Characteristics of Young Suicides by Violent Methods in Rural China*

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Abstract

Suicide is one of the most common public health problems in the world. Information on 392 completed suicides aged 15–34 years were consecutively collected from 16 counties in three provinces of China. Information on each suicide was obtained from two informants. The results showed ingesting pesticides or other poisons (73.5%) and hanging (10.5%) were the two most common methods of suicide. Suicides happened more in autumn (30.10%) or summer (27.29%), nighttime (68.3%), and at home (73.6%). However, suicides with violent methods were more common in winter and spring and outside of home. Season (autumn or summer), place (at home), and pesticide stored in home were negatively while depression was positively associated with violent methods of suicide. Characteristics of the suicides by violent methods are different from those by nonviolent methods. Investigations into the methods of rural young suicides are necessary for suicide prevention in China.

Keywords

forensic science; suicide; violent method; nonviolent method; rural; China

Suicide is one of the most common public health problems in the world. In public health practice of preventing suicide, limiting access to potential methods of suicide is often considered (1–3). There are two levels of suicide methods. Firearm or shotgun, hanging, cutting and piercing with sharp objects, jumping from high places, and run over by train or other vehicles are classified as violent methods while ingestion of pesticides, poison by gases, and overdose are classified as nonviolent methods (4–7). Characteristics of violent methods are different from nonviolent methods, in such as their case fatality rates (8–10) and seasonality (4,11,12). Suicide in China has some specific characteristics: poisoning and hanging continue to be the most popular methods for suicide in the past and today (10), rural suicide rates (27.1/100,000) are three times higher than urban suicide rates (8.3/100,000) and suicide is the most common cause of death in young adults of 15–34 years old, which accounts for 19% of all deaths in this age group (13). Studying characteristics of young rural suicides will have much important significance in suicide prevention.

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In this study, we aim to (i) study distribution of suicide methods in young suicides in rural China by gender, age, location, and timing; (ii) compare characteristics between suicides with violent methods and suicides with nonviolent methods; and (iii) explore factors related to suicides with violent methods.

Methods

Study Population

Data from 392 suicide victims aged 15–34 years were consecutively collected from October 2005 to June 2008 in three provinces in China. The three provinces were Liaoning (population: 43,150,000), Shandong (population: 94,172,000), and Hunan (68,452,000) that are located from northeast to middle south. The suicide victims aged 15–34 years came from 16 counties (six from Liaoning, five from Shandong, and five from Hunan). Information about suicide victims was collected with the psychological autopsy (PA) method, which had been tested to be reliable with good validity in Chinese social and cultural environments (14).

Procedures

Interview schedule was arranged between 2 and 6 months after a suicide event. Each suicide victim had two informants: one as a next kin and the other as a friend or neighbor who was familiar with the victim. After getting their agreement with the written informed consent, our trained interviewers began the interview. The interview place was either the home of interviewees or the village clinic without interruption by others. Interview time averaged 2.5 h.

Interview Contents and Instruments

The same questionnaire interview was conducted with two informants for each suicide. In the questionnaire, the contents included demographic factors, health status, psychological factors, and characteristics related to suicide.

Demographic factors included age, gender (male = 1; female = 0), education years, marriage status (never married: single and no dating; ever married: married, widowed, divorced, remarried and single but dating with others), personal annual income (RMB), religion (no: atheist; yes: Taoism, Islam, Protestantism, Catholicism, Buddhism, other), and family history of suicide.

Health status factors included mental illness and physical illness. Mental illnesses were diagnosed by using the Chinese version of the Structured Clinical Interview for the DSM-III-R (SCID) (15,16), which is an adequate instrument for Chinese populations (17). Physical illness status was obtained by using a question "Do you know whether s/he has ever had serious or chronic illness?"

Instruments included the Chinese version of the first eight items of the suicide intent scale (SIS) (18), which we called the Chinese shortened version of suicide intent scale (C-SIS) (19), the total score can range from 0 to 16; Beck Hopelessness Scale (BHS) (20) with 20 5-Likert responses from 1 (completely fit me) to 5 (completely opposite to me), the total score can range from 20 to 100; 24-item Hamilton Depression Rating Scale (HAMD) (21); Spielberger State-Trait Anxiety Inventory (STAI) (22) with 20 items, each item has four alternative answers from never = 1 to always = 4, the total score can be 20–80; social support scale, which is a 7-item scale with each item's answer being "yes" (1) or "no" (0), its total score can range from 1 to 7.

Characteristics related to suicide include method of suicide, month of suicide, timing, and place of suicide.

