



Comparison of Suicide Attempts and Associated Risk Factors During the COVID-19 Pandemic and One Year Before

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Abstract

Background: Many studies have investigated the rate of suicide attempts and their risk factors during the coronavirus disease 2019 (COVID-19) pandemic; however, the results are still challenging.

Objectives: This study investigated and compared the risk factors effective in suicide attempts during the pandemic period and one year before.

Methods: This case-control study was conducted at Loghman Hakim hospital, Tehran, Iran. Random sampling included all patients in the inpatient ward who were over 12 years of age and committed suicide during the pandemic within October 1, 2021, to August 30, 2022 (case group; n = 160) or one year before within March 11, 2019, to March 11, 2020 (control group; n = 160). Demographic information, mental-psychological status, and socioeconomic status (SES) of the patients in the case group, before and after the COVID-19 pandemic, were recorded during face-to-face interviews using a pre-designed semi-structured questionnaire by study staff trained and supervised by a clinical psychiatrist. Additionally, the data of the patients in the control group were retrospectively recorded during the review of medical records and telephone interviews. The Wilcoxon signed-rank test was used to compare the variables in the case group before and after the COVID-19 pandemic. The Student's *t*-test and chi-square test were used to compare the variables between the case and control groups. Additionally, to determine the risk factors predicting suicide attempts during the pandemic, a multivariable logistic regression test was used. The data were analyzed using PASW18 software.

Results: The results showed that the patients in the case and control groups had significant differences in terms of age ($P = 0.01$), underlying mental disorders ($P = 0.032$), and parental relationship ($P = 0.001$). Moreover, the variables of suicidal ideation ($P = 0.002$), feeling lonely ($P = 0.023$), sleep disorder ($P = 0.32$), and domestic violence ($P = 0.004$) in the case group were significantly higher than the control group. In addition, the comparison of these variables in the patients of the case group, before and after the COVID-19 pandemic, showed that the start of the pandemic triggered these factors and led to an increase in suicide attempts in this population. Finally, the logistic regression analysis showed that the variables of SES, having a close friend, parental relationship, previous planning for suicide, domestic violence, and job loss could be considered predictive risk factors for suicide attempts during the pandemic period.

Conclusions: According to the present study's findings, the psychological and socioeconomic conditions triggered by the COVID-19 pandemic led to an increased likelihood of suicidal ideation or attempts in vulnerable individuals.

Keywords: Suicide, Mental Disorders, Social Class, COVID-19, Pandemics

1. Background

Suicide is an important global problem, with the World Health Organization (WHO) reporting that one person dies by suicide every 40 seconds. According to the WHO, suicide is the act of deliberately killing oneself. Mental illness, including depression and neurological problems, cancer,

and human immunodeficiency virus (HIV) infection, are significant risk factors for suicide. Nearly one million individuals every year commit complete suicide, with low- and middle-income nations accounting for 86% of these deaths. Suicide accounts for 10-20% of deaths in women up to one year postpartum and is one of the top three

causes of death in young individuals under 25 years (1). The estimated lifetime prevalence of suicidal ideation in the general population is approximately 4% (2). In the Fars province of southern Iran, within 2011 and 2018, a study measuring the years of life lost as a result of completed suicides showed an increasing trend in successful suicide attempts. About 58669 years were calculated to be the total number of years of life lost (14.71 per 1000 individuals), and the most years of life lost due to suicide were among individuals aged 15 to 29 years (3). Therefore, suicide should be considered a significant public health concern, especially in cases of crises, such as the coronavirus disease 2019 (COVID-19) pandemic.

The COVID-19 pandemic's potential effects on suicide rates are still unknown (4). Studies have shown that there is a two-way relationship between mental health disorders and the COVID-19 pandemic; therefore, not only individuals with a history of mental disorders are susceptible to COVID-19, but having COVID-19 itself could increase the risk of mental disorders (5). An increased probability of mental disorders during the COVID-19 pandemic might lead to the occurrence of suicidal behavior and ultimately increase the rate of suicide among individuals (6-8).

In recent years, numerous studies have been conducted on the relationship between the risk factors for suicide attempts in the COVID-19 pandemic (9-11). Feeling lonely due to social distancing, sleep disorders, underlying mental disorders, alcohol or drug abuse, anxiety and stress related to COVID-19, domestic violence, economic recession, and temporary changes in the health system's structure might increase the rate of suicide (12-14). Although numerous studies have reported that suicide rates have increased both in past epidemics and in the COVID-19 pandemic (15-18), there is no consensus in this regard. A reduction or no change in the suicide rate has also been reported in some other studies (19-22).

