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Literature Review

Suicide in the COVID-19 Pandemic

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Abstracts

Introductions: The COVID-19 pandemic affects various aspects of life, not only in terms of health but also economically and socially. Several studies have shown that the impact of the COVID-19 pandemic is related to an increase in the number of suicides. The study review aims to determine the incidence of suicide during the COVID-19 pandemic. **Methods:** This study review was compiled using the literature review method by collecting sources from valid scientific literature, namely PubMed and Scientific Direct. **Discussions:** Suicide risk is related to several factors due to the COVID-19 pandemic, such as a significant relationship between suicide and living in an area with a high prevalence of COVID-19 infection, loss of income due to the pandemic, having relatives or acquaintances who died from COVID-19, fear of being infected by COVID-19, and changes in the learning system. Things that can be protective factors include mental health knowledge, exercising regularly during the pandemic, family support, and a high level of awareness and preventive measures for COVID-19. **Conclusions:** The COVID-19 pandemic also affects mental health. The impact of the COVID-19 pandemic has a relationship with increased suicides.

Keywords: COVID-19, Suicide, Suicide Risk, Suicide ideation, Suicidal behavior

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Introductions

Coronavirus disease 2019, or COVID-19, is an acute and severe respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This condition has become a crisis in the global health sector. World Health Organization (WHO) declared that the spread of COVID-19 had become a pandemic on March 11, 2020 [1].

The COVID-19 pandemic has affected various aspects of life. The spread of the virus that occurs globally, causing the public to take preventive measures through the use of masks, washing hands, and distancing physically, decreases their daily economic activity. The government has also implemented large-scale preventive measures that have never been implemented before, namely in the form of asking the public to limit social contact, avoid social gatherings to reduce the number of crowds in the community, close schools, and stop business activities that are not so important, so that a trend appears, "just stay at home" [2,3].

The strict preventive measures implemented by the government are considered quite effective in controlling the spread of COVID-19. Researchers and clinicians are constantly working hard to find the vaccine and therapy for COVID-19. However, the end of the COVID-19 pandemic will take a long time, and the government's strict preventive measures still take a long time to apply to the public. This raises concern for the community, so one of the harmful effects is affecting mental health, such as anxiety, post-traumatic stress disorder, depression, and the worst thing is suicide [2,3].

Based on the explanation above, the author is interested in bringing up topics related to suicide and the COVID-19 pandemic. Several studies have also shown a relationship between the state of the COVID-19 pandemic and the incidence of suicide. Therefore, the study review aims to determine the incidence of suicide during the current COVID-19 pandemic.

Reviews

Coronavirus disease 2019 (COVID-19)

In the current situation, many countries worldwide are facing the impact of the coronavirus disease (COVID-19). WHO coordinated global efforts to address the effects and declared COVID-19 a global pandemic on March 11, 2020 [1]. The COVID-19 virus was first discovered in Wuhan, Hubei Province, China, and has presented a new challenge to public health in various countries.

The sudden and rapid spread of COVID-19 has caused many governments of various countries to be unprepared to deal with it. On March 26, 2020, WHO declared six priority strategies that the government must implement in tackling the pandemic, namely disseminating and training health workers, implementing a system to detect suspected cases, increasing test production and availability, identifying facilities that can become health centers for the coronavirus, developing strategies to quarantine cases, and refocus government measures in suppressing the spread of the virus [4]. Uncontrolled actions will lead to a rapid increase in the number of cases.

Common symptoms in patients with COVID-19 are cough, fever, fatigue, and loss of the ability to taste or smell. Less common symptoms include sore throat, headache, chest pain, skin rash or discoloration of the fingers or toes, diarrhea, and eye irritation [5,6]. Severe cases will result in hospitalization and death. The daily news reporting a spike in new cases and deaths brings a high health concern. In addition, job loss, financial stress, and social isolation aggravate factors that hurt mental health.

