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Changing Characteristics of Young Severe Suicide Attempters Admitted to an Emergency Room in Tokyo, Japan

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Background: The decreasing trend in the number of young suicides in Japan changed to a flat/increasing trend in 2017. To identify how this change was reflected in young suicide attempters, we investigated changes in the characteristics of young suicide attempters admitted to our emergency room.

Methods: The subjects were suicide attempters younger than 30 years admitted to the Critical Care Medical Center of Nippon Medical School Hospital between January 1, 2010, and December 31, 2021. The means of suicide attempt, sociodemographic data, psychiatric diagnoses, and causes and motives of suicide attempts were retrospectively examined from medical records. We compared post-2017 to pre-2017 suicide attempts and performed a statistical analysis.

Results: The proportion of suicide attempters younger than 30 years was 27.9% (143 of 513) before 2017 and 38.0% (132 of 347) after 2017, a significant increase. From 2017 to 2021, there was a significant increase in the number of female suicide attempters younger than 30 years and in the percentage of drug overdoses.

Conclusions: The proportion of suicide attempters younger than 30 years was significantly higher after the start of 2017 than before 2017, possibly because of an increase in drug overdoses.

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Key words: young suicide attempters, drug overdose, copycat suicide, access to suicide means, means restriction

Introduction

After a sharp increase in 1998, the number of suicides in Japan remained high until 2009 and began to decline in 2010. We reported a similar trend in data on suicide attempters in our institution[1,2]. However, in 2020, the number of suicides in Japan began to increase again. The trend for the number of suicides among those younger than 30 years differed from that for suicides among all age groups. **Figure 1** shows the number of suicides among those younger than 30 years in Japan. Since 2010, the number of suicides among this group had been decreasing, but this decline began to level off in 2017 and an increase began in 2020[3–14].

This increase in suicides among those younger than 30 years has also had a substantial impact on the total number of suicides in Japan and has become a major social problem. Although the COVID-19 pandemic has had a strong effect on the increase in the number of young and female suicides from 2020[15], the downward trend in the number of young suicides in Japan began to change before the COVID-19 pandemic[16]. As shown in **Figure 1**, the trend in the number of suicides among those younger than 30 years changed after 2017, which suggests that factors other than the COVID-19 pandemic may have influenced this change (**Fig. 1**).

Suicide attempts are a major risk factor for follow-up suicides[17–19]. Of all suicides in Japan in 2022, 19.5% were preceded by earlier suicide attempts, and 34.4% of females younger than 20 years and 40.7% of females aged 20-29 years had a previous history of suicide attempts[20]. Since a history of suicide attempts is particularly prominent among young suicides, we hypothesized that simi-

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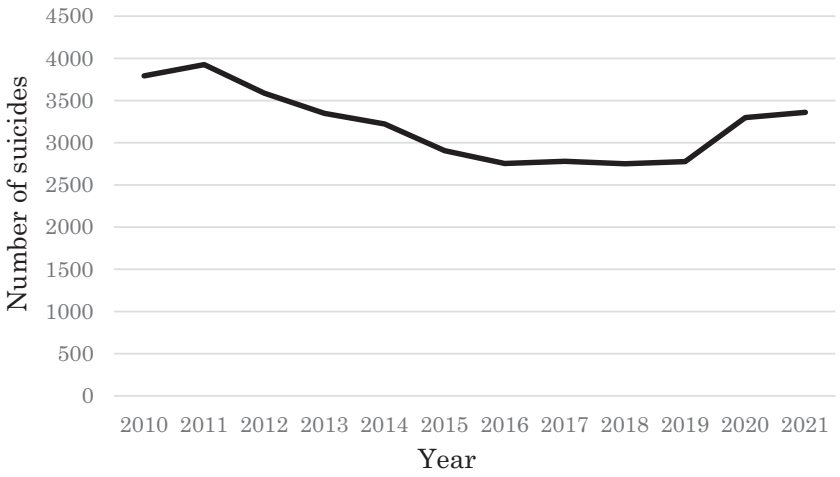

Fig. 1 Number of suicides among people younger than 30 years in Japan from 2010 to 2021 (compiled from National Police Agency suicide statistics)

lar characteristics are likely present in young suicides and young suicide attempters.

