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The Impact of the COVID-19 Pandemic on Calls to a National Suicide Prevention Hotline in Taiwan: An Analysis of Time Trend and Characteristics of Calls

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ABSTRACT

We investigated the impact of the COVID-19 pandemic on call volumes and call characteristics using data from a national crisis helpline. Data were extracted for 215,066 calls to Taiwan's national suicide prevention hotline (January 2018–May 2020). We used negative binomial regression to investigate changes in the weekly number of calls during the early period of the COVID-19 outbreak (January 21, 2020–May 25, 2020), relative to that expected according to the pre-pandemic trend. The call characteristics during the pandemic period (February 18, 2020–May 31, 2020) were compared between COVID-19 related vs unrelated calls. Higher-than-expected call volumes started from the 6th week of the pandemic and reached a peak in the 14th week, which was 38% (rate ratio = 1.38, 95% confidence interval 1.26–1.51) higher than that expected based on the pre-pandemic trend. The higher-than-expected call volumes were mainly attributable to higher-than-expected calls from non-suicidal and male callers. Calls in which COVID-19 was mentioned (13.2%) were more likely to be from male and first-time callers, occur outside 12 am–6 am, last less than 5 min, and were less likely to be from callers who had previous suicide attempts, recent suicidal ideation or suicide plans or actions than COVID-19 unrelated calls. Callers who made COVID-19 related calls were more likely to request information than other callers. Crisis helplines should strategically adapt to the increased need and callers' specific concerns related to the outbreak.

KEYWORDS

COVID-19; crisis helpline; suicide; Taiwan; trend

INTRODUCTION

The COVID-19 pandemic has presented unprecedented challenges to population health, including mental health. There are concerns that the negative impacts of the pandemic and control measures on mental health may increase suicide risk in the population (Gunnell et al., 2020; Holmes et al., 2020). Research to date has shown mixed results regarding the impact of the COVID-19 pandemic on suicidal behaviors (John et al., 2020). Pirkis et al. (2021) found that suicide rates remained unchanged or slightly decreased in 21 high-income or upper-middle-income countries during the early months

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of the pandemic. A recent updated analysis based on data from 33 countries found no evidence of greater-than-expected numbers of suicides in the majority of countries/areas-within-countries investigated during the first 9-15 months of the COVID-19 pandemic (Pirkis et al., 2022). By contrast, some survey studies showed that suicidal ideation and suicide plans or actions increased during the pandemic compared to pre-pandemic baseline data (Czeisler et al., 2020; Knudsen et al., 2021). There is an urgent need to closely monitor the effect of the COVID-19 pandemic on population mental health and suicide risk (John et al., 2020; Pirkis et al., 2021; Pirkis et al., 2022).

Suicide researchers have used data from various sources to investigate the potential effect of the COVID-19 pandemic on suicide risk. These include analyses of changes in suicide rates using official mortality statistics of suicide (Calderon-Anyosa & Kaufman, 2021; Chen, Yang, Pinkney, & Yip, 2022; Lin, Chang, & Shen, 2021; Ueda, Nordstrom, & Matsubayashi, 2022), changes in the prevalence and correlates of suicidal ideation using cross-sectional survey data (Chen, Wu, & Gau, 2021; Czeisler et al., 2020; Daly et al., 2021; Niederkrotenthaler et al., 2022; O'Connor et al., 2021; Winkler et al., 2020; Wu et al., 2022), and trends in hospital admissions for suicide attempts/self-harm using service utilization data (Bergmans & Larson, 2021; Carr et al., 2021; Hawton et al., 2021; Jollant et al., 2021; Liu, Chen, Chen, & Yeh, 2022; McIntyre, Tong, McMahon, & Doherty, 2021). However, most of these study designs are insufficiently fine-grained to investigate short-term (e.g., daily or weekly) changes in suicidal behavior and many lack high-quality pre-pandemic data. Furthermore, health-care utilization studies could be confounded by pandemic-related restrictions on access to health services (John et al., 2020).

