



Hospital-treated intentional self-poisoning events and in-hospital mortality in Tehran before and during the COVID-19 pandemic

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Abstract

Hospital-treated intentional self-poisoning is common. The possibility of changed (increased) suicidal behaviors during the COVID-19 pandemic has been raised. To compare frequencies in self-poisoning events (SPEs) and the proportions with in-hospital mortality, in the year prior to and following the official onset of the COVID-19 pandemic, in a population of hospital-treated self-poisoning patients in Iran. All self-poisoned patients admitted to Loghman-Hakim Hospital, a clinical toxicology specialty hospital in Tehran, were included. The frequency of SPEs was compared between the one-year periods immediately before and after the onset of COVID-19 pandemic using Poisson regression. Differences in proportions of in-hospital mortality were also compared using logistic regression. A total of 14,478 patients with 15,391 SPEs (8,863 [61.2%] females) were evaluated in the study. There was no difference in the overall frequency of SPEs (relative risk [RR] of 0.99 [CI95% 0.96–1.03]), but a small increase in males (RR 1.07; 1.02–1.13) and a minor decrease in females (RR 0.95; 0.91–0.99). In total, 330 patients died (2.3% of all SPEs). There was no difference in overall in-hospital mortality odds ratio (OR: 0.98 [0.79–1.22]), in females (OR = 1.14 [0.80–1.60]) or males (OR = 0.92 [0.69–1.23]). There was no change in the frequency of SPEs and no difference in the in-hospital mortality proportions, suggesting that the COVID-19 pandemic had little or no effect on these aspects of suicidal behavior in Iran.

Keywords Suicide · Overdose · Poisoning · Mortality · Pediatric · Mental health

Introduction

The ongoing COVID-19 pandemic has caused social isolation during lockdown as well as economic uncertainty, resulting in increased rates of anxiety and depression in the general

public (Sher, 2020a). As early as March 2020, the World Health Organization provided an outline to support patients and the public with the assistance of mental health professionals and psychiatrists against the possible effects of the pandemic on mental health and suicide (Shuja et al., 2020).

Suicidal thoughts and attempts are severe mental health conditions due their high inherent risk of mortality.

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Self-poisoning is the most common cause of non-lethal suicide attempts and the third most common cause of suicide mortality (Pfeifer et al., 2020). In Iran, self-poisoning is the third most common method for death due to suicide, after self-hanging and self-immolation (Hadeiy et al., 2021).

There have been suggestions of potential increased suicidal behaviors associated with COVID-19 attributed to the pandemic's impact on mental illness, social disadvantage, and the pandemic's impact on increased alcohol use (Gunnell et al., 2020). Chinese COVID-19 survivors experienced post-traumatic stress disorder (PTSD) following in-hospital treatment (Bo et al., 2021). Severe anxiety and depression can be the result of serious outcomes in COVID-19 survivors and of fear of the disease or of loss of employment and income due to COVID-19 in the general population (McGiffin et al., 2016; Sher, 2020b).

Valid data on any changes in suicide attempt rates (and other suicidal behaviors) are necessary for public health decision-makers to monitor these outcomes. Loghman-Hakim hospital poison center is the largest poison center in the capital city of Tehran and in the country; thus, the data from this center may best reflect any changing trends. To the best of our knowledge, this is the first study evaluating the trend of self-poisoning attempts in response to COVID-19 pandemic in Iran.

Aims This study aimed to compare the 12-month period before vs. during COVID-19 for:

- 1) differences in the frequencies of SPEs and
- 2) differences in the proportions of in-hospital mortality at a regional poisoning hospital in Tehran, Iran.

Materials and Methods

Setting and Study Design All patients (any age) admitted to Loghman-Hakim Hospital (Tehran, Iran) due to intentional self-poisoning between 23 February 2019 and 22 February 2021 were evaluated. February 23rd, 2020 was considered the onset of the COVID-19 epidemic in Iran, and therefore the study period was divided into two 12-month-periods for comparison, namely “pre-COVID-19” (23.02.2019–22.02.2020) and “during COVID-19” (23.02.2020–22.02.2021). Data on all relevant admissions and in-hospital mortality was extracted from the electronic health records of Loghman-Hakim Hospital (see Fig. 1).