2. Objectives

To the best of our knowledge, reports and definitive evidence about the contribution of risk factors for suicide attempts during the COVID-19 pandemic, such as age, gender, occupation, marital status, educational level, death of a family member due to contracting COVID-19, a history of mental disorders, and a history of suicide attempts, are very limited. By studying the risk factors related to suicide during the COVID-19 pandemic, it is possible to identify at-risk individuals and thereby prevent committing suicide during crises similar to the COVID-19 pandemic as much as possible. Therefore, this study

examined and compared the risk factors for committing suicide before and after the pandemic.

3. Methods

3.1. Study Design and Participants

The study protocol was approved by the Research Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran, with the ethics code REC: [IR.SBMU.RETECH.REC.1400.443](#). In this case-control study, patients were divided into two groups: 160 individuals who committed suicide during the pandemic period, within October 1, 2021, to August 30, 2022 (the case group) and 160 individuals who committed suicide before the pandemic period, within March 11, 2019, to March 11, 2020 (the control group).

3.2. Sample Size and Sampling Method

The sample size was arrived at through the following equation, where n is the sample size, Z is the statistic corresponding to the level of confidence, P is the expected prevalence (that can be obtained from the same studies or a pilot study conducted by the researchers), and d is precision (corresponding to effect size):

$$n = \frac{Z^2 P (1 - P)}{d^2}$$

With a 95% confidence interval (CI), Z is equal to 1.96. In a pilot study, the expected prevalence of suicide among poisoned patients admitted to Loghman Hakim hospital, Tehran, Iran, was estimated to be 11.5%. With a prevalence of the disease between 10% and 90%, it is recommended to select a precision of 5%. By placing the values in the above-mentioned equation, the final sample size arrived at 156 and was rounded off to 160. Sampling was random and included the patients admitted to Loghman Hakim hospital due to suicide attempts during the COVID-19 pandemic and one year before.

3.3. Data Collection

The data on the demographic characteristics, mental-psychological status, and socioeconomic status (SES) of the patients were obtained based on a pre-designed questionnaire. A semi-structured questionnaire was prepared based on the review of the previous research and experts' opinions. Patients with ages less than 12 years and patients with prominent intellectual disabilities or cognitive disorders were excluded from the study. Moreover, the patients who had incomplete medical records or provided incomplete information during the face-to-face or telephone interview were excluded

from the study. The patients in the case group were orally interviewed by trained study staff under the supervision of a clinical psychiatrist. The patients were asked about their demographic characteristics, mental-psychological status, and SES before and after the COVID-19 pandemic. The data for the control group were obtained by retrospectively reviewing electronic medical records and conducting a telephone interview. Each participant was explained in detail about the study, and informed consent was obtained from the participant prior to the commencement of data collection.

3.4. Data Analyses

The statistical analysis of the collected data was performed using SPSS software and appropriate statistical tests. The Student's *t*-test and chi-square test were used to compare quantitative and qualitative variables between the two groups, respectively. Missing data were less than 5% and addressed using listwise deletion. The Wilcoxon signed-rank test was used to compare the mental-psychological and SES of the patients in the case group before and after the pandemic. Finally, a multivariable logistic regression test was used to determine the risk factors predicting suicide attempts during the COVID-19 pandemic. Quantitative variables were reported as mean (\pm standard deviation [SD]) and qualitative variables as number (percentage). Differences were considered significant if *P*-values were less than 0.05.

4. Results

4.1. Demographic Data

In the case group, there were 43 (26.9%) and 117 (73.1%) male and female patients, respectively. In the control group, there were 56 (35%) and 104 (65%) male and female patients, respectively. There was no significant difference between the case and control groups in terms of gender distribution. The average age of patients in the case group was 27.03 with an SD of 8.9, and the average age of the patients in the control group was 29.66 with an SD of 9.6, which was significantly higher than the case group ($P = 0.01$). Based on clinical history, the patients were classified as having mental disorders if they had received at least one of the medications related to mental disorders (including antidepressants, antipsychotics, or mood stabilizers) under the physician's prescription. The results showed that mental disorders were more frequent among patients in the case group than in the control group (73.1% vs. 61.9%, respectively; $P = 0.032$) (Table 1).

Some other variables were also different between the two groups, which were mostly related to the mental and

psychological status of the patients (Table 1). The results revealed that, compared to the control group, a higher percentage of the patients in the case group had at least one close friend. According to the results, 66 (41.3%) and 49 (30.6%) patients in the case and control groups had at least one close friend, respectively ($P = 0.048$). The relationship between the parents of patients who committed suicide during the pandemic period was worse than that between those who committed suicide before the pandemic. In the case group, compared to the control group, the prevalence of patients whose parents had a bad relationship (25% vs. 10.6%) or got divorced (18.1% vs. 11.3%) was higher ($P = 0.001$).