Most countries have had to deal with repeated waves of the COVID-19 pandemic. Therefore, preventive measures from the emergence of an uncontrolled increase in cases continue to be carried out. One of the efforts that the government has taken to help break the chain of distribution of COVID-19 is through physical distancing through closing businesses and implementing a work-

from-home system, thereby changing people's work patterns and having an impact on reducing working time and income. In addition, school closures were also implemented to help reduce the spread of COVID-19, so the learning method was implemented online.

People with lower education and income levels have suffered substantially during the pandemic. They have been hit particularly hard with higher odds of losing their jobs and income in Canada, the UK, and the US. However, a study in the United States reported that the decline in subjective well-being during the COVID-19 pandemic was more significant among those more educated, perhaps because they felt a more substantial loss of control and wealth due to the uncertainty surrounding COVID-19 [7]. Therefore, mental health during the COVID-19 pandemic must be given great attention because conditions are so drastic in society, forcing people to adapt quickly.

Suicide

Based on data from the World Health Organization (WHO), in 2021, more than 700,000 people die from suicide yearly. It can be estimated that every 40 seconds, someone intentionally kills himself. Suicide is the fourth leading cause of death among children aged 15-19. 77% of suicides worldwide occur in low- and middle-income countries. Some of the common ways of committing suicide are by ingesting pesticides, hanging themselves, and firearms [8].

There are several definitions of terms commonly used in research related to suicide as follows [9]:

1. Suicide: deliberately ending one's own life.
2. Suicidal behavior: behavior that can end a person's life, whether fatal or not. This term does not include suicidal ideation.
3. Suicide attempt: self-injury, suspected non-fatal behavior, or actual intent to die.
4. Suicidal ideation: any thoughts about ending one's life, either planning suicide (active) or with only thoughts of wanting to die but no plans (passive). Although suicidal ideation occurs in depressive states in various psychopathologies, the transition from suicidal ideation to suicide attempts is facilitated by concomitant psychiatric conditions, namely increased distress (such as panic disorder or post-traumatic stress disorder) or reduced self-control (such as substance abuse or cluster personality disorder). Additional factors involved in this transition, such as the ability to commit suicide, exposure to suicide, mental image, and access to suicide, were identified.
5. Non-suicidal self-injury: Self-injury behavior without intent to die.

Although suicide is not a disease, suicidal behavior (including suicide and attempted suicide) is such a significant public health issue that it has been the focus of increasing attention in research and public awareness campaigns over the last decade, as well as a substantial focus of the international public health community.

Death suicide represents an individual tragedy and is thought to indirectly affect many individuals, including family, friends, and the community. Advances in understanding the factors involved in suicide have allowed us to paint a more comprehensive picture of suicide. There are several risk factors related to suicide, namely age (often found in older people than younger people), gender (women are taller than men in Southeast Asia), and family history (history of mental disorders among family members).), stressful life events (such as breakup, death of a loved one, peer rejection, school and family academic stressors, and mental and physical/sexual abuse) [9–11].

Suicidal behavior is associated with widespread neurobiological changes throughout the brain that affect several functional pathways. These neurobiological changes are as follows [9,12,13]:

1. Monoamine dysregulation in suicidal behavior, in which there is a decrease in serotonin.

2. Stress response and HPA axis. Changes in the HPA axis and cortisol reactivity can increase the risk of suicidal behavior.
3. The neurotrophic pathway, in which the expression of neurotrophic genes, such as encoding brain-derived neurotrophic factor (BDNF) and encoding BDNF receptor tyrosine kinase B (Trk-B), is decreased.
4. Glutamatergic hyperactivity and GABAergic dysfunction.
5. Immune function and inflammation, in which it was found that elevated plasma IL-6 levels have been associated with impulsivity and suicide attempts violent

Suicide in the COVID-19 Pandemic

The COVID-19 pandemic has impacted various fields, both in the health sector and socially and economically. Due to the COVID-19 pandemic, many activities cannot run as well as usual. There have been many changes that have resulted in people having to adapt quickly to survive during the COVID-19 pandemic. The impact of economic conditions and social distancing restrictions are intense stressors for the community. Therefore, mental health problems have also increased amid the COVID-19 pandemic [14].

