

Psychological effects of the COVID-19 pandemic – what do we know about them?

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Abstract. – The coronavirus disease 2019 (COVID-19) pandemic was a shock to the whole world. This pandemic caused not only many deaths of people of all ages and health effects that are still difficult to assess, but also economic, and psychological ones. Numerous studies have shown that chronic stress related to social isolation and fear of contagion increased the rates of development of anxiety, depression syndrome, emotional eating, and posttraumatic stress disorder (PTSD). The increased rate of substance use and antidepressant drugs has also been observed. Depression is included in the symptoms of long-COVID syndrome. The data on the deterioration of mental states of children and adolescents during the COVID-19 pandemic are particularly worrying. Some studies have shown increased suicide rates during and after the COVID-19 pandemic. The deterioration of mental health can also have long-term consequences in terms of physical health, for example, emotional eating (EE) associated with depressed mood and anxiety may increase the incidence of binge eating disorder (BED) and addictive eating. Consequently, the number of patients with overweight and obesity and its complications will increase. Problems related to the deterioration of the mental and physical health of the population will increase the burden on the healthcare system. Another important problem is psychological disturbances related to the COVID-19 pandemic developed in healthcare workers. It is necessary to take systemic actions aimed at improving mental health, although it will not be easy in the era of the general global economic crisis, which may deepen the psychological problems from the time of the pandemic. Therefore, the aim of our manuscript is to analyze the available data on the psychological effects of the COVID-19 pandemic on the general population and healthcare workers.

Key Words:

Depression, Anxiety, Posttraumatic stress disorder, Emotional eating, Substance use, COVID-19 pandemic.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic was a shock to the whole world. Humanity has not encountered a global pandemic for 100 years since the Spanish flu epidemic occurred. The rate of the spread of infections around the world has been rapid due to the ease of movement in short periods of time between remote locations. The lack of a vaccine and effective drugs for SARS-CoV-2 infection made it necessary to use methods known for centuries, such as quarantine and isolation. In 2020, many day-to-day restrictions were introduced, including travel bans and lockdowns. The speed of the restrictions introduced changed people's daily lives, leaving no room for acclimatization to these changes¹⁻⁴. People lost the possibility of direct daily contact with family and friends. The daily number of cases and deaths due to COVID-19 reported in the media and the lack of known drugs caused fear of infection to self and loved ones. Moreover, due to the lockdown, many people found themselves in a difficult financial situation, losing their source of income, and others were afraid that they would lose their jobs. Furthermore, children and young people had to get used to remote learning, and many people to remote work. In addition, everyone was concerned about the future and how the world would function after the COVID-19 pandemic. All these factors contributed to the deterioration of the mental health of the general population⁵⁻⁸. In addition, many people who have been quarantined and contracted COVID-19 developed post-traumatic stress disorder (PTSD) symptoms^{9,10}.

It should also be noted that an important problem that may cause the failure of healthcare systems

is also the psychological effects of the COVID-19 pandemic on healthcare workers, including PTSD.

The current data indicates that we will struggle with the effects of the COVID-19 pandemic in the form of deterioration of mental and physical health for many years to come. Currently, the psychological problems that occurred during the COVID-19 pandemic may be exacerbated by factors related to the economic crisis.

Thus, the purpose of this review was to summarize available data describing the relationships between the effects of the COVID-19 pandemic on mental health. Moreover, we analyzed the impact of psychological problems on physical health, and we described the possibility of taking preventive measures.

Methods

Search Strategy

PubMed, Embase, Cochrane, and Web of Science databases were searched for related studies to 06 January 2023. A text search with the following keywords singly or in combination was conducted: 'Chronic stress', 'Psychological disturbances', 'Depression', 'Anxiety', 'Mental health', 'Post-traumatic stress disorder', 'Substance use', 'Quarantine', 'Lockdown', 'SARS-CoV-2 infection', 'the COVID-19 pandemic'. The final search results were exported into EndNote, and duplicates were removed. The detailed search strategy is shown in Figure 1.

Inclusion and Exclusion Criteria

Accepted studies met the following criteria: (1) analysis of psychological disturbances and or mental health during the COVID-19 pandemic, (2) articles published in English, (3) studies involving human participants, (4) studies including single measurements, longitudinal studies, and meta-analysis. Papers were excluded if they did not fit into the conceptual framework of the study. Studies including patients with a mental illness prior to the COVID-19 pandemic were also excluded.

Data Extraction

Data extraction was conducted with the following information: (1) name of the first author, (2) publication year, (3) country, (4) study design, (5) sample size, (6) psychological disturbances assessment, (7) mental health assessment. Because the research conducted during the COVID-19

pandemic was quickly published and our manuscript is a narrative review, the quality of the research was not assessed as a meta-analysis.