Eligibility All patients with history of intentional self-poisoning were considered for inclusion irrespective of their sex and age. All patients were assessed by a consultant psychiatrist and included if the self-poisoning was intentional.

Measures Data from the clinical records was extracted for the number of patients (individuals), the number of SPEs (events), and mortality.

Statistical Analysis Frequency of SPEs was stratified by pre- vs. during COVID-19 periods and compared using Poisson regression. Comparisons were reported as relative risk (RR) and 95% confidence interval (CI 95%) (see Table 1). The proportion of in-hospital mortality (per SPE) was compared using logistic regression and reported as odds ratios (OR) (CI 95%) (see Table 2).

Subgroup analyses by gender and age group were also conducted for frequency of SPEs and proportions of in-hospital mortality using the same statistical techniques (see Tables 1 and 2). Patients' age was categorized by age groups < 15, 15–24, 25–44, 45–64, and ≥ 65 years. Graphical descriptive analyses were conducted for self-poisoning frequencies and in-hospital deaths for the overall population and by age group (see Fig. 2). All analyses were completed using the Statistical Package for Social Sciences (SPSS) software (Chicago, Ill, USA) version 21.

Ethics

All procedures performed in studies involving human participants were under the ethical standards of the institutional and/or national research committee, and in keeping with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The research ethics committee of Shahid Beheshti University of Medical Sciences approved this study (26524). Written informed consent was obtained from the patients or parents/guardians on admission.

Results

In the two-year study period, 14,478 patients met the inclusion criteria, of whom 8,863 (61.2%) were female and 5,615 (38.8%) were male. The patients' median age was 27 years (IQR: 20–35, range: 7–100). The distribution of patients by age group as well as the number of SPEs and associated mortality rates are displayed in Table 1. The trends of SPE and mortality rates by age group are also depicted in Fig. 2. Older age was positively associated with mortality ($P < 0.001$), with age above 30 years being a significant factor for mortality ($P < 0.001$; OR 0.40 CI95% 0.32–0.50).

Self-Poisoning Events In total, 15,391 SPEs occurred; 9,441 (61.3%) among females and 5,950 (38.7%) among males, showing a significant difference between genders ($P < 0.001$; OR = 1.13; 95% CI = 1.06–1.20).