The patients with suicidal ideation who had previously planned to commit suicide were more prevalent among patients in the case group than in the control group (66.9% vs. 49.4%, respectively; $P = 0.002$). According to the data, a high percentage of patients who committed suicide during the pandemic had sleep disorders, and their frequency was significantly higher in the case group than in the control group (73.1% vs. 61.9%, respectively; $P = 0.032$). The feeling of loneliness was also higher among patients in the case group who committed suicide during the pandemic than in the control group (65.6% vs. 53.1%, respectively; $P = 0.023$). Finally, data analysis showed that domestic violence was higher among patients who committed suicide during the pandemic (the case group) than the patients who committed suicide before the pandemic (the control group). In the case and control groups, 63 (39.4%) and 39 (24.4%) patients, respectively, reported that they were victims of domestic violence, and the observed difference was statistically significant ($P = 0.004$).

4.2. Comparison of the Mental, Psychological, and Socioeconomic Status of Patients in the Case Group Before and After the Start of the COVID-19 Pandemic

The patients who committed suicide during the pandemic period (the case group) were asked about their mental-psychological and SES before and after the pandemic period. The results showed that during the pandemic period, these patients had sleep disorders and suicidal ideation more often than in the pre-pandemic period ($P = 0.046$ and $P = 0.025$, respectively). In addition, the parental relationship worsened during the pandemic period ($P < 0.001$), and the experience of domestic violence with these patients during the COVID-19 pandemic was significantly higher than in the previous years ($P = 0.008$) (Table 2).

Table 2. Comparison of Mental-psychological and Socioeconomic Status and Family Relationships of Patients Before and After the Start of the Pandemic

Variables	Negative Ranks			Positive Ranks			Test Statistics		
	N	Mean Rank	Sum of Ranks	N	Mean Rank	Sum of Ranks	Ties	Z	P-Value
Parental relationship	28	15.16	424.5	1	10.5	10.5	131	4.7 ^a	< 0.001 ^c
Cigarette smoking	1	4	4	6	4	24	153	1.9 ^b	0.059
Alcohol drinking	0	0	0	3	2	6	157	1.7 ^b	0.083
Suicide planning	0	0	0	5	3	15	155	2.2 ^b	0.025 ^c
Sleep disorder	4	2.5	10	0	0.00	0.00	156	2.0 ^a	0.046 ^c
Feeling loneliness	2	1.5	3.0	0	0.00	0.00	158	1.4 ^a	0.157
Domestic violence	0	0	0	7	4	28	153	2.6b	0.008 ^c
Physical fight	3	2	6	0	0	0	157	1.7 ^a	0.083

^a Based on positive ranks.

^b Based on negative ranks.

^c Indicates a statistically significant change.

4.3. Predicting the Risk Factors for Suicide Attempts During the Pandemic Period

The multivariable logistic regression model for committing suicide during the COVID-19 pandemic is shown in Table 3. The independent predictors of committing suicide during the COVID-19 pandemic were as follows:

Good economic status (odds ratio [OR] = 1.68; 95% CI: 1.08 - 2.6; P = 0.022), having a close friend (OR = 0.28; 95% CI: 0.14 - 0.57; P < 0.001), a bad relationship between parents (OR = 1.82; 95% CI: 1.34 - 2.46; P < 0.001), suicide planning (OR = 0.15; 95% CI: 0.06 - 0.34; P < 0.001), domestic violence (OR = 0.3; 95% CI: 0.16 - 0.59; P < 0.001), and job loss (OR = 0.42; 95% CI: 0.18 - 0.99; P = 0.047).

5. Discussion

Although numerous studies have investigated the relationship between suicide risk factors during the COVID-19 pandemic, the results are still challenging in this regard. As a result, the present study examined and compared the risk factors effective in suicide attempts during the COVID-19 pandemic and one year before to demonstrate how effective these risk factors were in suicidal attempts during the COVID-19 pandemic. The results of this study showed that during the COVID-19 pandemic, the probability of committing suicide increased in younger individuals with an underlying mental illness who had suicidal ideation and suffered from sleep disorders or a feeling of loneliness. In agreement with the aforementioned finding, it was reported that during the COVID-19 pandemic, the suicide rate among younger individuals (under 25 years) increased, and among middle-aged individuals (25 to 64 years) decreased (23).

Numerous studies have shown that individuals with underlying mental disorders were more likely to commit

suicide in the COVID-19 pandemic (9, 24). In addition, a study reported that there is a bidirectional association between mental disorders and COVID-19 contraction; accordingly, individuals with mental disorders were more likely to contract COVID-19 and vice versa (5). Studies showed that during the COVID-19 pandemic or other previous global public health crises, feeling lonely and sleep disturbance were common (25, 26). It was also suggested that feeling lonely might be a risk factor for insomnia (27). It was also reported that there is a close association between sleep disturbances and a heightened sense of loneliness with suicidal ideation and attempts (28-31).