The Relationships between Anxiety and Depression and the COVID-19 Pandemic in the General Population

The concept of fear is defined in various ways. Anxiety is usually assumed to be a feeling of general uncertainty in the face of an undefined threat, and as such, differs from fear, the feeling that arises when the threat is real, arising from specific situations. Long-term states of anxiety are maladaptive for human beings, disorganize action, block development, and distort personality, which at high intensity can lead to neuroses¹¹.

Depression is a disease characterized by alterations in regulators of mood, behavior, and affection¹². The review¹³ of eight studies assessed the psychological effect of the quarantine and demonstrated the development of anxiety in 35.1% and depression in 16.9% of the study subjects. While the meta-analysis¹⁴ of 17 studies, including 63,439 participants, performed during the first lockdown period in the general population found anxiety occurrence in 31.9% (95% CI: 27.5-36.7) and in 14 studies including 44,531 subjects, depression occurrence was found in 33.7% (95% CI: 27.5-40.6)¹⁴. In another meta-analysis¹⁵ of 66 studies including 221,970 subjects, the prevalence of anxiety and depression were similar (31.9% and 31.4%, respectively). A slightly lower frequency of anxiety and depression was shown in a systemic review and meta-analysis of 18 studies published from 2019 to March 2021 [27.77% (95% CI: 24.47-31.32) and 26.93% (95% CI: 23.92-30.17), respectively]¹⁶ and in another meta-analysis¹⁷ of 107 studies published from January 2000 to July 2020 (26.9% and 28.0%, respectively). It should be noted that the prevalence of both anxiety and depression was higher in low-/middle-income countries¹⁸. Of interest, a meta-analysis¹⁹ of 38 studies including 8,587 respondents after SARS-CoV-2 infection found a lower frequency of anxiety and a higher frequency of depression [16.6% (95% CI: 10.1-23.1) and 37.7% (95% CI: 29.3-46.2), respectively]. Moreover, the data from 204 countries tabulated by the COVID-19 Mental Disorders collaborators²⁰ revealed that in 2020, the occurrence of major depressive disorders increased globally to 27.6% and anxiety to 25.6%. The main risk factors for the development