Suicide has a complex etiology hypothesized to result from dynamic interactions between psychological stressors and neurobiological risks. Environmental stressors (such as negative social, familial, and personal events) and the resulting feelings of hopelessness can trigger most suicidal behaviors, but the underlying neurobiological abnormalities may promote suicidal tendencies. Suicide risk is reported in numerous genetic and biochemical markers, including alterations in BNDF, serotonergic, kynurenine signaling, and other neurometabolic signaling pathways. In most studies, the pathophysiology of suicide involves inflammation mediated by both soluble factors (TNFα, IL6, and IL1) and aberrantly activated cell populations (monophagocytes and glial cells) [14].

Covid-19 infection-activated alveolar macrophages produce both inflammatory mediators, such as TNFα, IL6, and IL1, and chemotactic molecules, such as CCL2/CCL5, to recruit circulating blood monocytes to the airways, amplifying respiratory hyperinflammation. SARS-CoV2 secrete inflammatory cytokines, activates alveolar macrophages, and then activates mast cells, which orchestrate airway hyperinflammation via their production of histamines. In SARS-CoV2 neural invasion, dying neurons are surrounded by activated microglia. Microglia serve as communication hubs to sustain neuroinflammation by producing inflammatory mediators and subsequent activation of astrocytes and CD8+ T cells [14].

Suicide-specific psychiatric risk factor is relevant to the contribution of the primary innate immune cells as hyperinflammatory pathology in COVID-19. In this regard, mast cell activation is associated with depression, one of the most vital risk factors for suicide. Therefore, SARS-CoV2 infection induced dysregulation of mast cell activity, which might heighten the risk for depression-related suicidal ideation or suicidal behavior development [14].

Seven studies discuss the correlation between the COVID-19 pandemic and the risk of suicide, whether related to suicidal ideation, planning suicide, or having committed suicide. The study by Cheung et al. (2021) found that the lowest prevalence of suicidal ideation was 7.6% in the UK, and the highest was 24.9% in the Philippines. The study sample with younger age, male gender, the status of having a partner, and working as a non-health worker showed significantly higher suicidal ideation ($p < 0.001$). In this study, it was explained that men found suicidal ideation. During the pandemic, they experienced sudden job losses, resulting in financial difficulties and the emergence of a sense of worthlessness because they were unable to provide for their family or considered themselves a burden on the family. When men experience a crisis, they are also less likely to seek help in the form of pro-

fessional support or counseling. The rate of higher suicidal ideation due to the suspension of the face-to-face teaching and learning system in all educational institutions during the pandemic, so students have to switch to online. Changes that occur suddenly cause students to have difficulty adapting and increase stress, anxiety, and academic pressure levels. Students may also receive less peer support due to reduced face-to-face interactions and miss out on extracurricular activities, such as sports and entertainment (e.g., cinema, amusement park, playground) due to lockdowns. Lockdowns in some countries (e.g., China, Hong Kong, Brazil, UK, USA, Italy) may have increased social isolation and loneliness, contributing to an increased risk of suicidal ideation among youth [14].

This study also shows that all the core components of the health belief model (HBM) are significant predictors of suicidal ideation. The study found that a significantly higher sample who believed they were susceptible to disease considered their illness severe but had low motivation to act, had poor knowledge of the disease, and had poor ability to wear a mask appropriately exhibited higher rates of suicide ideation. High ($p < 0.001$) [15].