It is interesting to note that, according to the results, having a close friend increases the probability of committing suicide during the pandemic. Previous studies revealed that worrying about close friends or family members being infected with COVID-19 is associated with an increased likelihood of suicidal ideation during the COVID-19 pandemic (32). Moreover, sudden and unexpected loss of connection with close friends following social distancing measures had destructive effects on mental health in individuals with a sociable lifestyle (33, 34). Poor family bonds, poor relationships between parents, and frequent family conflict lead to post-traumatic stress disorder, depression, and other mental illnesses that increase the risk of suicidal ideation or attempts (35).

Given that family functioning was affected by the COVID-19 pandemic (36), it is important to consider the quality of relationships between parents as a risk factor for perpetrating suicide during the COVID-19 pandemic. Domestic violence was also reported to be among the identified risk factors for suicidal attempts during the COVID-19 pandemic (37). The results of this study, which indicate that poor parental relationships and domestic violence were associated with an increased likelihood of

Table 3. Risk Factors Predicting Suicide Attempts During the Pandemic Period

Variables	B	S.E.	Wald	Sig.	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Socioeconomic status	0.518	0.226	5.255	0.022	1.679	1.078	2.615
Close friend	-1.271	0.364	12.196	< 0.001	0.280	0.137	0.572
Parental relationship	0.597	0.156	14.717	< 0.001	1.817	1.339	2.465
Plan for committing suicide	-1.916	0.433	19.560	< 0.001	0.147	0.063	0.344
Domestic violence	-1.198	0.338	12.546	< 0.001	0.302	0.155	0.586
Job loss	-0.876	0.440	3.959	0.047	0.416	0.176	0.987

Abbreviation: CI, confidence interval.

suicide attempts during the COVID-19 pandemic, are in line with these reports. According to the results of logistic regression, in addition to the discussed variables, job loss and high SES were two other variables that could predict the risk of suicide attempts during the COVID-19 pandemic. Previous studies also reported that belonging to a higher socioeconomic class and job loss were associated with a higher likelihood of suicide during the COVID-19 pandemic (38, 39).

The multivariable logistic regression analysis revealed that high SES, having a close friend, relationships between parents, having suicidal ideation and planning for it, experiencing domestic violence, and job loss are independent. Some other studies have also investigated the predictors of suicide attempts during the COVID-19 pandemic. For instance, Liu et al. reported that job or income loss, feelings of loneliness, and experiencing stressful or traumatic events were associated with a higher likelihood of suicidal thoughts during the COVID-19 pandemic (40). In another study conducted in Norway, authors reported that lower age, daily alcohol use, considering oneself to be in the risk group, and having economic concerns were associated with increased suicidal ideation during the COVID-19 pandemic (41).

Moreover, a statistically significant relationship between anxiety and depressive symptoms with age, educational level, occupation, financial difficulties, COVID-19 infection, health status, suicidal thoughts, and abuse or domestic violence was observed through logistic regression analysis. With the exception of age, educational attainment, and occupational status, the results of the regression analysis showed a statistically significant correlation between insomnia and all other study factors (42). In one study, it was reported that the monthly suicide rate decreased by 14% during the first five months of the COVID-19 pandemic; however, several months later, during the second wave, it increased by

16%. Although the COVID-19 pandemic's negative effects might last for a while, its moderators (e.g., government subsidies) might not. Effective suicide prevention should, therefore, be a key public health concern, especially for vulnerable groups (43).

For the first time, the current study evaluated the pre- and post-pandemic psychological and SES of patients who committed suicide during the COVID-19 pandemic. In addition, the findings were compared to those of patients who committed suicide before the inception of the COVID-19 pandemic. However, there are some limitations in this study, including the small sample size, failure to evaluate patients who died due to suicide during the COVID-19 pandemic, possible dishonesty of the patients in the interview, and incomplete electronic medical records. In addition, the differences in the number of patients in the two groups in terms of some factors of demographic characteristics, mental-psychological status, and SES can create bias in the study results.

5.1. Conclusions

According to the present study's findings, COVID-19 or the death of relatives due to COVID-19 did not play a role in the suicide attempts of the patients; however, the mental and socioeconomic conditions resulting from the COVID-19 pandemic led to an increase in the suicide attempt rate, especially among those who had suicidal ideation. As a result, in times of crises, such as the COVID-19 pandemic, it is critical to identify the vulnerable population in society and provide them with more effective psychological and economic support. However, it seems that there is a mutual relationship between different variables predicting suicide attempts during the COVID-19 pandemic. Further investigations are needed to unravel this complex connection in order to precisely detect the root predictors of suicide attempts during crises similar to the COVID-19 pandemic.

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Footnotes

Authors' Contribution: Study concept and design: B. M. and H. T.; Analysis and interpretation of the data: M. R., P. E., and M. G.; Drafting of the manuscript: S. P. and H. T.; Critical revision of the manuscript for important intellectual content: B. M. and M. H.; Statistical analysis: Sh. Sh.

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Informed Consent: Each participant was explained in detail about the study, and informed consent was obtained from the participant prior to the commencement of data collection.