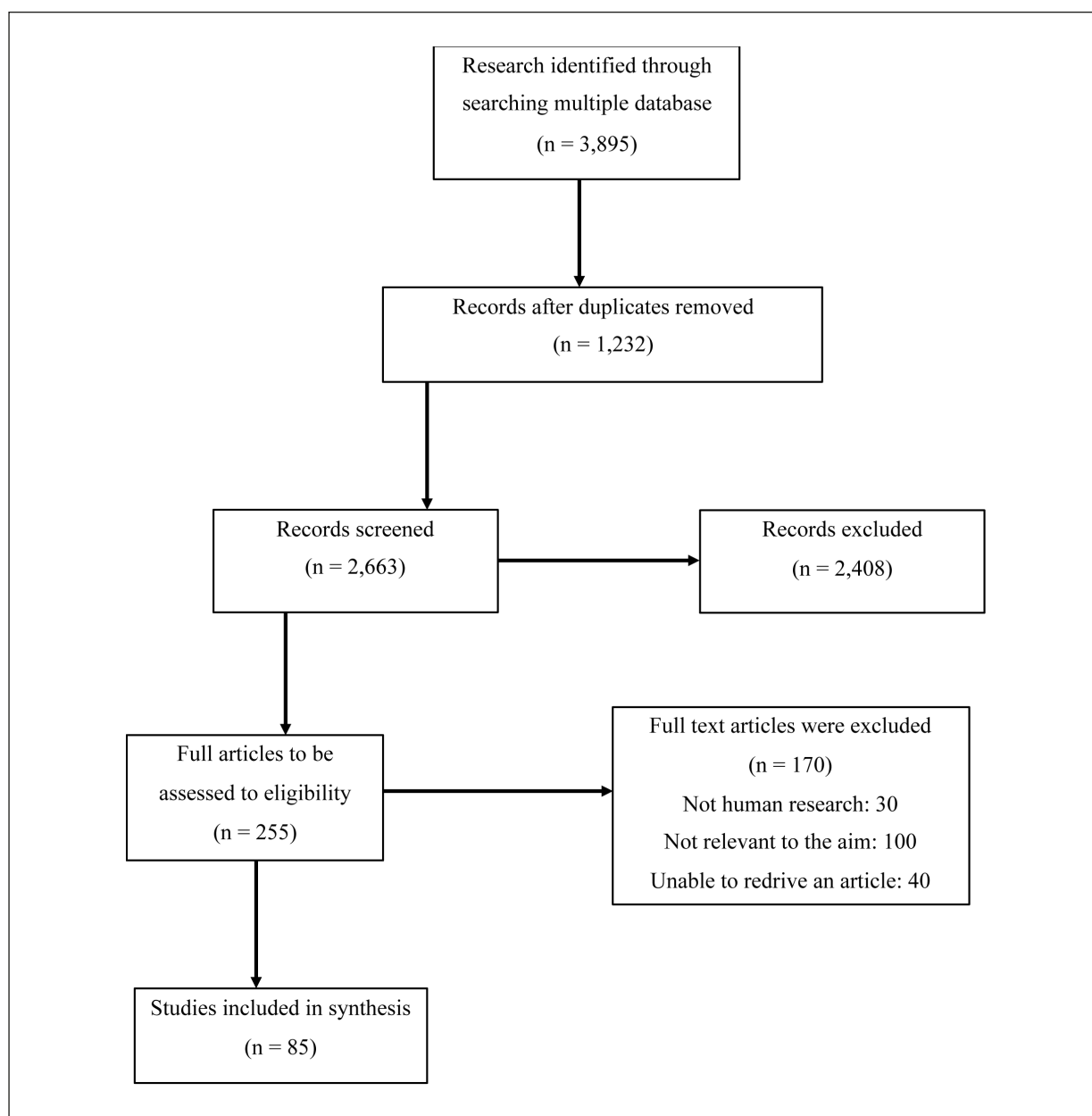


Figure 1. Flow chart of the selection of sources.

of anxiety and depression were female sex, lower income, preexisting medical conditions, perceived risk of infection, exhibiting COVID-19-like symptoms, social media use, financial stress, and loneliness²¹.

Particular attention should be paid to the data on the mental health of children and adolescents. The meta-analysis²² of 15 studies performed during the first wave of the COVID-19 pandemic, including 22,996 children and adolescents, found the occurrence of anxiety at 34.5% and depression at 41.7%. Of interest, factors related

to the COVID-19 pandemic and lockdown contributed to 48% of suicides during the lockdown in England in an adolescent cohort²³. A recently published meta-analysis²⁴ of 19 studies, including 35,543 children and adolescents from 9 countries, demonstrated that the prevalence of anxiety increased from 17.6% to 43.7% (data from 12 studies), depression from 6.3% to 71.5% (data from 10 studies), and suicidal ideation from 29.7% to 31.3% (data from 2 Chinese studies).

In summary, the data from different countries show that during the COVID-19 pandemic, every

fourth surveyed person demonstrated symptoms of anxiety and depression. To assess the trend of changes over time, it would be necessary to study the same groups, which is unlikely because most of the research was conducted anonymously online. However, the data to date indicates the need for widespread screening for anxiety and depression; for the purpose of undertaking therapeutic measures.

The Relationships between Emotional Eating (EE) and the COVID-19 Pandemic in the General Population

The relationships between mental health and EE during the COVID-19 pandemic were analyzed in the previously published systemic review²⁵ performed by a member of our team. Emotional eating is the propensity to eat in response to emotion and not physical needs. EE is frequent, but not an effective method used to regulate affects and can lead to the development of addictive eating²⁶.

Three major categories of the effect of the COVID-19 pandemic on the development of EE include: (1) increase weight and shape concerns, adverse life-style changes, deprivation of social support, and adaptive coping strategies; (2) fear and anxiety related to media information about the pandemic; (3) health concerns, stress, and negative effects²⁷.

Studies²⁸⁻³⁰ performed during the COVID-19 pandemic demonstrated the incidence of EE increased from 40.4% to 75.7% of respondents and a higher prevalence of EE and binge eating disorders during lockdown than when restrictions were lifted. EE was associated with depression, anxiety, quality of relationships, quality of life, and alexithymia^{31,32}. Furthermore, higher EE during lockdown was related to higher maladaptive coping strategies and COVID-19-related stress^{33,34}. EE related to psychological distress and emotional dysregulation was also observed during the quarantine and the second in the wave of the COVID-19 pandemic^{35,36}. Moreover, it has also been shown³⁷ that the severity of EE was related to social media exposure, neuroticism, and anxiety. A very unfavorable phenomenon observed³⁸ during the COVID-19 pandemic was frequently rewarding children with food, especially by mothers with uncontrolled eating. EE is an ineffective strategy for coping with stress, which in connection with consuming high-energy snacks to stimulate the reward system,

increases the risk of developing overweight and obesity. Thus, the COVID-19 pandemic in the future may be a cause of escalation of the obesity pandemic and its complications²⁵.

