Short-term effect of the COVID-19 pandemic on suicidal ideation: A prospective cohort study

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Abstract

Background: Few studies have examined the effect of pandemics on suicide-related outcomes. **Aims:** We examined whether suicidal ideation levels among the general population changed owing to the COVID-19 pandemic by tracking individuals between January and April 2020. **Method:** We used a prospective observational longitudinal design ($n = 6,683$) to conduct online surveys of the general adult population in Japan before (baseline) and during the pandemic (follow-up). **Results:** Suicidal ideation levels were significantly lower during than before the pandemic; however, the effect size was small ($r = .07$). Participants who were younger, with unstable employment, without children, with low income, and receiving psychiatric care were more likely to have higher suicidal ideation levels during the pandemic. **Limitations:** The dropout rate may have affected the results. COVID-19 cases and deaths in Japan were relatively lower than in other developed countries. **Conclusion:** Although the short-term impact of COVID-19 on suicidal ideation is limited, relatively young and economically vulnerable individuals are more likely to show exacerbated suicidal ideation during the pandemic.

Keywords

Suicide prevention; suicidal behaviors; mental health; public health; novel coronavirus

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Introduction

The 2020 COVID-19 pandemic is an unprecedented public health crisis that has substantially disrupted economic and social activities. Approximately 22.6 million people worldwide have been infected and 790,000 have died from COVID-19 (Worldometers, 2020). To reduce the spread of SARS-CoV-2, many countries have adopted social and physical distancing policies (e.g., local/national movement restrictions, stay-at-home orders, closure of non-essential businesses/services). These policies may help to prevent the spread of the virus, but they also have large-scale economic and psychosocial ramifications. Reduced economic activity has led to economic decline in many countries, and social distancing and stay-at-home measures can cause psychological distress. These factors may have adverse effects on public mental health. Indeed, studies in various countries show that the general population's mental health has worsened since the pre-pandemic period (Pierce et al., 2020; Salari et al., 2020). Because economic shocks and deteriorating mental health status can be major suicide risk factors, the number of suicides may rise during and after the pandemic (Gunnell et al., 2020; Reger et al., 2020).

However, the effect of pandemics on suicide remains unclear. There are few high-quality studies on the effect of previous pandemics (e.g., the 1918–1919 great influenza epidemic, severe acute respiratory syndrome (SARS)) on suicide (Niederkrötenhaler et al., 2020; Zortea et al., 2020), although some studies suggest that suicides tend to increase after pandemics (Chan et al., 2006; Cheung et al., 2008; Honigsbaum, 2010; Wasserman, 1992; Yip et al., 2010). However, to the best of our knowledge, there are no peer-reviewed studies on the effect of the COVID-19 pandemic on suicide and suicidal ideation, although some evidence is emerging in preprints. A Peruvian study showed that violent and accidental deaths, including suicide, declined during the COVID-19 lockdown period (Calderon-Anyosa & Kaufman, 2020). A U.S. Internet survey reported that COVID-19-related experiences are associated with suicidal thoughts and behaviors (Ammerman et al., 2020). However, the latter cross-sectional study used a convenience sample and lacked pre-COVID-19 data.

It is also unclear which populations are most likely to be adversely affected by pandemics. The suicide rate of elderly people in Hong Kong increased after the SARS pandemic (Chan et al., 2006; Cheung et al., 2008), but the findings may not be generalizable to the COVID-19 pandemic because the societal effects of COVID-19 are much larger and more wide-ranging than those of any other recent pandemics. To develop clear, effective suicide prevention policies for pandemics (Niederkrötenhaler et al., 2020), it is important to identify and target individuals likely to be at increased risk of suicide in a pandemic.

The study aim was to compare suicidal ideation levels of the general population in Japan during the pandemic to that of the pre-pandemic period, and to identify those individuals experiencing suicidal ideation during the pandemic. To examine changes in suicidal ideation, we used a longitudinal survey to measure suicidal ideation immediately before the COVID-19 pandemic and in the middle of the first wave of the pandemic in Japan.

Methods

Study design and sampling

We used a prospective observational longitudinal design. Baseline (T1) and follow-up (T2; approximately three months after T1) surveys were conducted in Japan with members of Internet survey panels through a major Japanese Internet survey company (Cross Marketing Inc., Tokyo, Japan). Japan ranks 45th in the number of infected cases. As of August 2020, there were 57,600 registered cases and 1,128 deaths (Worldometers, 2020), or 8.91 deaths per one million persons. Figure 1 shows the timing of the surveys and the monthly number of new COVID-19 cases in Japan. The T1 survey was conducted on January 24, 2020, when there were only two COVID-19 cases in Japan. The T2 survey was conducted between April 27 and 30, 2020. The number of COVID-19 cases in Japan began to increase in March, and the government declared a state of emergency on April 7. The reported COVID-19 cases were mainly in urban areas (Tokyo, Kanagawa, Saitama, Chiba, Osaka, Hyogo, Fukuoka), which were designated special alert areas when the state of emergency was declared. The cases in April constituted the first wave of infections and corresponded to the COVID-19 epidemic period.