In this study, we analyzed recent data on the characteristics of young suicide attempters who were admitted to the Critical Care Medical Center (CCM) of Nippon Medical School Hospital. Because the number of suicides among Japanese younger than 30 years decreased from 2010 to 2016, leveled off, and then increased from 2017 to 2021, we compared suicide attempters from 2017 to 2021 with those from 2010 to 2016. The CCM of Nippon Medical School Hospital is located in central Tokyo and admits 1,600-1,800 of the most demanding emergency patients each year.

Methods

Study Design and Sample

The subjects were suicide attempters admitted to the CCM of Nippon Medical School Hospital between January 1, 2010, and December 31, 2021. The analysis was limited to suicide attempters younger than 30 years and compared two groups: suicide attempters younger than 30 years during the period from January 1, 2010, through December 31, 2016, and suicide attempters younger than 30 years during the period from January 1, 2017, through December 31, 2021. Assessment of suicide attempts was based on the definition provided by the Columbia Classification Algorithm of Suicide Assessment (C-CASA)[21], which defines a suicide attempt as a potentially self-injurious behavior that is associated with at least some intent to die as a result.

The means of suicide attempts, sociodemographic data, psychiatric diagnoses, and causes and motives of suicide attempts were retrospectively examined in the medical records of eligible suicide attempters. In the CCM of Nippon Medical School Hospital, psychiatrists examine almost all suicide attempters and evaluate the psychiatric diagnoses as well as the causes and motives of the attempts. Psychiatric diagnoses were made in accordance with DSM-IV-TR or DSM-5 diagnostic criteria[22,23]. The causes and motives of suicide attempts were evaluated based on the classification of causes and motives of suicide used in the 2010 National Police Agency statistics (seven major categories: family problems, health problems, financial problems, work problems, romantic problems, school problems, and other problems). In the National Police Agency statistics, items related to mental disorders are included in health problems; however, because psychiatric diagnoses are evaluated separately in the present study, mental disorders were excluded from the causes and motives of suicide attempts. Psychiatric diagnoses and causes and motives for suicide attempts were evaluated by agreement among two or more experienced psychiatrists. When multiple means of suicide attempts, psychiatric diagnoses, and causes or motives for suicide attempts were identified, all were included.

Statistical Analyses

Statistical analyses were conducted using SPSS Statistics 24. The chi-square test or Fisher exact test was used to compare the number of suicide attempters younger than 30 years, sex, employment status, residential status, history of self-harm, history of psychiatric visits, means of suicide attempts, psychiatric diagnoses, and causes and motives for suicide attempts between suicide attempters during 2010-2016 and 2017-2021. A significance level of $p<0.05$ and two-sided probability were used.

Table 1 Number of suicide attempters at the CCM of Nippon Medical School Hospital from 2010 to 2021

Age group	total (N=860)	2010-2016 (N=513)	2017-2021 (N=347)	significance		odds ratio	95%CI
<30 years	275 (32.0%)	143 (27.9%)	132 (38.0%)	p=0.002¶	χ^2=9.833	1.589	1.188-2.123
20-29 years	216 (25.1%)	113 (22.0%)	103 (29.7%)	p=0.011¶	χ^2=6.450	1.494	1.095-2.039
10-19 years	59 (6.9%)	30 (5.8%)	29 (8.4%)	NS¶		1.468	0.865-2.494

¶chi-square test

CCM: critical care medical center

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of Nippon Medical School Hospital (approval number: B-2020-113) and was conducted in accordance with the provisions of the Declaration of Helsinki. Informed consent was not obtained because only anonymized information was used for data collection. The Ethics Committee of Nippon Medical School Hospital waived the need for informed consent because this was a retrospective study. In the opt-out section of the website, study subjects were informed of the purposes, methods, and publication of the results and were guaranteed the opportunity to refuse participation.