Due to the impacts of the pandemic and control measures, access to many mental health services and face-to-face supports was disrupted. Crisis helplines became a critical source of support for individuals with mental health needs (Gunnell et al., 2020; Niederkrotenthaler et al., 2020). The crisis helplines may thus provide useful real-time longitudinal data to shed light on the extent to which the COVID-19 pandemic influenced population mental health and suicide risk (Arendt, Markiewitz, Mestas, & Scherr, 2020). A few studies based on crisis helpline data indicated that the number of calls or chats appeared to increase during the COVID-19 pandemic (Arendt et al., 2020; Batchelor, Stoyanov, Pirkis, & Kolves, 2021; Brulhart, Klotzbucher, Lalive, & Reich, 2021; Zalsman et al., 2021). A recent report from UK Samaritans showed a 23% increase in emails received as well as a 12% increase in phone calls received at night (2 am–6 am) in the year since the lockdown began, compared to the previous year (Samaritans, 2021). The UK Samaritans report also showed that calls with COVID-19 related concerns tended to increase in times of tighter restrictions, and these COVID-19 related calls tended to last longer than other calls, suggesting a greater need for support. However, other studies of the characteristics and main concerns of helpline callers showed that callers who presented with COVID-19 related problems were less likely to be suicidal than those presenting with problems not related to COVID-19 (Tong et al., 2021; Zhao et al., 2021). Further studies of the trends and characteristics of calls to crisis helplines during the pandemic are needed.

Taiwan is an island country with a population of 23 million and is close to the epicenter of the COVID-19 outbreak in China. The first COVID-19 case in Taiwan was identified on January 21, 2020, and there was a peak of COVID-19 cases ($n = 129$) in the week of

March 17–March 23, 2020. With a combination of case-based (including contact tracing and quarantine) and population-based (including border control, physical distancing, and face masks) interventions (Ng et al., 2021), Taiwan was initially successful in containing the COVID-19 outbreak, with a total of only 799 cases and seven deaths in 2020. However, government-imposed outbreak control measures severely disrupted daily life, and the pandemic caused a high level of uncertainty and anxiety in the population during the early months of the outbreak (Wong, Hung, Alias, & Lee, 2020). Recent national survey studies in Taiwan showed that concerns related to job or finance were common during the COVID-19 outbreak in 2020 (Chen et al., 2021; Wu et al., 2022). Although recent studies showed that overall suicide rates decreased slightly in Taiwan in 2020 (Chen et al., 2022; Lin et al., 2021), a hospital-based study of emergency department presentations showed an increase in the proportion of patients presenting with self-harm during the pandemic compared with the year before the pandemic (Liu et al., 2022). Moreover, in 2020, Taiwan's national suicide prevention hotline received a total number of 104,501 calls, which is 14% higher than that in 2019 (Taipei Lifeline Association, 2021).

Taiwan's national suicide prevention hotline has been maintained by the same organization (i.e., Taipei Lifeline Association) since its founding in 2009 and is an important source of emotional support for people in crisis in the country (Shaw & Chiang, 2019). The hotline offers 24-h free counseling and crisis intervention services. Hotline helpers are social workers or volunteers who are trained using Taipei Lifeline Association's service model and practice framework. The data of calls made to the national suicide prevention hotline provided an opportunity to obtain a timely understanding of the population mental health need and suicide risk during the COVID-19 pandemic.

This study aimed to investigate the impact of the COVID-19 pandemic on trend in call volume to Taiwan's national suicide prevention hotline during the early months of the pandemic. We also compared the characteristics of COVID-19 related and unrelated calls. We hypothesized that call volume to the hotline would be higher than that expected during the COVID-19 outbreak and this could be due to factors, such as increased levels of worries related to job or financial concerns, rather than increased prevalence of suicide risk. We also hypothesized that the COVID-19 related calls would show some distinct characteristics compared with unrelated calls.

METHODS

Data

Data for calls to Taiwan's national suicide prevention hotline were extracted from a computerized information system maintained by the Taipei Lifeline Association (Shaw & Chiang, 2019). The system automatically captures the following information: incoming number, date and time of the call, and previous call history. Hotline helpers routinely record the following information using a structured form: sex, age, call duration, preexisting mental health conditions, previous suicide attempt, recent suicidal ideation, current suicide plans or actions, and main presenting problems.

On January 21, 2020, the first COVID-19 case was identified in Taiwan. From January 23, 2020, the hotline helpers started to mark calls in which COVID-19 was mentioned, as requested by the Ministry of Health and Welfare. From February 18,

2020, the helpers also started to record the quarantine status and COVID-19 related problems for callers who mentioned COVID-19.

Taiwan's national suicide prevention hotline received a total of 215,066 calls between January 1, 2018, and May 31, 2020. The calls that were "hung up immediately when connected," "wrong number," "silent calls," or with a conversation time less than two min ($n = 43{,}315$, 20.1%) were excluded from all analyses.

For analysis of trend in call volume, we included 29,017 calls during the *pandemic period* (January 21–May 25, 2020, 18 weeks) and 141,197 calls during the *pre-pandemic period* (January 2, 2018–January 20, 2020, 107 weeks). For analysis of calls' characteristics, 24,740 calls between February 18 and May 31, 2020, were included; information for COVID-19 related problems and quarantine status of callers was collected only during this period.