Information Incorporation from Different Sources

For different responses from the two informants for the same target, data were integrated according to the variables based on previous experiences (23). For the demographic information, that provided by the informant who should better know it was employed. For example, to the target person's age and birth date, information provided by family member was more accurate than that of friends or others. To determine a diagnosis with the SCID, the positive response was selected, because the other informant might not have had an opportunity to observe the specific behavior.

Statistical Analysis

Frequency and percentage were used to describe suicide methods by gender, age group, location, season (autumn or summer vs. spring or winter), and timing. Chi-square tests were used to compare categorical variables of demographic or health status between violent methods and nonviolent methods. *T*-tests or Kolmogorov–Smirnov *Z*-tests were used to compare continual variables such as personal annual income, education years, social support, and scores of psychological status between suicides with violent methods and nonviolent methods. Multiple logistic regression models were used to analyze related factors to violent methods of suicides. All statistical analyses were carried out with the Statistical Package for Social Sciences (SPSS for Windows, version 16.0, SPSS Inc., Chicago, IL). The levels of significance for inclusion in the model and for determination of statistical significance were all 0.05 in this study.

Results

In 392 suicides, there were 178 (46.4%) women and 214 (54.6%) men, 141 (36.0%) aged 15–24 years, 251 (64.0%) aged 25–34 years.

In this study, the most common method was ingesting pesticides or other poisons (73.5%, 288/392) used by suicide victims. Pesticides were used in 66.6% (261/392) while other poisons were used in 6.9% (27/392) of suicides studied. The second method was hanging (10.5%, 41/392). Other methods were as follows: drowning, 4.8% (19/392); jumping from high place, 1.8% (7/392); suffocation, 0.5% (2/392); wrist cutting, 0.3% (1/392); gas, 0.3% (1/392); electric shock, 0.3 (1/392); run over by train, 0.3% (1/392); methods not known, 4.8% (19/392) (see Table 1).

Suicide was more common in autumn and summer: there were 118 (30.10%) suicides in autumn, 107 (27.29%) suicides in summer, 82 (20.92%) suicides in spring, 84 (21.43%) suicides in winter, 1 (0.26%) suicide with unknown season.

In 392 suicide cases, there were 8.16% (32/392) with missing value of timing. In 360 cases with information of timing, 68.3% (234/360) of suicides happened at nighttime (7 PM–6 AM), 31.7% (126/360) of suicides happened in daytime (7 AM–6 PM) (see Table 1). In 392 suicide cases, 73.6% (287/392) happened at home, only 26.4% (103/392) happened outside (see also Table 1).

According to classification of violent and nonviolent methods by previous suicide researches (5–7), in this study, suicide cases with pesticide, other poisons and overdose, gases, and suffocation were classified into nonviolent group. Suicide cases with hanging, drowning, jumping from high place, wrist cutting, electric shock, and run over by train were classified into violent group. So, in this study, excluding 19 cases without information of suicide

methods, there were 18.8% (70/373) cases classified into violent group, while 81.2% (303/373) cases were classified into nonviolent group.

Compared with suicides with nonviolent methods, suicides with violent methods were commonly seen in cases with mental disorders (60.0% vs. 43.6%) ($p = 0.013$), higher hopelessness (72.9 ± 14.0 vs. 68.7 ± 12.9) ($p = 0.019$), depression (20.6 ± 17.5 vs.13.3 ± 12.7) ($p = 0.000$), and anxiety (55.8 ± 11.6 vs. 52.7 ± 10.1) ($p = 0.027$), less in spring or winter (42.8% vs. 61.0%) ($p = 0.005$), in home (48.6% vs. 81.8%) ($p = 0.000$), and pesticide stored in home (60.9% vs. 79.8%) ($p = 0.001$) (see Table 2).

Multiple logistic regression models were carried out to analyze factors related to violent methods used by suicides. After adjusting age and gender, the results showed that pesticide stored in home (yes = 1, no = 0), season (summer or autumn = 1, spring or winter = 0), and place (home = 1, outside places = 0) were negatively associated with violent methods, which means that rural young suicides with violent methods happened more in home without storing pesticide, winter or spring season, and outside places. Depression was positively associated with violent methods (see Table 3).

Discussion

From our data, hanging, drowning, and jumping from high place as violent methods were ranked second, third, and fifth for their frequencies, while ingesting pesticides and other poisons, and overdose as nonviolent methods ranked as the first and the fourth. These results indicated that ingestion of pesticides or other poisons and hanging were major methods used by our sample of suicides, which was similar to the previous results in China (10). Different areas of China had different major patterns of suicide methods (10): a higher percent of hanging and jumping was used by suicides in urban areas while a higher percent was due to poison used in rural areas. China is a country with a large agriculture and has a large rural population. About 1.4 million tons of pesticide use is estimated each year (24), and that is correlated with the number of suicides using pesticide as methods (3,25) and happened in home. In the United States, people with a ready availability of firearms at home are at higher risk of suicide than those without firearms at home (26). Choice of methods is not likely to be random (1), availability of methods is very important (1,10), and it is also influenced by multiple factors, such as social, cultural, psychological, physical, and biological factors. Our results in this study supported that the probability of suicide death depended on the availability and/or acceptability of such methods (27–29).