Figure 2 shows the sampling process. The T1 survey was based on a target population aged 20 years or older and distributed according to the demographics of the latest Japanese census data (Japanese Ministry of Internal Affairs and Communications, 2016). The stratified variables were age, sex, and geographic area of residence. We distributed questionnaires to 125,011 individuals selected according to the stratified variables. Of these, 15,698 individuals accessed the survey website and 9,982 completed the questionnaire at T1. We then invited all participants who had completed the T1 survey to participate in the T2 survey; 6,683 participants completed the T2 questionnaire. We analyzed T1 and T2 survey responses for these 6,683 participants.

We were unable to obtain a priori institutional review board approval because the institution to which the first author belongs has no such board. However, the study was conducted in accordance with the Helsinki Declaration (revised 1989). Prior to participation, potential participants were advised that answering some of the survey questions may lead to a mood change and that they were allowed to quit at any point during the survey. We obtained explicit informed consent from the participants online. Participants were also provided with website links containing professional support resources while they were completing the questionnaire.

Measurements

All participants completed an online self-administered questionnaire assessing suicidal ideation, other suicide-related items (e.g., current psychiatric care), and demographic details (sex, age, educational background, employment, marital status, family structure, annual household income, and residential area).

Suicidal ideation was measured using the short form of the suicidal ideation scale (Sueki, 2019) at T1 and T2. This 6-item instrument (example item: Do you wish to die?) was designed to quantify suicidal ideation. Responses are rated on a 3-point scale from 0 to 2; higher scores indicate

increased suicidal ideation levels (total score range: 0–12). The scale has shown internal consistency (Cronbach's $\alpha = .89$), test–retest reliability (4-week interval: Spearman's $\rho = .84$), and validity in a survey with 2,486 Internet users (Sueki, 2019).

Statistical analyses

To examine changes in suicidal ideation between the pre-COVID-19 (T1) and COVID-19 periods (T2), we conducted a paired t -test with time of measurement as the independent variable and suicidal ideation as the dependent variable. To identify vulnerable populations experiencing suicidal ideation during the pandemic, we used forced-entry multivariate regression analysis to predict suicidal ideation at T2. The model independent variables were suicidal ideation at T1, sex, age, educational background, employment, marital status, family structure, annual household income, residential area, and current psychiatric care status. Regression coefficients (B) and their 95% confidence intervals (CI), and standardized regression coefficients (β), were calculated. All analyses were conducted separately with data from all participants, non-suicidal group only (T1 suicidal ideation = 0), and suicidal group only (T1 suicidal ideation >0). Presented p -values are for two-tailed tests. Analyses were performed using SPSS (SPSS 24.0 for Windows; SPSS Inc., Chicago, IL, USA).

Results

Participant characteristics and scale scores

Table 1 summarizes participant characteristics. Data for 6,683 participants were analyzed; 51.2% were men and the mean age was 46.5 years ($SD = 13.8$). About half of participants (50.3%) had a university or graduate degree, were married (56.5%), had children (50.0%), and resided in a special alert area (50.8%). Of participants, 41% were permanent employees, 19.8% were part-time or temporary workers, 5.7% were self-employed, 14.8% were full-time homemakers, and 12.3% were not in the labor market. The median annual household income was JPY 400–800 million, and 11.1% of participants had visited a psychiatric clinic at the time of the survey. The only missing values in the final data set were for income (participants were allowed to skip this question); respondents who did not answer this question were included in the analysis as “Income unknown.”

Changes in suicidal ideation

Suicidal ideation was significantly lower during the pandemic ($M = 1.59$) than before it ($M = 1.71$), $t(6682) = 5.87$, $p < .001$; however, the effect size was very small, $r = .07$. A paired t -test on data from the non-suicidal group showed that suicidal ideation was significantly higher during the pandemic ($M = 0.31$) than before it ($M = 0$), $t(3517) = 20.27$, $p < .001$, $r = .32$. Similarly, a paired t -test on data from the suicidal group showed that suicidal ideation was significantly lower during the pandemic ($M = 3.02$) than before it ($M = 3.61$), $t(3164) = 15.77$, $p = .005$, $r = .27$.