Data for the daily number of COVID-19 confirmed cases in Taiwan were retrieved from the website of the Ministry of Health and Welfare (Ministry of Health & Family Welfare, 2021).

Approval for this study was granted by The Research Ethics Committee C, National Taiwan University Hospital, Taipei, Taiwan (reference number 202004065RINC).

Statistical Analysis

We calculated the weekly numbers of all calls, calls for suicidal concerns, and calls related to work and finance problems in males and females combined, males, and females during the pre-pandemic and pandemic periods. The calls in which recent suicidal ideation or current suicide plans or actions were mentioned were classified as suicidal calls, whilst others were classified as non-suicidal calls. We also calculated the weekly number of confirmed COVID-19 cases.

Trends in the weekly number of calls and COVID-19 cases were first examined graphically. Negative binomial regression was then used to estimate the rate ratio (RR) of call volumes and its 95% confidence interval (CI) for each week during the pandemic period relative to that expected based on the pre-pandemic trend. Regression analyses were conducted for all calls, calls by sex (male vs female) and suicidality (suicidal vs non-suicidal), calls related to work and finance problems, and calls not related to COVID-19 (i.e., all calls excluding COVID-19 related calls). Regression analyses were not conducted for COVID-19 related calls as, by definition, no data were available for the pre-pandemic period. We controlled for both the long-term trends (entered as fractional polynomials to account for non-linear trends) (Royston & Altman, 1994) and seasonal variations (entered as Fourier terms) (Stolwijk, Straatman, & Zielhuis, 1999) in the regression models. The fractional polynomials could account for trends in call volumes before the pandemic over the period from January 2, 2018–January 20, 2020 (107 weeks). The effect of time was modeled as a non-linear predictor; if this did not improve the fitting of data beyond a linear model, we used the linear model instead. Non-linear time trends were estimated based on the best fitting model selected from a series of fractional polynomial models. The Fourier terms are pairs of sine and cosine functions and can describe the seasonal pattern when included in the regression models.

For the analysis of calls' characteristics, the calls between February 18 and May 31, 2020 were classified as COVID-19 related or unrelated, and COVID-19 related calls were further grouped according to the quarantine status of callers. The following characteristics were compared across different groups of calls: sex (female vs male), age (0–29, 30–59, and 60+, or unknown), first-time caller (yes/no), time of calls (night [12 am–6 am], morning [6 am–12 pm], afternoon [12 pm–6 pm], and evening [6 pm–12 am]), call duration (2–5, 6–10, 11–20, 21–30, and 30+ min), pre-existing mental health conditions (yes/no), previous suicide attempt (yes/no), recent suicidal ideation (yes/no), current suicide plans or actions (yes/no), main presenting problems (family and relationships, mental health and substance use, physical health, work and finance, legal issues, information requests, and other issues), and COVID-19 related presenting problems (physical symptoms [e.g., fever]; access to health care services; quarantine regulations; access to personal protective materials [e.g., face mask]; work, economic, or care problems; mental symptoms [e.g., anxiety]; and other problems).

Binary logistic regression models were used to compare the characteristics between COVID-19 related and unrelated calls (reference group). Multinomial logistic regression models were used to compare the call characteristics amongst callers of different quarantine statuses (quarantined vs non-quarantined [reference group] vs unknown). Results of sex-adjusted regression analyses were presented. All analyses were conducted using Stata Statistical Software Version 15.

RESULTS

There were on average 1,320 ($SD = 153$) and 1,612 ($SD = 167$) calls per week during pre-pandemic and pandemic periods, respectively (see Supplementary Table 1 for details). When compared with the same periods in 2018 and 2019, the pandemic period in 2020 showed an increase in call volume—the weekly average number of calls was 1,116 ($SD = 58$), 1,325 ($SD = 99$), and 1,612 ($SD = 167$) in 2018, 2019, and 2020, respectively (Supplementary Table 1).

Call volumes showed an upward trend during the pre-pandemic period and were higher than expected during the COVID-19 outbreak, with two peaks in the 9th week (late March) and the 14th week (late April) into the pandemic (Figure 1). The first peak corresponded to the period with the highest incidence of COVID-19 cases, whilst the second and larger peak occurred following a cluster of COVID-19 infection amongst crew members of a military supply ship that occurred in the 13th week into the pandemic. The cluster was extensively covered by the media and caused anxiety and worries in the population about possible further mass outbreaks.