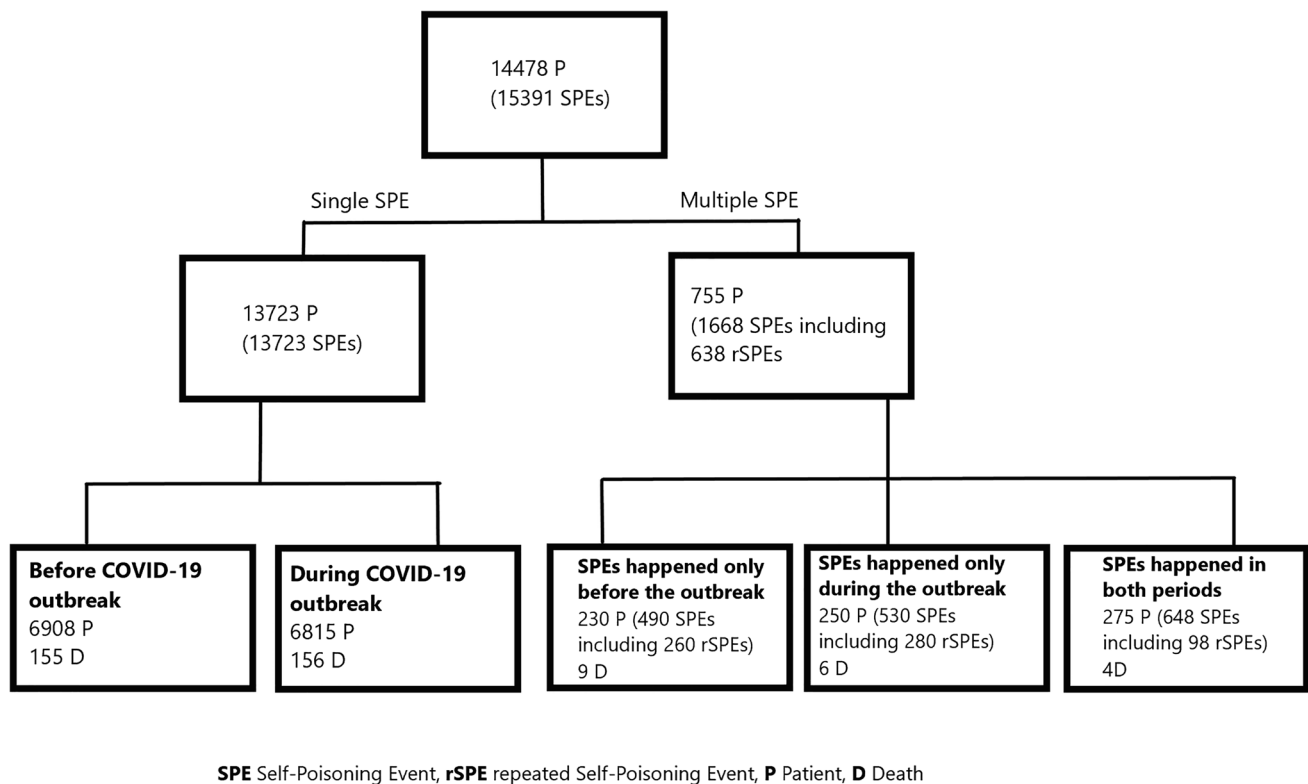


Fig. 1 Algorithm of selecting patients and events in the study period

Almost 50% (7,718) of the SPEs (4,844 [62.8%] among females and 2874 [37.2%] among males) had happened before the COVID-19 outbreak and the remaining 7673 (49.9%) SPEs (4,597 [59.9%] among females and 3,076 [40.1%] among males) occurred during the outbreak.

Comparing pre-COVID-19 and during COVID-19, there was thus no difference in the overall frequency of SPEs (relative risk [RR] of 0.99 [CI95% 0.96–1.03]), but a small increase in males (RR 1.07; 1.02–1.13) and a minor decrease in females (RR 0.95; 0.91–0.99). The rate of repeat SPEs showed no significant difference in the era before and during the outbreak (see Table 1).

In-Hospital Mortality A total of 330 deaths (2.3% of SPEs) occurred during the study period, of which 164 were before and 166 during the COVID-19 pandemic. There was no difference for overall in-hospital mortality (OR = 0.98 [0.79–1.22]) which were OR = 1.14 [0.80–1.60] and OR = 0.92 [0.69–1.23] for females and males, respectively).

Discussion

Main Findings

There was no significant difference in the rates of SPEs or mortality when comparing the pre vs. during COVID-19 periods. Our findings do not support previous studies which have shown that traumatic events, lockdown, quarantine, social isolation, and loneliness are associated with mental distress and increased risk of suicide (Calati et al., 2019; Fagan et al., 2003; Kim et al., 2019), although cultural differences between the study populations and different study endpoints should be considered. During pandemics, infected patients, their families, and health care workers are at risk of experiencing stigmatization and scapegoating (Rubin & Wessely, 2020). For instance, an elevated rate of suicide was noted in the elderly in Hong Kong during the SARS epidemic due to social isolation (Cheung et al., 2008). Increased rates of suicide were also reported during the Spanish flu (Wasserman, 1992). In a study conducted among Indonesian prison inmates, elevated anxiety states were linked to limited freedom and the unhealthy prison environment leading to irrational thinking and the emergence of behaviors like suicides and riots

Table 1 Comparison of the number of SPEs and repeat SPEs per patient stratified by gender and age group pre and during COVID-19