The Relationships between Posttraumatic Stress Disorder (PTSD) and the COVID-19 Pandemic in the General Population

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defined PTSD as a disorder including a characteristic set of symptoms developing in a person who directly experienced a traumatic event. The symptoms of PTSD are categorized into four clusters: intrusion/re-experiencing symptoms (recurrent and intrusive memories, images, thoughts, distressing dreams, dissociative reactions such as flashbacks, strong emotional and physical reactions to causes that resemble or symbolize an aspect of the trauma), avoidance symptoms (efforts to avoid thoughts, feelings, conversation or activities, places or people connected to trauma), negative cognitions and mood (amnesia for an important aspect of the trauma, a persistent and distorted sense of blame of self or others, persistent negative emotional state (e.g. fear, horror, guilt, shame), inability to experience positive emotions, feelings detachment or estrangement from others, markedly diminished interest in activities), and symptoms of hyperarousal, (increased anxiety, sleep difficulties, poor concentration, increased irritability, outbursts of anger, reckless or self-destructive behavior, hypervigilance, exaggerated startle response)¹². Three groups of risk factors for PTSD have been selected: pre-trauma factors (lower socioeconomic status, parental neglect, personal or family psychiatric disease, female sex, poor social support), peri-trauma stress (severity, intensity, frequency, and duration of trauma, initial severity of a person's reaction to trauma, unpredictability and uncontrollability of the trauma), and post-trauma factors (lack of social support, life stress, failure for early identification and treatment)³⁹. The COVID-19 pandemic was associated with numerous risk factors, especially among people infected with the SARS-CoV-2, people who had a loved one seriously ill or died due to SARS-CoV-2 infection, persons quarantined, and healthcare workers. Thus, we analyzed data describing the occurrence of PTSD and its risk factors related to the COVID-19 pandemic.

From the beginning of the COVID-19 pandemic, based on data from the SARS and MERS epidemics, recommendations for diagnosing PTSD in people after COVID-19 have been developed, especially for those who had been hospitalized in the ICU, were intubated and mechanically ventilated, and/or experienced delirium. It was also noted⁴⁰ that PTSD may account for some or all of the patient's subjective cognitive complaints and neuropsychological test performance. The meta-analysis⁴¹ of 136 studies, including 189,159 subjects from 15 countries (most of the studies came from China), demonstrated that the pooled prevalence of PTSD was 21.94% (95% CI: 9.37-43.31). While the study⁴², including 180 French patients with COVID-19, demonstrated the occurrence of PTSD to be 6.5%, and predictive factors were psychological distress at the onset of the illness and hospitalization in the ICU. Of interest, the study⁴³ performed in the first month of the COVID-19 pandemic among 570 Chinese adolescents and young adults demonstrated the occurrence of the symptoms of PTSD in 12.8% of participants, and a mediating factor was negative coping style with stress. A similar frequency of PTSD was observed in Norwegian men (12.5%), while in women, a higher frequency was found (19.5%) during the early stage of the COVID-19 pandemic. In this study⁴⁴, the risk factors of PTSD were younger age, female sex, the lack of social support, and a range of pandemic-related variables, including economic concerns, expectant economic loss, having been in quarantine and isolation, being at high risk for complications from COVID-19 infection, and having concern for family and close friends. The highest frequency of PTSD, 20.3%, was found among Korean patients after hospitalization due to COVID-19⁴⁵. While, among Italian patients with COVID-19 three months after discharge from the hospital, PTSD was diagnosed in 10.4% and subthreshold PTSD in 8.6%⁴⁶. However, another Italian study⁴⁷ assessed PTSD trajectories the year after hospitalization due to COVID-19 and found a 1-year PTSD period prevalence in 23.9%, with the peak at the 6th month, and in 11.0%, chronic PTSD was diagnosed. The pre- and post-hospitalization factors that influenced the onset and course of PTSD were working status, perception of threat to life, and the lack of social support. Of interest, the factors associated with PTSD following COVID-19 were obesity, pulmonary disease, and family cluster infection. Protective factors were clinical interventions, older age, and

male sex. In addition, in the meta-analysis⁴⁸ of 13 studies, including 1,093 survivors of severe COVID-19 infections, the prevalence of PTSD was estimated to be 16.0% (95% CI: 9%-23%). There is also a study⁴⁹ that assessed the occurrence of PTSD symptoms in family members of patients with COVID-19. This study⁴⁹ demonstrated significant symptoms in 63.6% at 3 -months and 32.9% at one year. During observations, three clusters of symptom evolution emerged over time: persistent symptoms (34.8%), recovered symptoms (33.0%), and non-development symptoms (32.2%).

In the general Italian population, PTSD symptomatology occurred in 29.5%⁵⁰. Furthermore, another Italian study⁵¹ demonstrated the occurrence of significant posttraumatic stress symptoms in 20.0% of participants. While the occurrence of PTSD in the general Chinese population was 33.9% and was associated with more somatic symptoms, lower self-efficacy, higher perceived risk of infection, fear of infection, and self-rated more negative influence due to the epidemic⁵². In contrast, the meta-analysis⁴¹ of 55 studies, including 189,159 participants, found the prevalence of PTSD at 21.94% (95% CI: 9.37-43.31%). In addition, a Lebanese study⁵³ demonstrated a significant increase in the frequency of the symptoms of PTSD from the second to fourth week of quarantine.