Some researchers found that suicide seasonalities are more pronounced in rural areas (30–32) and are particularly related to suicide with violent methods (5,11,33). In this study, season of autumn or summer was negatively related to violent methods, which means that there was an interaction between seasons and violent methods in suicides. In winter or spring, pesticides and other poisons were not easily obtained by suicidal people, and violent methods were easily employed by suicides, which also supported the previous results (27–29). Studying seasonality has an important implication in establishing public health policy (34). In preventing suicides in rural areas in China, different strategies should be carried out according to different season patterns.

In this study, most suicides (73.6%) happened at home. Suicide place (at home) was negatively associated with violent methods. These results indicated that suicides with violent methods were more likely to select outside places to commit suicide. Combining the results of seasonalities of suicide with violent methods and suicides with nonviolent methods, our results suggest that our rural young suicides should be more susceptible to select violent methods when nonviolent methods were not easily obtained by season and place.

"Displacement hypothesis" (35) indicated that restriction of the access to suicide means could not prevent suicide because suicide-prone persons would always be capable to find and obtain other dangerous means. A study in Canada about changes in the overall and firearm suicides rates before and after Bill C-17 shows that firearm suicide is replaced by hanging suicide among men (2), and other studies find that the proportion of hangings typically decreases as either pesticide suicide or firearm suicide increases (10,36). Strengthening administration of pesticide or other poisons in rural areas might be effective in reducing suicides by pesticide or other poisons, but that the overall suicide rates would be largely reduced should be questioned if the "Displacement hypothesis" might exist in China.

In this study, 68.3% of suicides happened at nighttime, but there was no difference in daytime between suicides with violent methods (38.1%) and suicides with nonviolent methods (28.9%). Nighttime was selected by most suicides because it was not easy for others to find them and it was relatively difficult to rescue them from suicide place to the hospital, especially in rural areas of China (3). However, in this study, there was no significant difference in suicide intent score between suicides with violent methods and suicides with nonviolent methods. Our current study indicated that suicide intent might not determine the choice of methods, while availability of methods had more effect on it (1,10).

Although nonviolent methods were most common, violent methods accounted for nearly 20% in young rural suicides, and case fatality of violent methods was at 70–90% (9,10). So, in rural areas in China, strategy of preventing suicide should not ignore violent methods. As we know, control or intervention of suicide by violent methods is very difficult. For example, jumping from high places, solely on the acceptability and/or the availability of this method, is difficult to prevent, and more focus should be on the causal factors of suicide (29). Identifying their characteristics and related risk factors would provide some ideas to prevent this suicide event.

In this study, we found that people committing suicide with violent methods were more likely to have had mental disorders, higher hopelessness, depression and anxiety score, to commit suicide in spring or winter, at outside places, and pesticide was less likely to be stored in home. Suicide season, place, pesticide stored in home, and depression were associated with violent suicides by multiple logistic regression analysis. These results showed that suicides with violent methods had some different characteristics from those of suicides with nonviolent methods. Distinguishing suicides with violent or nonviolent methods and using different intervention strategies might have an important significance in preventing suicide behavior in the population.

In summary, this study, to the best of our knowledge, is the first report on characteristics of young suicides with violent methods in rural China. Ingestion of pesticides or other poisons and hanging are still the most common methods in young rural suicides, which is similar to the results of other areas in China (10,25). Suicides happen more in summer or autumn and at home. Characteristics of suicides with violent methods are different from those of suicides with nonviolent methods. There are no significant differences in age and gender between more violent methods and less violent methods, which is different from the results of study in Sweden where men often used violent methods for completing suicide (37). Suicide season, place, pesticide stored in home, and depression have an impact on suicides with violent methods. Exploring the characteristics of methods of young rural suicides will have important implications in suicide prevention in China. However, some weaknesses in this study should be pointed out. Psychological autopsy method was used to collect information of suicides, and information bias might occur because of informants' subjective observation and memory. We also just used suicide cases as our subjects, and risk factors related to suicides with violent methods or nonviolent methods should be further explored by case–

control study to inform us of more important measures in suicide prevention. Our sample of suicides aged 15–34 years in rural areas is limited by its size and should be cautiously used by other researchers in using our results from this sample.

Acknowledgments

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TABLE 1

Distribution of the methods among 392 young suicides in rural China by gender, age, suicide place, and suicide timing.