Negative binomial regression analyses showed that the weekly number of calls became higher than that expected according to the pre-pandemic trend from the 6th week into the pandemic and reached a peak in the 14th week, which was 38% (RR = 1.38, 95% CI 1.26–1.51) higher than the expected value (Figure 2a; Supplementary Table 2). The higher-than-expected call volumes over the pandemic period were mainly found in male callers (Figure 2b)

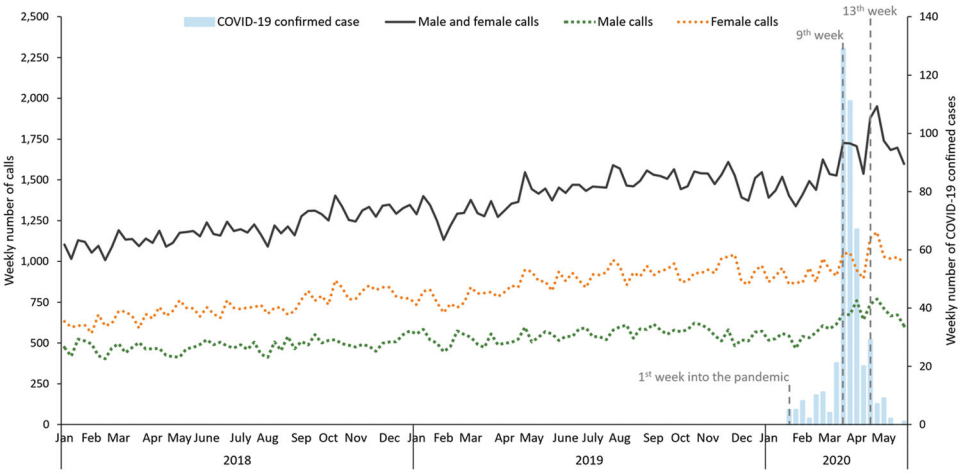

FIGURE 1. Weekly number of calls to a national suicide prevention hotline and COVID-19 confirmed cases in Taiwan between January 2, 2018 and May 25, 2020 (125 weeks). The 1st week of the COVID-19 outbreak started from January 21, 2020, when the first confirmed case was identified in Taiwan. The peak of the number of confirmed cases occurred in the 9th week into the outbreak, coinciding with the 1st peak of call volumes to the national suicide prevention hotline. The largest cluster of COVID-19 infection amongst crew members of a military supply ship was identified in the 13th week into the outbreak, followed by the 2nd peak of call volumes to the national suicide prevention hotline in the 14th week.

The higher-than-expected call volumes were mainly found for non-suicidal calls, which showed a relative peak (RR = 1.40, 95% CI 1.27–1.55) in the 14th week (Figure 2d; Supplementary Table 3). Similarly, the higher-than-expected volumes of non-suicidal calls were mainly found in males (Figure 2e). By contrast, the number of suicidal calls was higher than that expected in only two weeks, i.e., the 10th and 17th weeks into the pandemic (Figure 2g; Supplementary Table 4). Regarding the calls related to work and finance problems, the higher-than-expected call volumes showed a similar temporal pattern to that of all calls (Figure 2j; Supplementary Table 5).

When excluding the calls related to COVID-19, no change in call volume trend was found during the pandemic period (Figure 2m; Supplementary Table 6), indicating that the higher-than-expected overall call volumes over the pandemic period were attributable to COVID-19 related calls. Analyses stratified by sex showed higher-than-expected call volumes in males (Figure 2n; Supplementary Table 6) between weeks 11 and 17 of the pandemic, in contrast to lower-than-expected call volumes in females in most of the weeks during the pandemic (Figure 2o; Supplementary Table 6).

Amongst a total of 24,740 calls between February 18 and May 31, 2020, 3,263 (13.2%) were marked by helpers as COVID-19 related (Table 1). Compared with calls that were not related to COVID-19, COVID-19 related calls were more likely to be from male callers (42% vs 39%; odds ratio [OR] = 1.12, 95% CI 1.04–1.21) and first-time callers (64% vs 21%; sex-adjusted OR [aOR] = 6.86, 95% CI 6.34–7.43); occur outside 12 am–6 am (87% vs 81%), and last less than 5 min (50% vs 26%); and were less likely to be from callers who had a preexisting mental health conditions (27% vs 67%; aOR = 0.18, 95% CI 0.16–0.19), previous suicide attempt (15% vs 37%; aOR = 0.30,