Number of SPEs				
	Pre-COVID (n)	During-COVID (n)	RR (95% CI)	<i>p</i> -value
All patients				
< 15	212	219	1.03 (0.86, 1.25)	0.7
15–24	2939	2917	0.99 (0.94, 1.04)	0.8
25–44	3745	3730	1.00 (0.95, 1.04)	0.9
45–64	709	674	0.95 (0.86, 1.06)	0.3
> =65	113	133	1.18 (0.92, 1.51)	0.2
Total	7718	7673	0.99 (0.96, 1.03)	0.7
Males				
< 15	25	39	1.56 (0.95, 2.61)	0.08
15–24	1172	1225	1.05 (0.96, 1.13)	0.3
25–44	1356	1472	1.09 (1.01, 1.17)	0.03
45–64	262	269	1.03 (0.87, 1.22)	0.8
> =65	59	71	1.20 (0.85, 1.70)	0.3
Total	2874	3076	1.07 (1.02, 1.13)	<0.01
Females				
< 15	187	180	0.96 (0.78, 1.18)	0.7
15–24	1767	1692	0.96 (0.90, 1.02)	0.2
25–44	2389	2258	0.95 (0.89, 1.00)	0.055
45–64	447	405	0.91 (0.79, 1.04)	0.2
> =65	54	62	1.15 (0.80, 1.66)	0.5
Total	4844	4597	0.95 (0.91, 0.99)	0.01
Repeat SPEs per patient				
All patients				
< 15	9	5	0.78 (0.24, 2.25)	0.7
15–24	126	141	1.12 (0.88, 1.42)	0.4
25–44	136	157	1.15 (0.92, 1.45)	0.2
45–64	29	28	0.88 (0.52, 1.48)	0.6
> =65	4	3	1.50 (0.30, 6.80)	0.6
Total	304	334	1.10 (0.94, 1.28)	0.2
Males				
< 15	1	0	-	-
15–24	57	56	0.98 (0.68, 1.42)	0.9
25–44	51	62	1.22 (0.84, 1.77)	0.3
45–64	9	8	0.89 (0.33, 2.32)	0.8
> =65	4	2	0.50 (0.07, 2.56)	0.4
Total	122	128	1.05 (0.82, 1.35)	0.7
Females				
< 15	8	5	0.62 (0.19, 1.87)	0.4
15–24	69	85	1.23 (0.90, 1.70)	0.2
25–44	85	95	1.12 (0.83, 1.50)	0.5
45–64	20	20	1.00 (0.54, 1.87)	0.9
> =65	0	1	-	-
Total	182	206	1.13 (0.93, 1.38)	0.2

(Junaedi et al., 2022). We could not find such effects of the COVID-19 pandemic among our self-poisoned patients.

Other Findings

Gender and age were two factors showing an association with mortality. There was a significant increase in SPEs committed by males and among age subgroups during the COVID-19 pandemic. The only age-gender sub-group with a significant increase in the rate of SPEs during the pandemic were 25- to 45-year-old males (see Table 1).

In the current study, age was a significant factor affecting mortality (see Table 2), while the COVID-19 pandemic had no effect on mortality. Specific attention should be given to the elderly group and especially toward the residents of long-time care facilities and nursing homes. Loneliness, deprivation from visits from loved ones, and increased risk of infection during a pandemic are stressors to this population (Zalsman et al., 2020).

Our results showed that mortality was significantly higher in males, which lends further support to the general observation that self-poisoning tends to be more lethal and dangerous in males (Pfeifer et al., 2020; Hadeiy et al., 2021; Baumert et al., 2008). In a Nigerian study, males were found to experience higher stress levels due to the COVID-19 outbreak (Aki et al., 2020). Since the number of SPEs significantly increased during the COVID-19 outbreak among 25- to 45-year-old males (young working aged males), we hypothesized that this population may have faced greater outbreak-related economic uncertainty, which is a known trigger for anxiety and depression as well as suicide attempts (Ahn et al., 2017; Vandoros et al., 2019; Martin-Carrasco et al., 2016; Tapia Granados & Diez Roux, 2009).