References

- World Health Organization. *Suicide*. 2022. Available from: <http://www.emro.who.int/health-topics/suicide/feed/atom.html#:~:text=Suicide%20is%20the%20act%20of,disorders%2C%20cancer%20and%20HIV%20infection.>
- Shi L, Que JY, Lu ZA, Gong YM, Liu L, Wang YH, et al. Prevalence and correlates of suicidal ideation among the general population in China during the COVID-19 pandemic. *Eur Psychiatry*. 2021;**64**(1):e18. [PubMed ID: 33686933]. [PubMed Central ID: PMC7943957]. <https://doi.org/10.1192/j.eurpsy.2021.5>.
- Mirahmadizadeh A, Rezaei F, Moftakhar L, Heiran N, Azarbaksh H. Years of life lost due to suicide in Southern Iran 2011-18: A population-based study. *Arch Iran Med*. 2022;**25**(1):12-6. [PubMed ID: 35128907]. <https://doi.org/10.34172/aim.2022.03>.
- Radeloff D, Papsdorf R, Uhlig K, Vasilache A, Putnam K, von Klitzing K. Trends in suicide rates during the COVID-19 pandemic restrictions in a major German city. *Epidemiol Psychiatr Sci*. 2021;**30**:e16. [PubMed ID: 33461639]. [PubMed Central ID: PMC7889841]. <https://doi.org/10.1017/S2045796021000019>.
- Talaie H, Hosseini SM, Nazari M, Nazemi F. Bidirectional association between COVID-19 and mental health disorders: A narrative review. *Int J Med Toxicology Forensic Med*. 2021;**11**(3):34101. <https://doi.org/10.32598/ijmtfm.v11i3.34104>.
- Kahil K, Cheaito MA, El Hayek R, Nofal M, El Halabi S, Kudva KG, et al. Suicide during COVID-19 and other major international respiratory outbreaks: A systematic review. *Asian J Psychiatr*. 2021;**56**:102509. [PubMed ID: 33418284]. [PubMed Central ID: PMC7764387]. <https://doi.org/10.1016/j.ajp.2020.102509>.
- Taqumet M, Luciano S, Geddes JR, Harrison PJ. Bidirectional associations between COVID-19 and psychiatric disorder: Retrospective cohort studies of 62 354 COVID-19 cases in the USA. *Lancet Psychiatry*. 2021;**8**(2):130-40. [PubMed ID: 33181098]. [PubMed Central ID: PMC7820108]. [https://doi.org/10.1016/S2215-0366\(20\)30462-4](https://doi.org/10.1016/S2215-0366(20)30462-4).
- Pallathadka LK, Pallathadka H. Mental Health and Stress Issues during Covid-19 in India. *J Applied Sci and Res*. 2022;**10**(2):24-35.
- Sher L. Psychiatric disorders and suicide in the COVID-19 era. *QJM*. 2020;**113**(8):527-8. [PubMed ID: 32569376]. [PubMed Central ID: PMC7337853]. <https://doi.org/10.1093/qjmed/hcaa204>.
- Pajoumand A, Talaie H, Mahdavejad A, Birang S, Zarei M, FERESHTEH MF, et al. Suicide epidemiology and characteristics among young Iranians at poison ward, Loghman-Hakim Hospital (1997-2007). *Arch Iran Med*. 2012;**15**(4):213-0. [PubMed ID: 22424037].
- Mann JJ, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, et al. Suicide prevention strategies: A systematic review. *JAMA*. 2005;**294**(16):2064-74. [PubMed ID: 16249421]. <https://doi.org/10.1001/jama.294.16.2064>.
- Fitzpatrick KM, Harris C, Drawve G. How bad is it? Suicidality in the middle of the COVID-19 pandemic. *Suicide Life Threat Behav*. 2020;**50**(6):1241-9. [PubMed ID: 32589799]. [PubMed Central ID: PMC7361329]. <https://doi.org/10.1111/sltb.12655>.
- Wand APF, Zhong BL, Chiu HFK, Draper B, De Leo D. COVID-19: The implications for suicide in older adults. *Int Psychogeriatr*. 2020;**32**(10):1225-30. [PubMed ID: 32349837]. [PubMed Central ID: PMC7235297]. <https://doi.org/10.1017/S104610220000770>.
- McIntyre RS, Lee Y. Projected increases in suicide in Canada as a consequence of COVID-19. *Psychiatry Res*. 2020;**290**:113104. [PubMed ID: 32460184]. [PubMed Central ID: PMC7236718]. <https://doi.org/10.1016/j.psychres.2020.113104>.
- Cheung YT, Chau PH, Yip PS. A revisit on older adults suicides and severe acute respiratory syndrome (SARS) epidemic in Hong Kong. *Int J Geriatr Psychiatry*. 2008;**23**(12):1231-8. [PubMed ID: 18500689]. <https://doi.org/10.1002/gps.2056>.
- Acharya B, Subedi K, Acharya P, Ghimire S. Association between COVID-19 pandemic and the suicide rates in Nepal. *PLoS One*. 2022;**17**(1):e0262958. [PubMed ID: 35073377]. [PubMed Central ID: PMC8786170]. <https://doi.org/10.1371/journal.pone.0262958>.
- Dube JP, Smith MM, Sherry SB, Hewitt PL, Stewart SH. Suicide behaviors during the COVID-19 pandemic: A meta-analysis of 54 studies. *Psychiatry Res*. 2021;**301**:113998. [PubMed ID: 34022657]. [PubMed Central ID: PMC9225823]. <https://doi.org/10.1016/j.psychres.2021.113998>.
- Efstathiou V, Stefanou MI, Siafakas N, Makris M, Tsvigoulis G, Zoumpourlis V, et al. Suicidality and COVID-19: Suicidal ideation, suicidal behaviors and completed suicides amidst the COVID-19 pandemic (Review). *Exp Ther Med*. 2022;**23**(1):107. [PubMed ID: 34976149]. [PubMed Central ID: PMC8674972]. <https://doi.org/10.3892/etm.2021.11030>.
- Niederkrötenhaler T, Gunnell D, Arensman E, Pirkis J, Appleby L, Hawton K, et al. Suicide research, prevention, and COVID-19. *Crisis*. 2020;**41**(5):321-30. [PubMed ID: 32716205]. [PubMed Central ID: PMC8729451]. <https://doi.org/10.1027/0227-5910/a000731>.
- McIntyre RS, Lui LM, Rosenblat JD, Ho R, Gill H, Mansur RB, et al. Suicide reduction in Canada during the COVID-19 pandemic: Lessons informing national prevention strategies for suicide reduction. *J Soc Med*. 2021;**114**(10):473-9. [PubMed ID: 34551280]. [PubMed Central ID: PMC8532219]. <https://doi.org/10.1177/01410768211043186>.
- Leske S, Kolves K, Crompton D, Arensman E, de Leo D. Real-time suicide mortality data from police reports in Queensland, Australia, during the COVID-19 pandemic: An interrupted time-series analysis. *Lancet Psychiatry*. 2021;**8**(1):58-63. [PubMed ID: 33212023]. [PubMed Central ID: PMC7836943]. [https://doi.org/10.1016/S2215-0366\(20\)30435-1](https://doi.org/10.1016/S2215-0366(20)30435-1).