The study of Rahman et al. (2021) yielded another result. This study showed that there was a significant relationship between suicide and female gender (OR = 1,893; 95% CI [1,511, 2,373], $p < .001$) with divorced status (OR = 6,369; 95% CI; [2,039, 19,887], $p < .001$), secondary education level or below (OR = 2,694; 95% CI; [1,757, 4,129], $p < .001$), and had a high level of education (OR = 1,690; 95% CI; [1,250, 2.285], $p < .001$). This study explains that women have a higher risk of suicide because of the heightened emotional sensitivity factor. This study also showed that suicide is related to depression, anxiety, and several factors due to the COVID-19 pandemic. Some of the aspects due to COVID-19, namely a significant relationship between suicide and living in a high prevalence area of COVID-19 (OR = 1,347; 95% CI; [1,054, 1,721], $p = .017$), loss of income due to the pandemic (OR = 2,295; 95% CI; [1,600, 3,294], $p < .001$), had a relative or acquaintance who died of COVID-19 (OR = 1,299; 95% CI; [1,011, 1,669], $p = .041$), and fear of being infected with COVID-19 (OR = 1,309; 95% CI; [1,046, 1,640], $p = .019$). Living in an area with a high prevalence of COVID-19 results in a greater chance of being infected, resulting in suicide. Individuals who report having a relative or acquaintance die from COVID-19 have a higher risk of suicide because various reasons can cause it. First, there could be an increased risk of contracting a COVID-19 infection because they may have been in contact with an individual infected with COVID-19. Second, they may worry about the health conditions of their family or friends. COVID-19 infection causes various clinical manifestations, ranging from asymptomatic to acute respiratory infections and even death, so the fear of disease is also significant with the risk of suicide [16].

The results of the study by Rahman et al. (2021) which successfully showed a significant relationship between suicide and fear of being infected with COVID-19 due to the clinical presentation it caused, these results were supported by the study of Yom-Tov et al. (2021). The survey of Yom-Tov et al. (2021) showed that those who displayed anosmia/ageusia-related symptoms and were also positive for COVID-19 had an approximately 30% higher risk of suicide or depression. The findings of this study implicate anosmia/ageusia as an essential risk factor for depression and suicidal ideation [17].

The study by Tanaka et al. (2021) found that in Japan, suicide decreased substantially during the first wave of the COVID-19 pandemic (February to June 2020) but increased rapidly during the second wave (July to October 2020). In October 2020, there was an increase in the suicide death rate during the second wave in children and adolescents (individuals under

20 years of age) (49%, IRR = 1.49, 95% CI [1.12–1.98]). During the second wave of the COVID-19 pandemic, the increase in suicide among women was about five times greater than among men, with a more significant increase among homemakers. However, the suicide for men remains higher than for women, but the disparity decreases, so this study is in line with the study of Cheung et al. (2021). Suicide rates among children and adolescents also increased in the second wave of the pandemic. The study explained that this was due to a pandemic that affected young workers. Young workers tend to be less skilled and employed on contracts that do not provide job security. The decline in employment rates during the pandemic was more significant among this age group. The timing of the second wave also coincided with the period when schools (elementary to high school) were reopened after previously being closed nationally. After several months without school during the pandemic, the stress of returning to school can worsen. These factors may have amplified the psychological depression of children and adolescents [18].

The study also explains why the second wave of COVID-19 experienced an increase in suicides, while the first wave did not because Japan itself had several additional mechanisms that could explain this decline during the first wave. The central government provided several subsidies and benefits to citizens and companies experiencing economic hardship in response to the crisis. About 80% of cash benefits are distributed to citizens before June (all citizens are eligible to receive 100,000 cash benefits (approximately US$940)), and suicides among individuals (workers, unemployed, and retirees) decline just before June. In addition, claims for business subsidies increased between May and October, and the number of bankruptcies remained lower than pre-pandemic levels. The suicide did not increase during this period. Overwork and commuting are well-recognized risk factors for suicide, particularly
among the working population in Japan, reducing working hours and working from home policies during the COVID-19 pandemic can increase people's productivity, life satisfaction, and mental health [18].