Results

The number of suicide attempters is shown in **Table 1**. From January 1, 2010, through December 31, 2021, 860 suicide attempters were admitted to the CCM of Nippon Medical School Hospital, 275 (32.0%) of whom were younger than 30 years. Suicide attempters younger than 30 years comprised 216 aged 20 to 29 years and 59 aged 10 to 19 years; 143 (27.9%) of the 513 suicide attempters from 2010 to 2016 were younger than 30 years, while 132 (38.0%) of the 347 suicide attempters from 2017 to 2021 were younger than 30 years, indicating that the percentage of suicide attempters younger than 30 years was significantly larger during the latter period (chi-square test, χ^2 = 9.833, p= 0.002). Similar characteristics were observed regarding suicide attempters aged 20 to 29 years (χ^2 = 6.450, p= 0.011).

The characteristics of suicide attempters younger than 30 years from 2010 to 2016 (2010-2016) with those younger than 30 years from 2017 to 2021 (2017-2021) are shown in **Table 2**. As for the sex ratio, the percentage of females was significantly larger in 2017-2021 (chi-square test, χ^2= 4.647, p=0.031). There were no significant differences between 2010-2016 and 2017-2021 in work or living conditions. The proportion of those with a history of self-harm was high in both groups, and the difference between groups was not significant. The proportion of those with a history of psychiatric visits was also high in both groups, and there was no significant difference between groups. Regarding the means of suicide attempts, the percentage of drug overdoses was significantly larger in 2017-2021 (χ^2=4.449, p=0.035). There were no significant differences with respect to other suicide attempt means between the groups. The proportion of those with any psychiatric diagnosis was 96.5% in 2010-2016 and 94.7% in 2017-2021, indicating that most persons in both groups had a psychiatric diagnosis. The percentage of those diagnosed with "schizophrenia and other psychotic disorders" was significantly lower in the 2017-2021 group (χ^2=16.211, p<0.001). The proportions of those with other psychiatric diagnoses did not significantly differ between 2010-2016 and 2017-2021. There were no significant differences between 2010-2016 and 2017-2021 in the causes and motives for suicide attempts.

Discussion

The present results revealed a higher proportion of suicide attempters younger than 30 years during 2017-2021 than during 2010-2016, and an increase in the percentage of female suicide attempters younger than 30 years. Although this study was conducted at a single center, the results suggest that recent changes in the trend for Japanese suicides younger than 30 years, as indicated by Japanese suicide statistics, are also reflected to some extent in the present data on suicide attempts.

The presence of a psychiatric disorder is the most important risk factor for suicide among young people, and high percentages of suicide attempters and suicide victims have a psychiatric disorder[24-26]. Mood disorders were found to be a particularly strong risk factor for suicide among young people[27,28]. A history of previous suicide attempts is also a very strong risk factor for suicide among young people[24,25,27,28]. In this study, 96.5% of those in the 2010-2016 group and 94.7% of those in the 2017-2021 group had a psychiatric disorder, and 21.7% of the former and 18.9% of the latter had mood disorders. In addition, 73.4% of those in the 2010-2016 group and 75.0% of

Table 2 Comparison of characteristics of suicide attempters younger than 30 years between 2010-2016 and 2017-2021