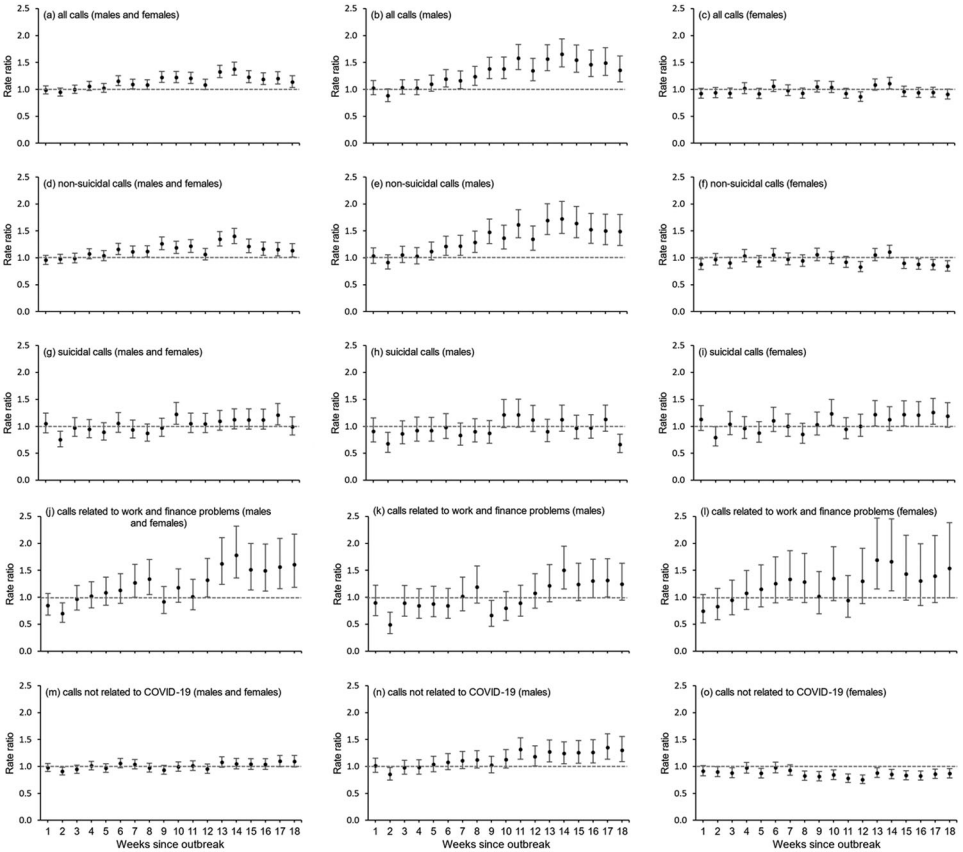

FIGURE 2. Rate ratios and 95% confidence intervals between the observed number of calls and that expected based on pre-pandemic trend (January 2, 2018–January 20, 2020, 107 weeks), by week, during the pandemic period (January 21–May 25, 2020, 18 weeks), for all calls (a, b, c), non-suicidal calls (d, e, f), suicidal calls (g, h, i), calls related to work and finance problems (j, k, l), and calls not related to COVID-19 (i.e., excluding COVID-19 related calls) (m, n, o). Vertical lines represent 95% confidence intervals.

95% CI 0.27–0.33), recent suicidal ideation (10% vs 21%; aOR = 0.43, 95% CI 0.38–0.48), or current suicide plans or actions (0.3% vs 1.1%; aOR = 0.26, 95% CI 0.13–0.50). Age was missing in half of the COVID-19 related calls, compared to 10% in unrelated calls, mainly due to the short duration of COVID-19 related calls that limited the opportunity to collect detailed information about the callers.

Regarding the main presenting problems, callers who made COVID-19 related calls were more likely to request information (46% vs 3%; aOR = 24.49, 95% CI 22.14–27.10) or present other issues (11% vs 10%; aOR = 1.15, 95% CI 1.02–1.29) and were less likely to report problems related to family and relationships (14% vs 36%; aOR = 0.30, 95% CI 0.27–0.34), mental health and substance use (17% vs 37%; aOR = 0.35, 95% CI 0.32–0.38), work and finance (7% vs 9%; aOR = 0.75, 95% CI 0.65–0.86), or legal issues (0.2% vs 0.8%; aOR = 0.21, 95% CI 0.09–0.48). A comparison of callers of different quarantine statuses showed that the characteristics of COVID-19 related calls (Table 1) were more likely to be found in quarantined callers (Supplementary Table 7).

TABLE 1. Comparison of characteristics and logistic regression analysis of COVID-19 related vs unrelated calls (reference group) to Taiwan's national suicide prevention hotline between February 18 and May 31, 2020.