Ammerman et al. (2020) study found 159 participants (17.5%) reported having suicidal ideation, and 44 (4.9%) had attempted suicide. Physical health concerns and stress related to the COVID-19 pandemic were significantly positively associated with suicidal ideation. At the same time, the impact of daily routine due to COVID-19 social distancing policies was very negative, with suicidal ideation. The perceived effect of social distancing practices on a person's mental health was not particularly related to suicidal ideation [19]. What is interesting about the findings of this study is that although the perceived impact of social distance on daily routines (social/work) was positively associated with a greater likelihood of suicide attempts, it showed a negative relationship with suicidal ideation. However, it is possible that acute stress and anxiety due to COVID-19, combined with disrupting social routines and breaking social distancing policies, may result in a combination of risk factors for suicidal behavior [19].

The study of Xu et al. (2021) aimed to determine the prevalence of symptoms of mental health problems and suicidal behavior and potential risk factors among students six months after the COVID-19 pandemic began in China. The sample of this study was those with a high risk of exposure to COVID-19 because they were returning home for winter holidays from Wuhan, Hubei Province, where COVID-19 was first identified. Therefore, they must undergo quarantine upon returning home and may suffer stigma and discrimination. Half of the study showed at least one symptom of a mental health disorder. The prevalence of mental health disorders, namely depression 41.5%, anxiety 32.6%, insomnia 35.0%,

PTSD 8.5%, and suicidal behavior 2.0%. In this study, female students had a significantly lower prevalence of PTSD symptoms (7.50 vs. 10.16%, $p < 0.01$) but a higher prevalence of suicidal behavior than men (2.39 vs. 1.41%, $p < 0.01$), which is in accord with the study of Rahman et al. (2021). The prevalence of mental health symptoms and suicidal behavior was higher among graduate students, students who had poor relationships with classmates/teachers and their parents, and had a previous history of mental illness and a positive family history of psychosis. Samples who had confirmed COVID-19 or were in close contact with confirmed cases had a higher prevalence of symptoms of mental health disorders and suicidal behavior. Most mental health disorders and suicidal behavior are higher among students with increased stress. Participants who experienced changes in lifestyle, alcohol use, and tobacco use during the pandemic had a higher prevalence of mental health symptoms and suicidal behavior. Participants who learned about mental health knowledge and exercised regularly during the pandemic had a significantly lower prevalence of mental health problem symptoms [20].

Zhou et al. (2021) study focused primarily on mental health status and associated factors in the COVID-19 pandemic among Chinese university students. This study shows that the proportion of symptoms of depression and anxiety in female students is higher than that of male students. Still, the balance of suicidal ideation among male students is higher than that of female students, which supports the study of Cheung et al. (2021). Symptoms of depression and anxiety are more common in graduate students than undergraduate students, but there is no significant difference in suicidal ideation. Symptoms of depression, anxiety, and suicidal ideation were found in students exposed to COVID-19 (formerly diagnosed or in close contact with COVID-19 patients) compared to those who were not exposed to COVID-19. The higher the awareness and precautions for COVID-19, the lower the proportion of symptoms of anxiety, depression, and suicidal ideation. This study also shows that symptoms of anxiety and depression are important risk factors for suicidal ideation, and adequate social support (family support) for students can reduce suicide [21].

Conclusions

The COVID-19 pandemic has impacted various aspects of people's lives, including the economy, education, society, and health. Health is not only physical but mental health must also be considered during the COVID-19 pandemic, as evidenced by the increasing suicide risk. Suicide is increasing in those who are vulnerable, such as those having a family history of mental disorders, such as psychosis. The COVID-19 pandemic has caused concern for the community and has been exacerbated by government policies that have limited economic and social activities, resulting in a high suicide rate. However, for people who study mental health knowledge and do regular exercise, it is stated that there is a significant reduction in mental health problems.

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