	total (N=275)	2010-2016 (N=143)	2017-2021 (N=132)	significance		odds ratio	95%CI
Female/male	189/86 (68.7%/31.3%)	90/53 (62.9%/37.1%)	99 /33 (75.0%/25.0%)	p=0.031¶	χ^2=4.647	1.767	1.050-2.972
Unemployed or part-time employment	133 (48.4%)	69 (48.3%)	64 (48.5%)	NS¶		1.009	0.629-1.620
Full-time employment	54 (19.6%)	26 (18.2%)	28 (21.2%)	NS¶		1.212	0.668-2.198
Living with family	130 (47.3%)	71 (49.7%)	59 (44.7%)	NS¶		0.820	0.510-1.317
Living alone	95 (34.5%)	51 (35.7%)	44 (33.3%)	NS¶		0.902	0.548-1.484
History of self-injury	170 (61.8%)	84 (58.7%)	86 (65.2%)	NS¶		1.313	0.805-2.141
History of psychiatric visits	204 (74.2%)	105 (73.4%)	99 (75.0%)	NS¶		1.086	0.632-1.865
Means of suicide attempts							
Drug overdose	185 (67.3%)	88 (61.5%)	97 (73.5%)	p=0.035¶	χ^2=4.449	1.732	1.037-2.892
Jumping from high place	49 (17.8%)	31 (21.7%)	18 (13.6%)	NS¶		0.570	0.302-1.078
Poisonous gas	19 (6.9%)	7 (4.9%)	12 (9.1%)	NS¶		1.943	0.741-5.094
Other methods	30 (10.9%)	20 (14.0%)	10 (7.6%)	NS¶		0.504	0.227-1.121
Psychiatric diagnosis							
Substance-induced disorders	14 (5.1%)	11 (7.7%)	3 (2.3%)	NS¶		0.279	0.076-1.023
Schizophrenia and other psychotic disorders	33 (12.0%)	28 (19.6%)	5 (3.8%)	p=0.001¶	χ^2=16.211	0.162	0.060-0.433
Mood disorders	65 (23.6%)	33 (23.1%)	32 (24.2%)	NS¶		1.067	0.611-1.861
Anxiety disorders	19 (6.9%)	6 (4.2%)	13 (9.8%)	NS¶		2.494	0.919-6.767
Adjustment disorders	47 (17.1%)	26 (18.2%)	21 (15.9%)	NS¶		0.851	0.453-1.600
Personality disorders	59 (21.5%)	27 (18.9%)	32 (24.2%)	NS¶		1.375	0.771-2.450.
Other psychiatric disorders	46 (16.7%)	18 (12.6%)	28 (21.2%)	NS¶		1.870	0.979-3.570
None	12 (4.4%)	5 (3.5%)	7 (5.3%)	NS¶		1.546	0.478-4.994
Causes and motives for suicide attempts							
Family problems	59 (21.5%)	26 (18.2%)	33 (25.0%)	NS¶		1.500	0.840-2.678
Health problems	9 (3.3%)	4 (2.8%)	5 (3.8%)	NS†		1.368	0.359-5.207
Financial problems	26 (9.5%)	12 (8.4%)	14 (10.6%)	NS¶		1.295	0.576-2.912
Work problems	47 (17.1%)	26 (18.2%)	21 (15.9%)	NS¶		0.851	0.453-1.600
Romantic problems	73 (26.5%)	35 (24.5%)	38 (28.8%)	NS¶		1.247	0.730-2.132
School problems	34 (12.4%)	14 (9.8%)	20 (15.2%)	NS¶		1.645	0.794-3.409
Other problems	81 (29.5%)	42 (29.4%)	39 (29.5%)	NS¶		1.008	0.600-1.694

¶chi-square test, †Fisher's exact test

those in the 2017-2021 group had a history of psychiatric visits, and 58.7% of the former and 65.2% of the latter group had a history of self-harm. These results are generally consistent with previous reports on suicide among young people. However, the presence of psychiatric disorders and history of self-harm did not change significantly between 2010-2016 and 2017-2021, suggesting that, in recent years, these risk factors, in combination with other factors, contributed to changes in suicide-related behaviors among persons younger than 30 years. Similarly, there was no significant change in the causes and motives for suicide attempts between 2010-2016 and 2017-2021, suggesting that there were no changes in social factors that would affect suicide-related behavior among those younger than 30 years in 2010-2016 and 2017-2021.

A significant increase in suicide attempts due to drug overdose was observed, from 61.5% in 2010-2016 to 73.5% in 2017-2021. This suggests that, at least in the study population, the increase in suicide attempts due to drug overdose is likely to be associated with the increase in suicide attempters younger than 30 years in 2017-2021.

The problem of drug overdose among young people has recently been identified as a serious problem worldwide. While opioid overdose and the resulting deaths among young people are a significant problem in North America, there has also been a marked increase in benzodiazepine abuse, particularly among young people[29–31]. Although opioid overdose is not common in Japan, overdose of over-the-counter (OTC) and prescription drugs

by young people has recently become a social problem. Hirose et al. studied 36 patients younger than 20 years who were admitted to a Japanese emergency room for overdosing on OTC drugs and reported that 9 of 12 (75%) patients who had died of a lethal dose had obtained information about intoxication and lethal doses from suicide websites and social networking sites[32]. The recent spread of smartphone use has made it easier to obtain information on drug overdosing via the internet and especially through social media. This has made it simpler for young people to attempt suicide by drug overdose and may have contributed to the increase in suicide attempts by drug overdose among young people, as well as to the general increase in suicide attempts among young people.