	Total ($n = 24,740$)		COVID-19 related calls ($n = 3,263$)		COVID-19 unrelated calls ($n = 21,477$)					
Characteristics	*n*	(%)	*n*	(%)	*n*	(%)	aOR[a]	(95% CI)		*p*
Sex										
Female	14,950	(60.4)	1,892	(58.0)	13,058	(60.8)	Ref			
Male	9,790	(39.6)	1,371	(42.0)	8,419	(39.2)	1.12	(1.04	, 1.21)	0.002
Age										
0–29	5,220	(21.1)	284	(8.7)	4,936	(23.0)	0.71	(0.62	, 0.81)	<0.001
30–59	13,601	(55.0)	1,028	(31.5)	12,573	(58.5)	Ref			
60+	2,163	(8.7)	336	(10.3)	1,827	(8.5)	2.26	(1.98	, 2.59)	<0.001
Unknown	3,756	(15.2)	1,615	(49.5)	2,141	(10.0)	9.24	(8.44	, 10.11)	<0.001
First-time caller	6,553	(26.5)	2,094	(64.2)	4,459	(20.8)	6.86	(6.34	, 7.43)	<0.001
Time of calls										
Night (12 am–6 am)	4,403	(17.8)	414	(12.7)	3,989	(18.6)	Ref			
Morning (6 am–12 pm)	5,437	(22.0)	780	(23.9)	4,657	(21.7)	1.62	(1.43	, 1.84)	<0.001
Afternoon (12 pm–6 pm)	7,451	(30.1)	1,171	(35.9)	6,280	(29.2)	1.81	(1.60	, 2.03)	<0.001
Evening (6 pm–12 am)	7,449	(30.1)	898	(27.5)	6,551	(30.5)	1.32	(1.17	, 1.50)	<0.001
Call duration (min)										
2–5	7,117	(28.8)	1617	(49.6)	5,500	(25.6)	Ref			
6–10	6,003	(24.3)	634	(19.4)	5,369	(25.0)	0.40	(0.36	, 0.44)	<0.001
11–20	5,944	(24.0)	538	(16.5)	5,406	(25.2)	0.34	(0.30	, 0.38)	<0.001
21–30	2,770	(11.2)	272	(8.3)	2,498	(11.6)	0.37	(0.32	, 0.42)	<0.001
30+	2,906	(11.7)	202	(6.2)	2,704	(12.6)	0.25	(0.22	, 0.30)	<0.001
Preexisting mental health conditions	15,343	(62.0)	872	(26.7)	14,471	(67.4)	0.18	(0.16	, 0.19)	<0.001
Previous suicide attempt	8,359	(33.8)	477	(14.6)	7,882	(36.7)	0.30	(0.27	, 0.33)	<0.001
Recent suicidal ideation	4,926	(19.9)	338	(10.4)	4,588	(21.4)	0.43	(0.38	, 0.48)	<0.001
Current suicide plans or actions	236	(1.0)	9	(0.3)	227	(1.1)	0.26	(0.13	, 0.50)	<0.001
Main presenting problems										
Family and relationships	8,151	(32.9)	470	(14.4)	7,681	(35.8)	0.30	(0.27	, 0.34)	<0.001
Mental health and substance use	8,585	(34.7)	565	(17.3)	8,020	(37.3)	0.35	(0.32	, 0.38)	<0.001
Physical health	1,088	(4.4)	138	(4.2)	950	(4.4)	0.95	(0.79	, 1.14)	0.57
Work and finance	2,102	(8.5)	220	(6.7)	1,882	(8.8)	0.75	(0.65	, 0.86)	<0.001
Legal issues	186	(0.8)	6	(0.2)	180	(0.8)	0.21	(0.09	, 0.48)	<0.001
Information requests	2,242	(9.1)	1,512	(46.3)	730	(3.4)	24.49	(22.14	, 27.10)	<0.001
Other issues	2,386	(9.6)	352	(10.8)	2,034	(9.5)	1.15	(1.02	, 1.29)	0.024

aaOR: sex-adjusted odds ratio in the logistic regression analysis.

Compared to non-quarantined callers, quarantined callers were also more likely to report physical symptoms and problems associated with access to health care services and quarantine regulations.

DISCUSSION

Main Findings

The volume of calls to Taiwan's national suicide prevention hotline was higher than that expected during the two peaks of COVID-19 cases in the early months of the pandemic (late January–May 2020), in keeping with our hypothesis. The first peak of call volumes corresponded to the peak of COVID-19 cases over this period, whilst the second and larger peak (38% higher-than-expected) occurred in the week following the largest cluster of COVID-19 infection in the country during the study period, which triggered extensive anxiety of further spread of the infection. The higher-than-expected call volumes were mainly attributable to higher-than-expected calls from non-suicidal and male callers. The higher-than-expected volumes of calls related to work and finance problems showed a similar temporal pattern to that of all calls. No change in call volume trend was found when excluding COVID-19 related calls. Compared with calls unrelated to COVID-19, related calls (13.2% of all calls in the period) were more likely to be from male and first-time callers, occur outside 12 am–6 pm, last less than 5 min, and the callers were less likely to report a previous suicide attempt, recent suicidal ideation, or current suicide plans or actions. Nearly half (46%) of callers who made COVID-19 related calls requested information and were less likely to present with problems of other categories than callers who made COVID-19 unrelated calls.