22. Knipe D, John A, Padmanathan P, Eyles E, Dekel D, Higgins JP, et al. Suicide and self-harm in low-and middle-income countries during the COVID-19 pandemic: A systematic review. *PLOS global public health*. 2022;**2**(6). e0000282.
23. Chen YY, Yang CT, Pinkney E, Yip PSF. Suicide trends varied by age-subgroups during the COVID-19 pandemic in 2020 in Taiwan. *J Formos Med Assoc*. 2022;**121**(6):1174-7. [PubMed ID: 34674903]. [PubMed Central ID: PMC8493279]. <https://doi.org/10.1016/j.jfma.2021.09.021>.
24. Czeisler ME, Lane RI, Petrosky E, Wiley JF, Christensen A, Njai R, et al. Mental health, substance use, and suicidal ideation during the COVID-19 Pandemic - United States, June 24-30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;**69**(32):1049-57. [PubMed ID: 32790653]. [PubMed Central ID: PMC7440121]. <https://doi.org/10.15585/mmwr.mm6932a1>.
25. Monterrosa-Castro A, Monterrosa-Blanco A, Gonzalez-Sequeda A. Perceived loneliness and severe sleep disorders in adult women during the covid-19 quarantine: A cross-sectional study in Colombia. *J Prim Care Community Health*. 2021;**12**:21501327211025200. [PubMed ID: 34130553]. [PubMed Central ID: PMC8212376]. <https://doi.org/10.1177/21501327211025170>.
26. Escobar-Cordoba F, Ramirez-Ortiz J, Fontecha-Hernandez J. Effects of social isolation on sleep during the COVID-19 pandemic. *Sleep Sci*. 2021;**14**(Spec 1):86-93. [PubMed ID: 34917279]. [PubMed Central ID: PMC8663737]. <https://doi.org/10.5935/1984-0063.20200097>.
27. Tesen H, Konno Y, Tateishi S, Hino A, Tsuji M, Ogami A, et al. Association between loneliness and sleep-related problems among Japanese workers during the COVID-19 pandemic. *Front Public Health*. 2022;**10**:828650. [PubMed ID: 35480595]. [PubMed Central ID: PMC9037375]. <https://doi.org/10.3389/fpubh.2022.828650>.
28. Kjaer Hoier N, Madsen T, Spira AP, Hawton K, Benros ME, Nordentoft M, et al. Association between hospital-diagnosed sleep disorders and suicide: A nationwide cohort study. *Sleep*. 2022;**45**(5). [PubMed ID: 35554572]. <https://doi.org/10.1093/sleep/zsac069>.
29. Bernert RA, Joiner TE. Sleep disturbances and suicide risk: A review of the literature. *Neuropsychiatr Dis Treat*. 2007;**3**(6):735-43. [PubMed ID: 19300608]. [PubMed Central ID: PMC2656315]. <https://doi.org/10.2147/ndt.s1248>.
30. Stravynski A, Boyer R. Loneliness in relation to suicide ideation and parasuicide: A population-wide study. *Suicide Life Threat Behav*. 2001;**31**(1):32-40. [PubMed ID: 11326767]. <https://doi.org/10.1521/suli.31.1.32.21312>.
31. Szanto K, Whitman K. Improving social connections to reduce suicide risk: A promising intervention target? *Am J Geriatr Psychiatry*. 2021;**29**(8):801-3. [PubMed ID: 34078585]. [PubMed Central ID: PMC8434874]. <https://doi.org/10.1016/j.jagp.2021.04.016>.
32. Paul E, Fancourt D. Factors influencing self-harm thoughts and behaviours over the first year of the COVID-19 pandemic in the UK: longitudinal analysis of 49 324 adults. *Br J Psychiatry*. 2022;**220**(1):31-7. [PubMed ID: 35045899]. [PubMed Central ID: PMC8958127]. <https://doi.org/10.1192/bjp.2021.130>.