Recent studies reported that communication about suicide on social media influences suicide attempts[33–35]. According to the White Paper on Information and Communications, the smartphone penetration rate in Japan exceeded 50% in 2015, and in 2016 reached 81.4% among the 13-19-year age group and 94.2% among the 20-29-year age group[36]. In addition, in 2016 the percentage of people using some type of social media was 71.2% for all ages and 97.7% for the 20-29-year age group. The authors noted that the number of social media users has increased in line with the spread of smartphones. We believe that it is not a coincidence that the period when smartphones became widespread in Japan overlaps with the period during which the decrease in the number of young suicides stopped.

In Japan, time spent on social media is greater among females than among males. According to a survey conducted in 2022 by the National Institute of Information and Communications Policy, Ministry of Internal Affairs and Communications, the average time spent on social media on weekdays was 42.3 minutes for males and 87.3 minutes for females in the 10-19-year age group, and 76.5 minutes for males and 98.6 minutes for females in the 20-29-year age group[37]. These data suggest that social media has a stronger influence on young Japanese females than on males. In the present study, the number of female suicide attempters was higher in 2017-2021, which may have been influenced by gender differences in the use of social media.

The World Health Organization has warned that media coverage of suicides may cause copycat suicides and that media should not report details of the means or location of suicides[38]. While most of the Japanese mass media and their internet sites report on suicides in accordance with these recommendations, information on suicides is not sufficiently restricted on social media, where individuals are the originators, and many people obtain information about suicides from social media. According to a 2021 survey conducted by the Ministry of Health, Labor, and Welfare, 2.0% of all ages used online message websites to share their feelings of wanting to die, with a particularly high rate of 9.0% among females in the 20-29-year age group[39]. The same survey also reported that, among 1.0% of people of any age and 6.3% of females in the 20-29-year age group, websites were used to recruit people to commit suicide together or teach people how to commit suicide. Sarchiapone et al.[40] stated that accessibility to the means of suicide influences the means that are chosen, and they discussed the usefulness of restricting access to means of suicide as a suicide prevention measure. The present results suggest that the increase in suicide attempts by drug overdose may be related to the increase in suicide attempts among young people and that the increase in suicide attempts by drug overdose may be linked to the accessibility of this information. Suicide attempts increased among females in the 20-29-year age group, that is, those most vulnerable to the influence of social media. However, because social media use will likely increase for all ages in the near future, suicide attempts may increase in other age groups. Therefore, further restrictions on suicide-related information on the internet, and especially on social media, should be seriously considered.

Our study has several limitations. First, the results indicate an increase in suicide attempts due to drug overdose in 2017 to 2021, but it was not possible to investigate the drug type or route of acquisition. The present results should thus be carefully interpreted in light of these limitations, and further studies are necessary to determine if drug type or route of acquisition changed from 2010-2016 to 2017-2021. We could not investigate how suicide attempters obtained information on the methods of their attempts, so further research on this issue is required. Second, as this study was conducted at a single center, it was not possible to examine adequately the subcategories of causes and motives for suicide attempts because of the limited number of cases. Regarding psychiatric diagnoses, the percentage of subjects with a diagnosis of "schizophrenia and other psychotic disorders" was significantly lower in 2017-2021 than in 2010-2016. However, no other psychiatric diagnosis was significantly more prevalent in 2017-2021 than in 2010-2016, indicating no clear trend. Additional data from similar surveys at

multiple centers should be collected. Third, this study showed that although the trend in suicide attempters younger than 30 years began to change in 2017, the trend may have been influenced by the COVID-19 pandemic after 2020. The effect of the pandemic on suicide attempters younger than 30 years is not well understood, and we believe that a longer study duration and a larger number of cases will be needed for clarification.

Conclusions

In Japan, suicide trends among those younger than 30 years changed from 2010-2016 to 2017-2021, perhaps in part because of an increase in suicide attempts from drug overdose. The recent increase in young suicides in Japan has not been adequately explained but may be related to greater accessibility of information on drug overdosing as a means of suicide, so the possibility of restricting internet information on drug overdose should be considered as a suicide prevention measure for young people.

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