Strengths and Limitations

This study is amongst the first examining the impact of the COVID-19 pandemic on trends and characteristics of calls made to national crisis helplines. There are several limitations of this study. First, this is an ecological analysis, and the observed temporal association between the peak and cluster of COVID-19 cases and the higher-than-expected hotline call volumes cannot be directly inferred as causal. Second, we may have underestimated the increased need for the hotline service by using data for answered calls, as the proportion of calls being answered may have decreased somewhat as a result of the fixed capacity of hotline service during the pandemic period. According to the annual report of the national hotline, the percentage of answered calls decreased slightly from 66% in 2019 to 59% in 2020 due to the increased demand (Taipei Lifeline Association, 2021). Third, data on callers' suicidality, main presenting problems, and quarantine status were based on the caller's self-reports and the helpers' assessment; the data quality might be limited. There was also substantial data missing on age and quarantine status. Furthermore, the severity of callers' mental health conditions was not systematically assessed based on standardized procedures.

Comparison With Previous Findings

Our data showed higher-than-expected call volumes to Taiwan's national hotline during the early months of the COVID-19 pandemic (March and April 2020), and such a change in trend appeared to be temporally associated with some significant events related to the COVID-19 outbreak (i.e., the peak of COVID-19 cases, and a cluster of infections amongst crew members of a military supply ship that caused concerns of a possible national outbreak). The finding is in keeping with those based on data from crisis helplines or online chat services from other countries. In one study from Israel, Zalsman et al. (2021) reported that the number of contacts to an internet-based national crisis chat hotline service was higher in the first half of 2020 during the pandemic than in the same period in 2019 before the pandemic. The study also reported a marked rise in suicide-related chats during the lockdown. Another study from Austria and Germany showed that the call volumes to the national crisis hotlines temporarily increased following the implementation of restrictive governmental measures to contain the pandemic and subsequently decreased after these measures were relaxed (Arendt et al., 2020). A third study from Australia showed that the number of attempts to contact Kids Helpline, the Australian national youth helpline, increased at two-time points when the pandemic was first declared and when parts of Australia experienced a second wave of infections (Batchelor et al., 2021). Based on data from 21 helplines in 19 countries, Brulhart et al. (2021) reported that the total call volume peaked six weeks after the initial local outbreak. These findings suggest that the COVID-19 pandemic may cause substantial anxiety and distress in the population and contribute to the increase in calls to crisis helplines during the early phase of the pandemic.

Our data indicated that the higher-than-expected call volumes to the national hotline during the pandemic period were mainly attributable to calls from male callers. This is in contrast to findings from the Israeli study, which showed an increase in contacts with a national crisis chat hotline service mainly in females (Zalsman et al., 2021), and the Australian study, which showed an increase in contacts with the national youth helpline mainly in girls (Batchelor et al., 2021). Previous studies suggested that females were more likely to seek help from suicide prevention hotlines or chat services than males (Mokkenstorm et al., 2017), and this may contribute to the finding of an increase in calls mainly from females in the Israeli and Australian studies. Our data showed the opposite sex pattern, however, and this could be due to different motivations of making calls to the national hotline in Taiwan during the COVID-19 pandemic—the higher-than-expected number of calls to Taiwan's national hotline was mainly from calls not related to immediate suicide risk, and nearly half of COVID-19 related calls were about requesting information, presumably related to the COVID-19. Furthermore, this could also be because more males traveled home from abroad and were quarantined, or males were more likely to be affected by the economic impact of the pandemic; therefore, they made more calls requesting for COVID-19 related information or presenting with job or work problems to the national hotline than females.

Our data showed that the higher-than-expected call volumes to Taiwan's national hotline were mainly attributable to non-suicidal calls; in contrast, the trend in the number of calls from callers who presented with suicide risk showed no apparent changes during the pandemic. This is in keeping with findings from a recent study in Taiwan

that showed a small decrease in suicide in 2020, i.e., the first year of the COVID-19 pandemic (Chen et al., 2022; Lin et al., 2021). Similarly, studies from other countries showed no increase or even a reduction in suicide rates or hospital presentations of suicidal behavior during the early months of the COVID-19 pandemic (John et al., 2020; Pirkis et al., 2021). By contrast, the Australian study of the national youth helpline data showed that contacts (phone calls, emails, and WebChats) with suicidal behavior related concerns increased in January–August 2020 (Batchelor et al., 2021). Further research is needed to investigate any difference in trends in suicidal thought and behavior across different age groups during the pandemic.