Predictors of suicidal ideation at T2

Multiple linear regression analysis to predict suicidal ideation at T2 produced a significant regression equation, $F(22, 6660) = 521.6, p < .001$, with an R^2 of .63 (Table 2). Individuals in their 30s, those with unstable employment status (part-time, temporary worker), those without children, those with relatively low annual household income (<JPY 400 million), and those currently receiving psychiatric care were more likely to have a significantly higher suicidal ideation level at T2 than the reference groups, after controlling for suicidal ideation at T1. In the non-suicidal group, relatively younger age (20–40s), low educational level, and current psychiatric care were significant predictors of suicidal ideation at T2, $F(21, 3496) = 3.71, p < .001, R^2 = .02$. In the suicidal group, unstable employment status (part-time, temporary worker), annual household income (<JPY 400 million), and marital status (divorced) were significant predictors of suicidal ideation at T2, $F(22, 3142) = 169.5, p < .001, R^2 = .54$.

Discussion

Main findings

We used a longitudinal design to examine whether COVID-19 affected suicidal ideation levels among the general population. We found a significant reduction in suicidal ideation in April 2020, when Japan had the first wave of infection and a state of emergency was declared, compared with January 2020, when there were almost no COVID-19 cases in Japan. This finding is consistent with the number of suicides: data from the Japanese National Police Agency (2020) show that suicide numbers in January 2020 ($n = 1,678$) were unchanged from those in January 2019 ($n = 1,684$), whereas suicide numbers in April 2020 ($n = 1,487$) dropped to approximately 82% of those in April 2019 ($n = 1,814$) (Figure 1).

Individuals who experienced increased suicidal ideation during the pandemic were in their 30s, in precarious employment, with low household income, had no children, and were receiving psychiatric care. Japan's gross domestic product fell 27.8% on an annualized basis in April–June, as economic activity stalled owing to the state of emergency (Japanese Cabinet Office, 2020). This worsening economic environment is likely to have exacerbated suicidal ideation among relatively young (20–40 years) and low-income individuals in precarious employment. The absence of children was also associated with worsening suicidal ideation. During the state of emergency, people were asked to spend more time at home, although there was no strict movement restriction. Individuals with no children are more likely to live alone, so some may have spent most of the emergency period at home alone. Our findings suggest that such individuals may have experienced increased suicidal ideation.

Comparison of the groups with/without suicidal ideation before the pandemic showed differences in the characteristics of those individuals more adversely affected. In participants with no suicidal ideation before the pandemic, suicidal ideation was worse among relatively young individuals attending psychiatric hospitals. However, in participants with suicidal ideation before the pandemic, unstable employment and low household income contributed to worsening suicidal ideation. During

the pandemic, people with mental health vulnerabilities may be most likely to have increased suicidal ideation, followed by those with economic instability. For groups at particularly high risk of suicide, implementing financial support alongside mental health treatment may be important in reducing suicide risk.

Comparison with previous studies

Several studies, including one in Japan (Ueda et al., 2020), indicate that the general population's mental health may have deteriorated during the COVID-19 pandemic (Salari et al., 2020); however, the present findings seem to contradict these previous results. Durkheim's theory that increased social integration reduces suicide in society as a whole may provide a possible explanation. The current pandemic crisis requires efforts by all members of society, and working towards a common goal may have increased social cohesion levels. Although no Japanese study has investigated whether people have experienced changes in social connectedness during the pandemic, a study in the United Kingdom in June 2020 found that 47%, 45%, and 31% of survey respondents felt more connected with their family members, neighbors, and local community, respectively, during lockdown (Abrams et al., 2020). Studies on the effect of natural and human-induced disasters on suicide (Matsubayashi et al., 2013; Orui et al., 2018; Safarpour et al., 2020) show that suicide rates tend to rise after a large disaster (Safarpour et al., 2020), but can temporarily drop after a natural disaster, as long as the scale of the disaster is not very large (Matsubayashi et al., 2013). This is because social integration tends to increase after natural disasters, which can protect against suicide risk (Matsubayashi et al., 2013). Thus, greater social integration during this pandemic may have counteracted the effect of deteriorating mental health, preventing vulnerable individuals from developing suicidal ideation. However, previous disaster studies also suggest that the reduction in suicide numbers in Japan may be shortly followed by an increase. Indeed, suicide numbers returned to their usual level in July 2020 (Figure 1), which calls for careful monitoring in the upcoming months.