In summary, PTSD was a frequent effect of the COVID-19 pandemic. Special attention should be paid to the studies that evaluate persistent PTSD symptoms because it can be one of the very important factors in the deterioration of the physical health of the population. Screening tests for PTSD should be carried out universally.

Substance Use during the COVID-19 Pandemic

Substance use can be a strategy for coping with stress. As shown above, the COVID-19 pandemic has created a heavy burden of stress. Therefore, we analyzed data describing substance use during the COVID-19 pandemic.

A German online survey⁵⁴, including 2,369 participants, performed during the first COVID-19 lockdown found increased alcohol use in 28.5%, tobacco products use in 28.8%, and THC-containing products use in 20.6%. These subjects also reported more depressive symptoms and anxiety. In addition, subjects reported increased consumption of alcohol or nicotine, frequently experienced loneliness and suicidal thoughts

and were more stressed by social isolation. In turn, an online epidemiological study⁵⁵ including 36,538 adults from 21 European countries performed during the first wave of the pandemic found an overall decrease in alcohol use mainly associated with a reduction of heavy episodic drinking consumption. Among people with severe alcohol use, the consumption of alcohol increased. However, the use of cannabis, nicotine, and cocaine had increased, but the use of ecstasy decreased. Similar data was revealed by the results of an online survey⁵⁶ including 1,346 responders from 83 countries that demonstrated that overall drinking behaviors decreased during quarantine and 36% of respondents increased alcohol use. The respondents with increased alcohol use were older, had children, belonged to essential workers, had a personal relationship with someone severely ill from COVID-19, and had higher levels of depression, anxiety, and positive urgency impulsivity. Moreover, the in-country analysis found increased alcohol consumption in the UK during quarantine. In addition, a meta-analysis⁵⁷ of 45 studies, including 366,798 respondents from 17 countries, found overall trends towards increased alcohol consumption and clear trends of increased use of other substances during the COVID-19 pandemic related to the deterioration of mental health.

The analysis⁵⁸ of wastewater samples from Athens, Greece, revealed increased use by 67% of cocaine, and 350% of amphetamine, with a 37% decreased use of methamphetamine and a 38% decrease in MDMA during the first lockdown compared to the corresponding period of the previous year. It should be noted that restrictions related to the COVID-19 pandemic have significantly reduced access to drug trafficking on the streets, and consumers got them by dark web or messaging applications⁵⁹. Moreover, the paucity of classic drugs induced addicts to misuse psychoactive prescription drugs such as benzodiazepines⁶⁰. Furthermore, during the three months of 2020, an increase in online cannabis product sales was found⁶¹. In addition, a Canadian study⁶² including 1,054 adolescents found a decreased use of most other substances and an increase in both alcohol and cannabis consumption. Of interest, a study⁶³ assessed substance use among a population-representative sample of 3,075 American and Canadian adults and demonstrated an increase in alcohol and drug use related to both COVID-19-related traumatic stress symptoms and the tendency to disregard social distancing. In turn, an online one-year longitudinal survey study⁶⁴ including

8,308 adults, representative of the US population demonstrated higher substance use among Hispanic or Black, younger in age, unemployed, below the federal poverty line, people with lower education level, and single during the first year of the COVID-19 pandemic. Of interest, a Brazilian study⁶⁵, including 12,086 health professionals, demonstrated an increased use of psychoactive substances, 17.8% use of tobacco, 69.0% of alcoholic beverages, and 17.1% hypnotic or sedative.

Particular attention should be paid to the UK study⁶⁶ assessing the impact of the COVID-19 pandemic on the use of psychoactive substances by adolescents and young adults. The study included 1,068 adolescents aged 14-18 years, and demonstrated a decreased alcohol and cannabis use, and binge drinking, during the first lockdown, a significant increase after the lockdown, and a lack of significant changes during the second stay-at-home period. A particular uptrend was observed for e-cigarette use. A study⁶⁷, including 1,008 young adults aged 18-35 years from the USA, found that 30% of respondents disclosed harmful levels of drinking, and 22% reported using drugs. Moreover, respondents reported a significant increase in depressive symptoms, moderate to severe anxiety, and substance use symptoms since the first wave of the COVID-19 pandemic. Another American study⁶⁸ involving 1,188 adolescents demonstrated that adolescents who did not restrict their social activity had fewer symptoms of depression but were substantially more likely to report using a variety of substances. The negative change in financial situation was associated with increased alcohol use. In turn, a multicenter, longitudinal, survey study⁶⁹ including 7,842 early adolescents aged 10-15 years at 21 centers across the USA, in the 6 months since the first wave passed, demonstrated that 30-day substance use remained stable and was primarily episodic. While fewer respondents were using alcohol, and more were using nicotine or misusing prescription drugs. The risk factors for increased substance use were higher stress related to the COVID-19 pandemic, experiencing material difficulties by the family, alcohol or drug use by parents, and experiencing greater depression and anxiety. Engagement in social distancing and worry about COVID-19 infection were unrelated to substance use.

