in an increase in post-traumatic

stress.[69] All the limitations of social interaction also interfere with basic support measures between family members and friends, who are essential to counteract post-traumatic stress reactions.[70]

Conclusions

Studies show that prevalence of PTSD in patients surviving coronavirus infection can vary from 5.8% to 96.2% depending on different factors involved in the methodology of each study. However, an average of around 30% could be considered. What all authors do agree on is that it tends to be higher than in the general population, and even in people who have been victims of natural disasters.

The risk factors are not very clear either since the results of the studies show contradictory aspects. However, in most of them the following risk factors have been established: lack of social support, living alone, being young, being a woman, and facing a series of problems directly related to the coronavirus outbreak, such as economic concerns, fear of infecting family and friends and perceiving oneself as being at high risk. In the same way, a history of mental illness has also been described as an important risk factor.

Knowledge of the prevalence of PTSD and triggering factors is important information to consider for the implementation of prevention strategies both at the beginning and at the end of the infection by COVID-19, and therefore try to avoid or reduce the subsequent development of this mental illness, especially when at the present time government agencies worldwide are echoing the importance of psychological health in citizens with major proposals during the coronavirus pandemic.

Data Availability

No data are associated with this article.

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