Suicide Methods	Frequency (%)	Frequency (%) by Gender M/F	Frequency (%) by Age 15–24/25–34	Frequency (%) by Place Home/Outside	Frequency (%) by Timing Day/Night
Pesticides/poison	288 (73.5)	151 (52.4)	102 (35.4)	234 (81.2)	76 (28.5)
		137 (47.6)	186 (64.6)	54 (18.8)	191 (71.5)
Hanging	41 (10.5)	25 (61.0)	10 (24.4)	30 (73.2)	11 (29.7)
		16 (39.0)	31 (75.6)	11 (26.8)	26 (70.3)
Drowning	19 (4.8)	11 (57.9)	8 (42.1)	2 (10.5)	11 (61.1)
		8 (42.1)	11 (57.9)	17 (89.5)	7 (38.9)
Jumping from high place	7 (1.8)	3 (42.8)	4 (57.2)	2 (28.6)	2 (40.0)
		4 (57.2)	3 (42.8)	5 (72.4)	3 (60.0)
Overdose	12 (3.1)	4 (33.3)	6 (50.0)	11 (100)	2 (20.0)
		8 (66.7)	6 (50.0)	0 (0)	8 (80.0)
Wrist cutting	1 (0.3)	1 (100)	0 (0)	0 (0)	0 (0)
		0 (0)	1 (100)	1 (100)	1 (100)
Gas	1 (0.3)	1 (100)	1 (100)	1 (100)	1 (100)
		0 (0)	0 (0)	0 (0)	0 (0)
Suffocation	2 (0.5)	1 (50)	2 (100)	1 (50.0)	2 (100)
		1 (50)	0 (0)	1 (50.0)	0 (0)
Electric shock	1 (0.3)	1 (100)	1 (100)	0 (0)	0 (0)
		0 (0)	0 (0)	1 (100)	1 (100)
Run over by train	1 (0.3)	1 (100)	0 (0)	0 (0)	0 (0)
		0 (0)	1 (100)	1 (100)	1 (100)
Methods not known	19 (4.8)	15 (78.9)	7 (36.8)	6 (33.3)	9 (52.9)
		4 (21.1)	12 (63.2)	12 (66.7)	8 (47.1)
Total	392 (100)	214 (54.6)	141 (36.0)	287 (73.6)	114 (31.7)
		178 (46.4)	251 (64.0)	103 (26.4)	246 (68.3)

TABLE 2

Comparing the characteristics of the suicides between the violent group (n = 70) and nonviolent group (n = 303).

Variables	Violent Group	Nonviolent Group	*p*
Age—15–24 years (%)	32.8	36.6	0.553
Male (%)	60.0	51.8	0.332
Education, years (mean ± SD)	7.7 ± 3.4	7.4 ± 2.6	0.292
Married (%)	64.3	58.1	0.341
Personal income, RMB (mean rank)	193.6	178.2	0.273
Religion (%)	30.0	29.2	0.894
Season—autumn or summer (%)	42.8	61.0	0.005[*]
Timing—daytime (%)	38.1	28.9	0.154
Place—home (%)	48.6	81.8	0.000[**]
Social support (mean rank)	172.4	181.8	0.486
Physical illness (%)	37.1	34.9	0.582
Mental disorders (%)	60.0	43.6	0.013[***]
Pesticide stored in home (%)	60.9	79.8	0.001[*]
Suicide in family (%)	25.7	20.9	0.375
Suicide intent (mean ± SD)	8.7 ± 3.3	8.2 ± 3.2	0.366
Previous attempt(s)—1 and over (%)	24.6	18.0	0.207
Hopelessness (mean ± SD)	72.9 ± 14.0	68.7 ± 12.9	0.019[***]
Anxiety (mean ± SD)	55.8 ± 11.6	52.7 ± 10.1	0.027[***]
Depression (mean ± SD)	20.6 ± 17.5	13.3 ± 12.7	0.000[**]

[*] $p < 0.01$,

[**] $p < 0.001$,

[***] $p < 0.05$.

TABLE 3

Factors related to the violent methods among the rural young suicides in China: a logistic regression model (n = 373).

Variables	p	OR	95% CI
Age (25–34 age)	0.31	0.71	0.38–1.36
Gender (male)	0.97	1.01	0.55–1.87
Pesticide stored in home	0.02	0.47	0.25–0.89
Season (summer/autumn)	0.01	0.46	0.25–0.83
Place (home)	0.00	0.20	0.11–0.39
Depression-HAMD	0.00	1.04	1.02–1.06
Constant	0.97	1.02	

Cox & Snell $R^2 = 0.147$, Nagelkerke $R^2 = 0.240$, $\chi^2 = 57.313$, $p < 0.001$.