33. Kulmala J, Tiilikainen E, Lisko I, Ngandu T, Kivipelto M, Solomon A. Personal social networks of community-dwelling oldest old during the Covid-19 pandemic-a qualitative study. *Front Public Health*. 2021;**9**:770965. [PubMed ID: 35004583]. [PubMed Central ID: PMC8739883]. <https://doi.org/10.3389/fpubh.2021.770965>.
34. Islam MS, Tasnim R, Sujun MSH, Ferdous MZ, Sikder MT, Masud JHB, et al. Depressive symptoms associated with COVID-19 preventive practice measures, daily activities in home quarantine and suicidal behaviors: Findings from a large-scale online survey in Bangladesh. *BMC Psychiatry*. 2021;**21**(1):273. [PubMed ID: 34039292]. [PubMed Central ID: PMC8150150]. <https://doi.org/10.1186/s12888-021-03246-7>.
35. Yu Y, Wu T, Wang S, Liu W, Zhao X. Suicide risk and association with the different trauma during the COVID-19 pandemic period: A cross-sectional study on adolescent with different learning stage in Chongqing, China. *Front Public Health*. 2022;**10**:858157. [PubMed ID: 35570972]. [PubMed Central ID: PMC9096724]. <https://doi.org/10.3389/fpubh.2022.858157>.
36. Pietromonaco PR, Overall NC. Implications of social isolation, separation, and loss during the COVID-19 pandemic for couples' relationships. *Curr Opin Psychol*. 2022;**43**:189-94. [PubMed ID: 34416682]. [PubMed Central ID: PMC8881098]. <https://doi.org/10.1016/j.copsyc.2021.07.014>.
37. Pathirathna ML, Nandasena H, Atapattu A, Weerasekara I. Impact of the COVID-19 pandemic on suicidal attempts and death rates: A systematic review. *BMC Psychiatry*. 2022;**22**(1):506. [PubMed ID: 35902951]. [PubMed Central ID: PMC9331016]. <https://doi.org/10.1186/s12888-022-04158-w>.
38. Mamun MA. Suicide and suicidal behaviors in the context of COVID-19 pandemic in Bangladesh: A systematic review. *Psychol Res Behav Manag*. 2021;**14**:695-704. [PubMed ID: 34113185]. [PubMed Central ID: PMC8185458]. <https://doi.org/10.2147/PRBM.S315760>.
39. Kawohl W, Nordt C. COVID-19, unemployment, and suicide. *Lancet Psychiatry*. 2020;**7**(5):389-90. [PubMed ID: 32353269]. [PubMed Central ID: PMC7185950]. [https://doi.org/10.1016/S2215-0366\(20\)30141-3](https://doi.org/10.1016/S2215-0366(20)30141-3).
40. Liu L, Capaldi CA, Dopko RL. Suicide ideation in Canada during the COVID-19 pandemic. *Health Promot Chronic Dis Prev Can*. 2021;**41**(11):378-91. [PubMed ID: 34569774]. [PubMed Central ID: PMC8639169]. <https://doi.org/10.24095/hpcdp.41.11.06>.
41. Bonsaksen T, Skogstad L, Heir T, Ekeberg O, Schou-Bredal I, Grimholt TK. Suicide Thoughts and Attempts in the Norwegian General Population during the Early Stage of the COVID-19 Outbreak. *Int J Environ Res Public Health*. 2021;**18**(8). [PubMed ID: 33924558]. [PubMed Central ID: PMC8069206]. <https://doi.org/10.3390/ijerph18084102>.
42. Elhadi M, Alsoufi A, Msherghi A, Alshareea E, Ashini A, Nagib T, et al. Psychological health, sleep quality, behavior, and internet use among people during the COVID-19 pandemic: A cross-sectional study. *Front Psychiatry*. 2021;**12**:632496. [PubMed ID: 33868049]. [PubMed Central ID: PMC8044819]. <https://doi.org/10.3389/fpsy.2021.632496>.
43. Tanaka T, Okamoto S. Increase in suicide following an initial decline during the COVID-19 pandemic in Japan. *Nat Hum Behav*. 2021;**5**(2):229-38. [PubMed ID: 33452498]. <https://doi.org/10.1038/s41562-020-01042-z>.