In summary, studies conducted during the pandemic indicate that changes related to addiction to psychoactive substances should be monitored.

It is currently difficult to assess what trends will occur in the coming years, but a worse mental state of societies resulting from the COVID-19 pandemic and the current economic crisis may cause an increase in people addicted to alcohol, traditional drugs, synthetic drugs, and psychotropic drugs, including benzodiazepines.

The Effect of COVID-19 Pandemic on Psychological Disturbances in Healthcare Workers

The development of mental health problems in frontline and non-frontline healthcare workers was observed⁷⁰ during the SARS and MERS epidemics. Furthermore, mental health problems, including symptoms of PTSD, burnout, depression, and anxiety related to occupational activities, were reported⁷¹⁻⁷³ by healthcare workers during and up until years after the epidemics. The scope of these outbreaks was limited, and never in modern times, has health care around the world faced such a challenge as the COVID-19 pandemic. The scale of infections and the severity of the course in many patients resulted in the need for many hours of staff work, and sometimes a sense of helplessness due to the lack of equipment and effective drugs, as well as fear for one's own health and life, and isolation from the family so as not to pose a threat. All of this could have had a significant impact on the mental health of healthcare workers. Therefore, from the beginning of the pandemic, research was carried out to assess the occurrence of psychological problems in healthcare workers, the factors influencing their formation, and the assistance provided to them in this regard.

Numerous studies were conducted during the first wave of the pandemic and in 2020 the first meta-analysis was published. The meta-analysis⁷⁴ of 13 studies including 33,062 participants showed the prevalence of anxiety in 23.2% (data from 12 studies) and depression (data from 10 studies) in 22.8%, and insomnia (data from 5 studies) in 38.9%. Female sex and being a nurse were the risk factors of the development of psychological problems. The next meta-analysis⁷⁵ of 59 studies, including 55,707 participants (most of the Republic of China 44,540 participants), from 34 separate countries demonstrated a varied prevalence of anxiety range from 9% to 90% with a median of 24% (data from 22 studies), depression ranged from 5% to 51% with a median of 21% (data from 19 studies), sleep problems from

34% to 65% with a median of 37% (data from 6 studies) and distress from 7% to 97% with a median of 37% (data from 13 studies). Exposure to patients with COVID-19, female sex, worry about being infected (data from 22 studies), and worrying about family members being infected (data from 3 studies) were the most common risks factor for the development of mental health problems. While the most common factor that reduced the risk of mental health problems was having social support. Another meta-analysis⁷⁶ of 65 studies, including 97,333 healthcare workers, from 21 countries, revealed the prevalence of moderate depression at 21.7% (95% CI: 18.3-25.2%), anxiety at 22.1% (95% CI: 18.2-26.3%) and PTSD at 21.5% (95% CI: 10.5-34.9%). Moreover, the meta-analysis⁷⁷ of 38 studies, including 53,784 participants (75% women, 27.9% doctors, 43.7% nurses) from 20 countries, demonstrated an estimated prevalence of anxiety 40% (95% CI: 29-52%) (data from 34 studies), depression 37% (95% CI: 29-45%) (data from 30 studies), distress 37% (95% CI: 25-50%) (data from 10 studies) and PTSD 49% (95% CI: 22-75%) (data from 7 studies). Furthermore, in the meta-analysis⁷⁸ of 70 studies, including 101,017 participants, from 23 countries, the estimated prevalence of anxiety was 30.0% (95% CI: 24.2-37.05%); depression 31.1% (95% CI: 25.7-36.8%); acute stress 56.5% (95% CI: 30.6-80.5%); PTSD 20.2% (95% CI: 9.9-33.0%) and sleep disturbances 44.0% (95% CI: 24.6-64.5%). Recently published meta-analyses⁷⁹ demonstrated similar results. The meta-analysis of 239 studies, including 271,319 healthcare workers (67% women), demonstrated the occurrence of depression symptoms to be 33% (95% CI: 28-38%) of participants exposed to COVID-19, anxiety features in 42% (95% CI: 35-48%), acute stress in 40% (95% CI: 32-47%), PTSD in 32% (95% CI: 26-37%), insomnia in 42% (95% CI: 36-48%), and burnout in 37% (95% CI: 31-42%). It should be noted that another recently performed meta-analysis⁸⁰ of 44 meta-analyses from 1,298 individual studies, including 1,491,439 participants (hospital staff), assessing 16 mental health symptoms, demonstrated the overall prevalence of anxiety in 29.9% (95% CI: 27.1-32.7%) (data from 32 meta-analyses including 838 individual primary studies), depression in 28.4% (95% CI: 25.5-31.3%) (data from 30 meta-analyses including 696 individual primary studies), insomnia and sleep problems in 40% (95% CI: 36.9-42.0%) (data from 26 meta-analyses including 261 individual primary studies), distress in 34.59%