Importantly, some groups are experiencing higher suicidal ideation levels during the pandemic, although the overall suicidal ideation level has slightly decreased. Individuals whose mental health has deteriorated during the pandemic and those whose suicidal ideation has worsened share many similarities. Mental health during this pandemic is worse among younger people (Ahmed et al., 2020; Salari et al., 2020; Ueda et al., 2020), although older people have a higher mortality rate from COVID-19 infection. Unemployment or precarious employment for self/family also contribute to poor mental health (Cao et al., 2020; Ueda et al., 2020). Young age and unstable employment were associated with increased suicidal ideation in this study. However, the presence of close others, such as living with family members, may protect against poor mental health (Cao et al., 2020), which is consistent with our finding that the presence of children protects against suicidal ideation. There is an urgent need to implement a system of care for these at-risk groups, particularly if suicide numbers begin to rise in the near future.

Strengths and limitations

This is the first prospective cohort study to examine the effect of a pandemic on suicidal ideation. A major study strength is that suicidal ideation was measured before the pandemic. To the best of our knowledge, no longitudinal studies have tracked suicidal ideation levels from pre-pandemic to pandemic periods.

Study limitations include the possibility that participants who became suicidal during the pandemic were more likely to have been excluded from the T2 survey. Of the 9,982 participants who completed the T1 survey, approximately 33% did not complete the T2 survey. If individuals whose suicidal ideation increased after the T1 survey tended to drop out of the T2 survey, this could have resulted in a reduction in suicidal ideation at T2. However, there was no discernible difference in demographic characteristics between the T1 and T2 respondents. Additionally, the generalization of results requires caution. This was a relatively short-term longitudinal survey. At the time of the study, COVID-19 infections and deaths in Japan were relatively lower than in other developed countries (Worldometers, 2020). It is unclear whether the present findings can be generalized to severely affected areas, as disaster severity can affect subsequent variations in suicide rates (Matsubayashi et al., 2013).

Conclusions and future research

Despite its limitations, this is the first longitudinal study to track suicidal ideation levels before and during the COVID-19 pandemic. Although the short-term effect of the pandemic on suicidal ideation was limited for the whole sample, relatively young and economically vulnerable people showed a higher risk of developing suicidal ideation during the pandemic. Pandemics may have a long-term effect on suicide risks (Chan et al., 2006; Cheung et al., 2008; Honigsbaum, 2010; Wasserman, 1992; Yip et al., 2010); thus, additional research is needed to understand the long-term consequences of the current pandemic and to protect vulnerable individuals.

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Figure 1 Monthly COVID-19 infections and suicide deaths in Japan

Figure 2 Research design

Table 1 Participant characteristics

	Total (<i>n</i> = 6,683)		Non-suicidal group (<i>n</i> = 3,518)		Suicidal group (<i>n</i> = 3,165)	
	<i>n</i> /Mean	%/ <i>SD</i>	<i>n</i> /Mean	%/ <i>SD</i>	<i>n</i> /Mean	%/ <i>SD</i>
Men: <i>n</i> , %	3,422	51.2	1,823	51.8	1,599	50.5
Age: Mean, <i>SD</i>	46.5	13.8	49.2	13.9	43.5	13.0
20s: <i>n</i> , %	942	14.1	380	10.8	562	17.8
30s: <i>n</i> , %	1,373	20.5	607	17.3	766	24.2
40s: <i>n</i> , %	1,530	22.9	751	21.3	779	24.6
50s: <i>n</i> , %	1,559	23.3	873	24.8	686	21.7
>60s: <i>n</i> , %	1,279	19.1	907	25.8	372	11.8
Educational background: <i>n</i> , %						
junior high school/high school	1,894	28.3	944	26.8	950	30.0
specialized training college/two-year college	1,425	21.3	737	20.9	688	21.7
university/graduate school	3,364	50.3	1,837	52.2	1,527	48.2
Employment: <i>n</i> , %						
permanent employee	2,794	41.8	1,504	42.8	1,290	40.8
part-time, temporary worker	1,323	19.8	654	18.6	669	21.1
self-employed	382	5.7	208	5.9	174	5.5
unemployed	825	12.3	394	11.2	431	13.6
full-time homemaker	986	14.8	615	17.5	371	11.7
other	373	5.6	143	4.1	230	7.3
Marital status: <i>n</i> , %						
married	3,779	56.5	2,315	65.8	1,464	46.3
not married	2,371	35.5	931	26.5	1,440	45.5
bereaved	113	1.7	67	1.9	46	1.5
divorced	420	6.3	205	5.8	215	6.8
With child/children: <i>n</i> , %	3,340	50.0	2,055	58.4	1,285	40.6
Household income: <i>n</i> , %						
unknown	1,272	19.0	650	18.5	622	19.7
<JPY 400 million	1,866	27.9	829	23.6	1,037	32.8
JPY 400–800 million	2,227	33.3	1,215	34.5	1,012	32.0
>JPY 800 million	1,318	19.7	824	23.4	494	15.6
Residential area: special alert area: <i>n</i> , %	3,396	50.8	1,832	52.1	1,564	49.4
Current psychiatric care: <i>n</i> , %	744	11.1	199	5.7	545	17.2
Suicidal ideation at T1: Mean, <i>SD</i>	1.71	2.59	0.00	0.00	3.61	2.71
Suicidal ideation at T2: Mean, <i>SD</i>	1.59	2.56	0.31	0.90	3.02	3.01