Table 1. Demographic Characteristics, Mental-psychological Status, and Socioeconomic Status of Case and Control Groups ^{a, b}

Variables	Control (N = 160)	Case (N = 160)	P-Value
Age	29.66 (9.6)	27.03 (8.9)	0.01*
Gender			0.116
Male	56 (35)	43 (26.9)	-
Female	104 (65)	117 (73.1)	-
Occupational status			0.104
Employed	52 (32.5)	37 (23.1)	-
Student	28 (17.5)	25 (15.6)	-
Unemployed	80 (50.0)	98 (61.3)	-
Marital status			0.163
Married	56 (35.0)	75 (46.9)	-
Single	86 (53.8)	68 (42.5)	-
Divorced	12 (7.5)	10 (6.3)	-
Widow	6 (3.8)	7 (4.4)	-
Educational level			0.556
Illiterate	10 (6.3)	12 (7.5)	-
Elementary	28 (17.5)	21 (13.1)	-
High school	47 (29.4)	56 (35)	-
Academic	75 (46.9)	71 (44.4)	-
Socioeconomic status			0.689
Low	36 (22.5)	35 (21.9)	-
Middle	97 (60.6)	92 (57.5)	-
High	27 (16.9)	33 (20.6)	-
Underlying mental disorders			0.032*
Yes	99 (61.9)	117 (73.1)	-
No	61 (38.1)	43 (26.9)	-
Underlying disease			0.221
Yes	39 (24.4)	30 (18.8)	-
No	121 (75.6)	130 (81.3)	-
Close friend			0.048*
Yes	49 (30.6)	66 (41.3)	-
No	111 (69.4)	94 (58.8)	-
Parental relationship			0.001***
Good	98 (61.3)	71 (44.4)	-
Bad	17 (10.6)	40 (25.0)	-
Divorced	18 (11.3)	29 (18.1)	-
Died	27 (16.9)	20 (12.5)	-
Cigarette smoking			0.138
Yes	89 (55.6)	102 (63.7)	-
No	71 (44.4)	58 (36.3)	-
Alcohol drinking			0.367
Yes	95 (59.4)	87 (54.4)	-
No	65 (40.6)	73 (45.6)	-
Family suicide history			0.211
Yes	28 (17.5)	37 (23.1)	-
No	132 (82.5)	123 (76.9)	-
Friends suicide history			0.243

Continued on next page

Table 1. Demographic Characteristics, Mental-psychological Status, and Socioeconomic Status of Case and Control Groups ^{a, b} (Continued)

Yes	35 (21.9)	44 (27.5)	-
No	125 (78.1)	116 (72.5)	-
Planning for suicide			0.002**
Yes	79 (49.4)	107 (66.9)	-
No	81 (50.6)	53 (33.1)	-
Suicide history			0.174
None	101 (63.1)	87 (54.4)	-
Once	45 (28.1)	50 (31.3)	-
Several times	14 (8.8)	23 (14.4)	-
Sleep disorder due to worry			0.032*
Rarely	61 (38.1)	43 (26.9)	-
Often	99 (61.9)	117 (73.1)	-
Feeling loneliness			0.023*
Rarely	75 (46.9)	55 (34.4)	-
Often	85 (53.1)	105 (65.6)	-
Domestic violence			0.004**
Yes	39 (24.4)	63 (39.4)	-
No	121 (75.6)	97 (60.6)	-
Physical fight			0.508
Yes	23 (14.4)	19 (11.9)	-
No	137 (85.6)	141 (88.1)	-
Losing job			0.562
Yes	27 (16.9)	31 (19.4)	-
No	133 (83.1)	129 (80.6)	-
Debt			0.052
Yes	47 (29.4)	32 (20)	-
No	113 (70.6)	128 (80)	-

^a Values are presented as No. (%) or mean \pm SD.

^b Significant levels are *P < 0.05, **P < 0.01, ***P < 0.001.