Explanation for Negative Findings

It is generally assumed that the first reaction to any pandemic is panic and extreme anxiety which may be followed by insomnia, hysteria, and depression (Shigemura et al., 2020). However, in our study, there was a reducing trend of SPEs and deaths in the short period immediately following the onset of the COVID-19 pandemic (see Fig. 2 and Supplementary figure). While this may be surprising, several possible explanations seem plausible. People with debilitating constant anxiety may feel more connected with other people during such epidemics as their anxious mood may not seem abnormal after occurrence of stressful situations anymore. Additionally, isolation and quarantine may provide better family support for this group of patients (Zalsman et al., 2020).

It is perhaps worth noting that experiences from the first and second world wars and natural disasters suggest a delayed increase in suicides after such crises (Baumert

Table 2 Comparison of all ages and gender difference for proportions of in-hospital mortality (stratified by age groups) pre and during COVID-19

Age	Gender	Before COVID (n = 7,719)				During COVID (n = 7,674)				pre- vs. during COVID	
		SPEs n (%)	Mortality n (%)	P, OR (CI 95%) [¥]	SPEs n (%)	Mortality n (%)	P, OR (CI 95%) [¥]	P, OR (CI 95%) [€]	P, OR (CI 95%) [£]		
<15 (n=431)	Female	187 (88.2)	1 (0.5)	0.71, 1.13 (1.08–1.19)	180 (82.2)	2 (1.1)	0.51, 1.22 (1.14–1.30)	0.54, 0.48 (0.04–5.32)	0.08, 1.62 (0.94–0.79)		
	Males	25 (11.8)	0		39 (17.8)	0					
	Total	212 (100)	1 (0.5)		219 (100)	2 (0.9)		0.58, 0.51 (0.05–5.71)			
15–24 (n=5,856)	Female	1,767 (60.1)	17 (1.0)	0.03, 0.51 (0.27–0.96)	1,692 (58.0)	9 (0.5)	<0.001, 0.24 (0.11–0.51)	0.14, 1.82 (0.80–4.09)	0.1, 1.09 (0.98–1.21)		
	Males	1,172 (39.9)	22 (1.9)		1,225 (42.0)	27 (2.2)		0.57, 0.85 (0.48–1.50)			
	Total	2,939 (100)	39 (1.3)		2,917 (100)	36 (1.2)		0.75, 1.08 (0.68–1.70)			
25–44 (n=7,475)	Female	2,389 (63.8)	40 (1.7)	0.001, 0.48 (0.32–0.74)	2,258 (60.5)	36 (1.6)	<0.001, 0.44 (0.29–0.68)	0.83, 1.05 (0.67–1.65)	0.004, 1.15 (1.05–1.26)		
	Males	1,356 (36.2)	46 (3.4)		1,472 (39.5)	52 (3.5)		0.84, 0.96 (0.64–1.44)			
	Total	3,745	86 (2.3)		3,730	88 (2.4)		0.85, 0.97 (0.72–1.31)			
45–64 (n=1,383)	Female	447 (63.0)	11 (2.5)	0.004, 0.34 (0.16–0.74)	405 (60.1)	11 (2.7)	<0.001, 0.31 (0.15–0.66)	0.81, 0.90 (0.39–2.10)	0.26, 1.13 (0.91–1.40)		
	Males	262 (37.0)	18 (6.9)		269 (39.9)	22 (8.2)		0.57, 0.83 (0.43–1.58)			
	Total	709 (100)	29 (4.1)		674	33 (4.9)		0.47 0.83, (0.50–1.38)			
≥65 (n=246)	Female	54 (47.8)	4 (7.4)	0.83, 0.86 (0.22–3.40)	62 (46.6)	3 (4.8)	0.84, 0.85 (0.18–3.96)	0.56, 1.57 (0.34–7.37)	0.85, 1.05 (0.63–1.73)		
	Males	59 (52.2)	5 (8.5)		71 (53.4)	4 (5.6)		0.52, 1.55 (0.40–6.06)			
	Total	113 (100)	9 (8.0)		133	7 (5.3)		0.39, 1.56 (0.56–4.32)			
All (n=15,391)	Female	4,844 (62.8)	73 (1.5)	<0.001, 0.47 (0.34–0.64)	4,597 (59.9)	61 (1.3)	<0.001, 0.38 (0.28–0.52)	0.46, 1.14 (0.80–1.60)	<0.001, 1.13 (1.06–1.20)		
	Males	2,874 (37.2)	91 (3.2)		3,076 (40.1)	105 (3.4)		0.59, 0.92 (0.69–1.23)			
	Total	7,718 (100)	164 (2.1)		7,673 (100)	166 (2.2)		0.87, 0.98 (0.79–1.22)			