Our data showed a higher-than-expected number of hotline calls with work and finance problems during the pandemic, in keeping with the findings from previous survey studies in Taiwan that job and financial concerns were prevalent in the population during the COVID-19 outbreak (Chen et al., 2021; Wu et al., 2022). A recent qualitative study based on conversations between suicidal callers and hotline helpers from Taiwan also showed that the economic impact of the COVID-19 pandemic led to perceived challenges, stress, and increased suicidality in some callers (Hwang et al., 2022). However, our call-level analysis showed a lower odds of reporting work and finance problems in COVID-19 related calls than unrelated calls. This suggests that the acute economic impact of the pandemic may be widespread and affect callers who did not specifically mention COVID-19 in their calls to the hotline.

We found that, compared with calls not related to COVID-19, related calls were characterized by a shorter duration. This is in contrast to findings from a study of phone calls to the Samaritans Ireland, which showed that, compared to the pre-pandemic period, calls tended to be longer during the period of lockdown (Turkington et al., 2020). Furthermore, a recent report from UK Samaritans showed that calls related to COVID-19 were on average 40% longer than other calls (24 vs 17 min) (Samaritans, 2021). The different findings from our study may be due to the different characteristics and concerns of individuals making calls to the national hotline in Taiwan during the COVID-19 pandemic—the higher-than-expected number of calls was mainly from non-suicidal callers who requested information; furthermore, such non-suicidal calls tended to be shorter than suicidal calls (the average of call duration 12 vs 25 min). In keeping with this, our call-level analyses showed that COVID-19 related calls were less likely to be from callers with previous suicide attempts, recent suicidal ideation, or current suicide plans or actions, compared to calls not related to COVID-19. Similarly, recent studies using data from a hospital-based psychological support hotline in Beijing, China, showed that callers with COVID-19 related distress were less likely to report recent suicidal ideation or suicide attempt than typical callers (Tong et al., 2021; Zhao et al., 2021).

Our data showed that quarantined callers were most likely to report physical symptoms, problems associated with access to health care services, and quarantine regulations. The finding was in keeping with a recent review of the psychological impact of quarantine by Brooks et al. (2020), which indicated that the main stressors experienced by quarantined individuals included worries about physical symptoms potentially related to the infection, problems about getting regular medical care, and insufficient information about quarantine measures. We also found that nearly 30% of quarantined callers reported mental symptoms (Supplementary Table 7). Brooks et al. (2020) indicated that

negative psychological effects of quarantine included post-traumatic stress symptoms, confusion, and anger. Future research is needed to further elucidate the specific mental health impact of quarantine and associated factors.

IMPLICATIONS

Our findings provide an indication of the impact of the COVID-19 pandemic on calls to suicide prevention hotlines. The higher-than-expected number of calls has implications for the hotline services planning responses to future pandemics, to ensure that the increased need for psychological support in the population could be adequately addressed when the provision of and access to routine face-to-face supports and services are severely interrupted. The different characteristics and presenting problems of callers with COVID-19 related concerns also inform the hotline's and its helpers' approaches to responding to callers' needs. It may be important for the hotline to provide additional training and support to the helpers regarding common psychological responses to the pandemic as well as timely and accurate information about the outbreak control measures and resources, so that the helpers can adequately respond to the callers' psychological and information needs. Meanwhile, to avoid the suicide prevention hotlines being overwhelmed by callers who sought only outbreak-related information, it is important for the governments to implement effective strategies to ensure that the communication of information related to the pandemic and control measures is timely, transparent, and showing empathy and understanding about the public's concerns (Pan American Health Organization, 2020).

For suicide prevention and mental health protection strategies during the pandemic, suicide prevention hotlines could be an important resource for delivering population-based emotional as well as informational support. As the population's needs for mental health support may further increase when the impact of the COVID-19 pandemic and its consequences unfold in the longer term, it is crucial for governmental and non-governmental agencies to collaborate and coordinate the resources from a variety of psychological services and supports, including remote services such as hotlines as well as face-to-face services at hospitals or other services, to address the mental health challenges from the pandemic. Further research is also needed to investigate the underlying mechanisms of the pandemic's impacts on mental health, suicide risk, and help-seeking behaviors as well as potentially vulnerable groups such as quarantined or infected individuals and those with preexisting mental health problems or previous suicidal behaviors.

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