(95% CI: 23.04-46.14%) (data from 9 meta-analyses including 56 individual primary studies), the overall prevalence of stress in 44.30% (95% CI: 37.92-50.69%) (data from 13 meta-analyses including 156 individual primary studies) and PTSD in 18.75% (95% CI: 13.92-23.57%). The prevalence of sleep problems and symptoms of anxiety and depression was higher in nurses than doctors, while acute stress and PTSD were frequent among doctors. Female sex was associated with a higher risk of anxiety, depression, and sleep disorders. In addition, the survey study⁸¹ performed during the second year of the COVID-19 pandemic among 984 healthcare workers demonstrated an occurrence of depression at 22.5%, anxiety at 14%, and PTSD at 20.4%, and had a higher prevalence among paramedics and nurses. The moderate-severe burnout was reported by 65.1% of participants. In turn, a recently published meta-analysis⁸² of 26 studies investigating depression in 31,447 doctors, and 30 studies on anxiety including 33,281 doctors, demonstrated their prevalence in 20.5% (95% CI: 16.0-15.3%) and in 25.8% (95% CI: 20.4-31.5%), respectively.

The above data demonstrated that the COVID-19 pandemic had a significant impact on the mental health of healthcare workers. All mental health issues affecting healthcare workers are important, but PTSD can contribute to long-term consequences, especially burnout, so we took a closer look at the research on this disorder. A study⁸³ performed during the second wave of the COVID-19 pandemic, including 852 participants (63% males), demonstrated that healthcare workers with subthreshold post-traumatic stress symptoms experienced greater physical health symptoms (88%) and sleep problems (36%) than those without these symptoms. Thus, even the subliminal symptoms of post-traumatic stress require recognition and intervention. Another study⁸⁴ from the USA found that factors such as the negative impact on family, fear of infecting others, and work-related concerns increased the risk of the development of PTSD and related burnout with work and interpersonal difficulties. The COVID-19 pandemic had a negative impact on families, fear of infecting others, and work-related concerns. Of interest, a Canadian study⁸⁵ demonstrated that during a one-year observation, the prevalence of burnout and anxiety had not changed (52% vs. 51% and 23% vs. 23%, respectively). At the same time, the frequency of PTSD and depression decreased significantly (23% vs. 11%, $p < 0.0001$ and 11% vs. 6%, $p = 0.001$,

respectively). The protective factor of social support emerged. Opposing results were obtained in a Chinese study⁸⁶ that demonstrated an increased prevalence of PTSD during the one-year follow-up in front-line healthcare workers.

The meta-analysis⁸⁷ of 34 studies, including 24,541 participants (25.2% physicians, 42.8% nurses, 12.4% allied health professionals, 8.9% auxiliary health professionals, and 10.8% others), demonstrated the prevalence of PTSD symptoms in 34% (95% CI: 30-29%) and severe PTSD in 14% (95% CI: 11-17%). The factor associated with a sharp decline in the prevalence of PTSD was the introduction of COVID vaccines, with new virus variants being associated with a small increase in PTSD.

Few studies analyzed the effects of support programs on the mental health of healthcare workers. A narrative review⁸⁸ included 31 studies that demonstrated that most programs offered one or more interventions, including expanded basic need resources/services, additional workplace training programs, and/or expanded psychological support programs, such as peer support programs, psychoeducational, or counseling services. However, there is currently no data evaluating the long-term effects of these activities.

In summary, the mental health of healthcare workers after the COVID-19 pandemic should be one of the top public health priorities in the world. People with PTSD and burnout will not be able to perform their duties properly, and many of them may resign from the healthcare professions, which can lead to the failure of healthcare systems. No country can afford this in the face of the challenges that healthcare will face in the coming years, resulting from the deterioration of the mental and physical health of societies.

The Links Between Deterioration of Mental and Physical Health of the Population

EE is the risk factor for obesity development or exacerbation. Depression and anxiety promote sedentary behavior and coping with stress by using food, drink, smoking, and substance use. All these substances stimulate the release of dopamine and endogenous opioids in the reward system and temporarily improve mood. It should be noted that the repetition of such behavior results in the development of addictions⁸⁹.

A meta-analysis study⁹⁰ performed during different times of the COVID-19 pandemic found

that weight gain rose from 11.1% to 72.4% of respondents. The exacerbation of obesity (mean weight gain 5.6 kg) had also been found in 60% of Canadian patients treated conservatively with obesity⁹¹, and in 86% of Spanish patients over a year after bariatric surgery (mean 2.1 kg)⁹². In both these groups, the main cause of weight gain was EE. Obesity, smoking, drinking, and several drugs are known risk factors for cardiovascular diseases (CVD).