SPE = Self-poisoning events

¥ Difference between gender and mortality

€ Difference between mortality before and during the outbreak

£ difference in gender before and during the outbreak

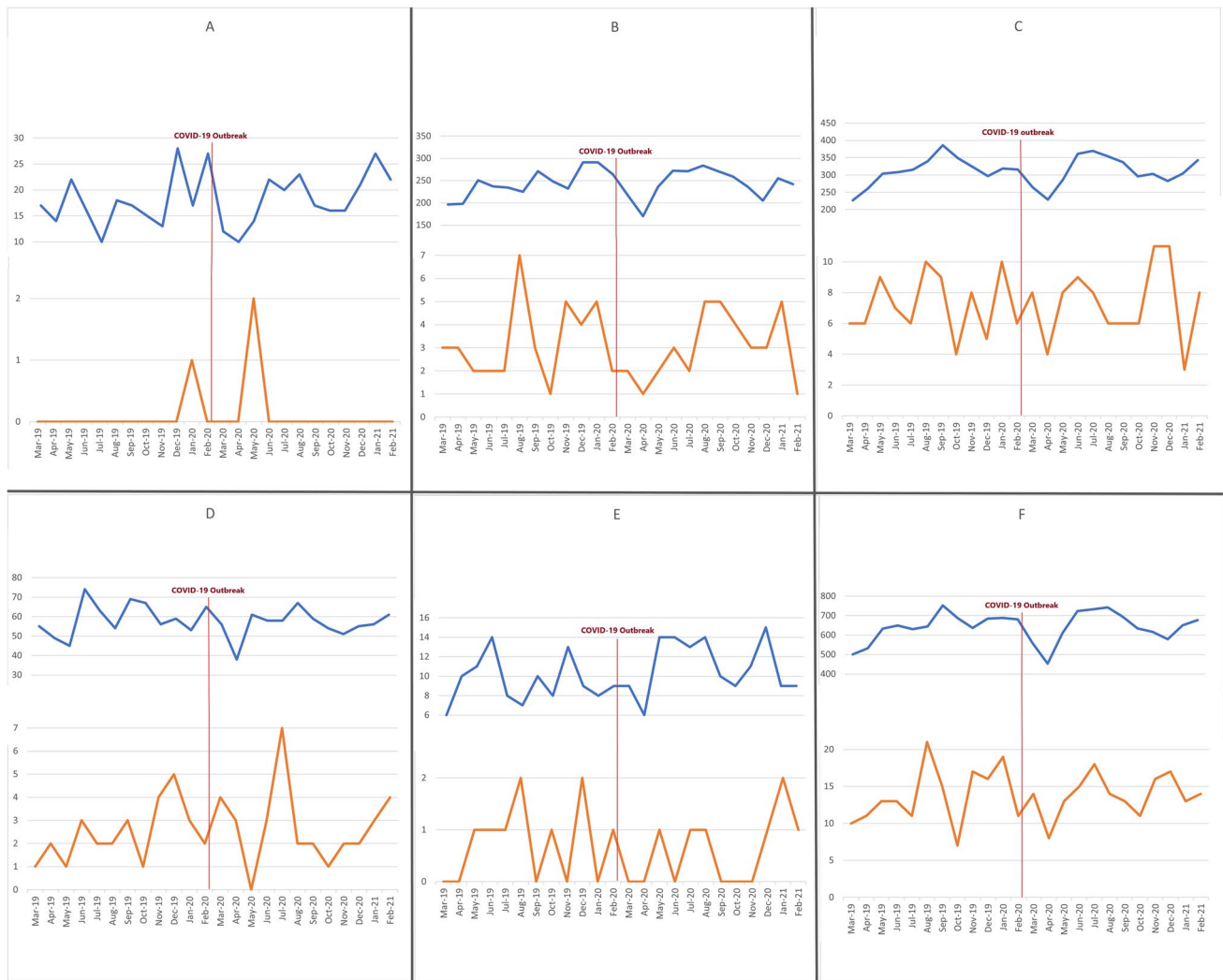


Fig. 2 Self-poisoning events (blue) and deaths (red, y-axis) over time (x-axis) by age group: A (age < 15), B (15–24), C (25–44), D (45–64), E (65+), and F (total population)

et al., 2008; Lester, 1994). It is thus possible that suicidal attempts increase when the pandemic is over rather than at its onset (Reger et al., 2020). Also, it has been suggested that psychological flexibility may act as a mitigating factor for disaster intolerance and adverse emotions during COVID-19 pandemic (Akbari et al., 2021).

Methodological Considerations

The main weakness of this study is its retrospective nature and lack of systematic follow-up. We were not able to include any measures of exposure to potential risk factors e.g. alcohol use, economic disadvantage or mental illness prevalence. We do not know if any patient was re-admitted in other hospitals during the study period, and there is also the possibility of death before admission to any healthcare

facility. Hence, the rates of repeat SPEs and mortality are likely underestimated.

Generalizability of Findings

Loghman-Hakim Hospital poison center is the largest poison referral center in Iran. Our findings likely reflect trends of self-poisoning across Tehran and will be indicative of other urban areas in Iran (Hadeiy et al., 2021).

Regarding the implications for policy and practice, our findings show that males in the 25–45 age bracket were particularly vulnerable during the pandemic (see Table 1). In January 2020, China was the first country to develop guidelines and implement a program to prevent COVID-19-related psychosocial crises in the general public, with psychological support teams consisting of psychiatrists and mental health professionals (Shuja et al., 2020). Our findings suggest that,

in the Iranian context, such programs should at least provide targeted support for young men. Other vulnerable populations including the elderly, low socioeconomic groups facing economic hardship, people with a history of mental health problems and suicide (Mann et al., 2005), healthcare workers in the frontlines, and the infected and COVID-19 survivors (Torales et al., 2020; Mann et al., 2005) should also be considered when providing mental support.