Table 2 Multiple regression analysis: suicidal ideation (T2) as the dependent variable

	Total					Non-suicidal group					Suicidal group				
	<i>B</i>	95% CI		β	<i>p</i>	<i>B</i>	95% CI		β	<i>p</i>	<i>B</i>	95% CI		β	<i>p</i>
		lower	upper				lower	upper				lower	upper		
Men	-.01	-0.10	0.08	.00	.858	-.05	-0.12	0.03	-.03	.241	.01	-0.15	0.18	.00	.888
Age															
20s	.13	-0.03	0.29	.02	.109	.29	0.17	0.42	.10	<.001	.00	-0.31	0.32	.00	.978
30s	.27	0.13	0.41	.04	<.001	.25	0.14	0.35	.10	<.001	.28	-0.01	0.56	.04	.057
40s	.12	-0.01	0.25	.02	.072	.13	0.03	0.22	.06	.012	.12	-0.16	0.39	.02	.413
50s	.06	-0.06	0.19	.01	.329	.05	-0.05	0.14	.02	.321	.06	-0.22	0.33	.01	.689
>60s (reference)															
Educational background															
junior high school/high school	.09	0.00	0.18	.02	.060	.10	0.02	0.17	.05	.010	.07	-0.11	0.25	.01	.432
specialized training college/ two-year college	-.02	-0.13	0.08	.00	.649	-.01	-0.09	0.07	.00	.789	-.05	-0.24	0.14	-.01	.621
university/graduate school (reference)															
Employment															
permanent employee (reference)															
part-time, temporary worker	.15	0.04	0.26	.02	.009	.02	-0.08	0.11	.01	.739	.26	0.06	0.47	.04	.013
self-employed	.02	-0.15	0.19	.00	.848	.00	-0.13	0.13	.00	.977	.00	-0.33	0.33	.00	.981
unemployed	.05	-0.09	0.19	.01	.473	-.08	-0.19	0.04	-.03	.202	.14	-0.11	0.39	.02	.265
full-time homemaker	.05	-0.09	0.19	.01	.504	-.05	-0.16	0.06	-.02	.352	.12	-0.16	0.40	.01	.411
other	.13	-0.05	0.30	.01	.152	-.04	-0.20	0.12	-.01	.589	.24	-0.06	0.54	.02	.114
Marital status															
married (reference)															
not married	.01	-0.12	0.14	.00	.869	-.10	-0.20	0.00	-.05	.052	.12	-0.12	0.36	.02	.340
bereaved	.22	-0.08	0.51	.01	.152	.02	-0.20	0.24	.00	.857	.55	-0.06	1.16	.02	.076
divorced	.16	-0.01	0.32	.01	.063	.00	-0.13	0.14	.00	.962	.32	0.01	0.63	.03	.044
With child/children	-.12	-0.23	-0.01	-.02	.030	-.07	-0.16	0.01	-.04	.105	-.18	-0.39	0.04	-.03	.106
Household income															
unknown	.09	-0.03	0.22	.01	.155	.05	-0.05	0.15	.02	.309	.20	-0.05	0.46	.03	.120
<JPY 400 million	.16	0.04	0.28	.03	.009	.07	-0.03	0.17	.03	.159	.32	0.08	0.56	.05	.008
JPY 400–800 million	.03	-0.08	0.14	.01	.580	.02	-0.06	0.10	.01	.597	.10	-0.12	0.33	.02	.357
>JPY 800 million (reference)															
Residential area: special alert area	-.07	-0.15	0.01	-.01	.072	-.01	-0.07	0.05	-.01	.702	-.13	-0.27	0.02	-.02	.083

Current psychiatric care	.17	0.04	0.29	.02	.008	.19	0.06	0.32	.05	.004	.14	−0.05	0.34	.02	.156
Suicidal ideation at T1	.76	0.74	0.78	.77	<.001	-	-	-	-	-	.79	0.76	0.82	.71	<.001

Bold: $p < .05$

CI: confidence interval.