PTSD is known as an independent risk factor for acute cardiac events and stroke⁹³. The meta-analysis⁹⁴ of 401,712 cases of PTSD demonstrated that PTSD is associated with a 53% increased risk for incidental cardiac events or cardiac-specific mortality after adjustment for demographic, clinical, and psychological factors, and even after adjustment for depression, the association was attenuated to 27% which remained statistically significant. Furthermore, another meta-analysis⁹⁵ found that PTSD is associated with an increased risk of stroke (RR = 2.36, 95% CI: 2.11-2.65). Moreover, the analysis⁹⁶ of data from the Nurses' Health Study (NHS) II, including 50,000 women, confirmed the associations between PTSD and myocardial infarction and stroke [HR = 1.60 (95% CI: 1.20-2.13)]. A study⁹⁵ in Denmark demonstrated a higher risk of incidence of venous thromboembolism in subjects with PTSD than subjects without PTSD during the median 7-year follow-up (SIR = 2.1, 95% CI: 1.7-2.7). In addition, another meta-analysis⁹⁷, including 150,000 patients, demonstrated that PTSD is associated with a 49% increased risk for type 2 diabetes (RR = 1.49, 95% CI: 1.17-1.89).

The important link between PTSD and cardiovascular diseases (CVD) are behavioral factors. PTSD is associated with smoking, physical inactivity, and overeating^{98,99}. In addition, sleep disturbances related to PTSD may increase the risk of CVD¹⁰⁰.

In summary, deterioration of mental health during the COVID-19 pandemic will, in the future, be the cause of an increase in the incidence of obesity, type 2 diabetes, and CVD, as well as cancer and many other complications of obesity. An increase in the percentage of people with addictions can also be expected. This will result in shortened life expectancy, poorer health conditions for people in working age, inefficiency of healthcare and increased costs. Therefore, mental health should now be a public health priority.

Suggestions for Preventive Strategies

Proposing a strategy to prevent the effects of psychological problems arising during the

COVID-19 pandemic is very difficult because we are currently dealing with an economic crisis that is associated with many negative emotions. However, failure to take any systemic action can have serious consequences not only for individuals but also for entire societies.

In our opinion, systemic actions should start at the level of primary schools. Not only psychologists and school counselors, but all teachers should be involved in this process. The main strategy should be learning about peer relationships and support. Working with families should not be omitted, but every child and teenager should have a built-in sense that if they do not find support among their peers and family, they can look for it from school employees. The care of the child psychiatry system cannot be overlooked either. A child with psychological problems should receive immediate specialist care.

Mental health promotion programs should also cover adults. These should include learning to cope with stress and behaviors that help build relationships and social support. Psychological help and psychotherapy should be reimbursed and quickly available.

Healthcare workers should also be screened for post-traumatic stress disorder and burnout. If they are diagnosed, they should receive adequate psychological help and, if necessary, paid sick leave. Despite the costs incurred, this may be beneficial as it will prevent health systems from failing in the near future. This, in turn, will prevent the social health catastrophe that the COVID-19 pandemic may still result in.

It should be noted that all the above-mentioned activities should be subject to periodic evaluation and modification depending on the changing needs and should be planned for many years.

Limitations

The main limitation of the review is the lack of longitudinal and follow-up studies. However, such research will only be possible after several years post-pandemic. The second limitation is that most of the studies were questionnaire-based, and performed online, often without data concerning acceptance rate, which could have influenced results. Third, we did not perform a meta-analysis because the studies conducted during the COVID-19 pandemic were so quickly published that the quality of the studies was difficult to evaluate. Fourth, this review did not include publications in languages other than English.

Conclusions

The COVID-19 pandemic has not only caused many deaths and damage to many people's physical health, but it has also worsened mental health. These two aspects cannot be separated because the deterioration of mental health is a vicious cycle that can cause the deterioration of physical health. Screening of mental health in different populations is needed. It is also necessary to develop effective strategies to help people who experienced psychological problems during the COVID-19 pandemic. Changes in the profile of addiction to psychoactive substances should also be carefully analyzed, and legal and medical strategies should be implemented to prevent stress-coping patterns that lead to the development of addictions. We proposed strategies that could help decision-makers develop a plan to prevent the effects of the COVID-19 pandemic. Mental health should now be a public health priority.

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Conflict of Interest

The authors have nothing to disclose, and all authors declare no conflict of interest.

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Authors' Contributions

M.G. contributed to manuscript concept, analyzed literature, and drafted the manuscript, D.C. and E.B. analyzed literature and drafted the manuscript, M.O.-G. contributed to manuscript concept and critical revised the manuscript. All authors have read and agreed to the published version of the manuscript.

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