Questions for Future Research

Understanding the cause of self-poisoning and specific attention to the people who are emotionally and financially affected by outbreaks may be helpful to reduce further self-poisoning acts. Finding vulnerable groups may help us to plan prevention of suicide attempts in those subgroups. Future research may focus on these issues in prospective studies to suggest public health interventions. This highlights an uncertainty to predict the exact trend of suicide in conditions like the ongoing pandemic and demand vigilance for monitoring the trends of suicides closely.

Conclusion

There was no change in the number of SPEs and no difference in the in-hospital mortality proportions, suggesting that the COVID-19 epidemic had little or no effect on these aspects of suicidal behavior. Nevertheless, hospital-treated self-poisoning is common, and effective measures should be targeted to vulnerable groups to prevent self-poisoning and provide a validated and comprehensive source of information for the public.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12144-022-03248-y>.

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Authors' Contributions HHM designed the study and is the guarantor of integrity of the entire work. OR and GC conceived of and designed the study. ASL and NG collected the data. SKH conducted the literature research. SKH, AAK, FN, and HHM performed the statistical data analysis. SKH and NZ prepared the manuscript draft, and GG, HS, and RM revised and edited the final manuscript. All authors have read and approved the manuscript.

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Data Availability The datasets generated during and/or analyzed during the current study are not publicly available to protect patient anonymity but are available from the corresponding author on reasonable request.

Declarations

Conflict of Interests The authors declare that they have no competing interests.

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