

Characteristics of Chinese rural young suicides by pesticides

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Abstract

Background: The major suicide method in rural China today is ingestion of agricultural pesticides.

Aim: This study is to investigate the characteristics of Chinese rural young suicides who died of pesticide ingestion.

Methods: A sample of 392 suicides from rural China was studied using the psychological autopsy method, and data were analysed for demographic characteristics, the suicide method used, mental disorder and psychological characteristics.

Results: Suicides by pesticide ingestion were enacted more because of impulsiveness and tended to demonstrate less mental illness than those suicides using other means in rural China.

Conclusions: Accessibility, high toxicity and lethality of the pesticides were risk factors for the suicides of people without a mental disorder in rural China. The use of pesticides is a rational choice and the safe storage of these kinds of farming chemicals should be controlled to prevent certain suicides.

Keywords

Suicide, pesticides, psychological autopsy, China

Introduction

Suicide is the fifth most common cause of death and the leading cause of death among 15–34-year-old adults (Wang et al., 2008) in China. Also, the rural suicide rate is three- to five-fold that of the urban rate (Phillips, Li, & Zhang, 2002; Yang, Zhou, Huang, & Chen, 2004; Yip, Liu, Hu, & Song, 2005), and women are much more likely than men to commit suicide (Ji, Kleinman, & Becker, 2001; Phillips, Li et al., 2002; Yip et al., 2005). Only about 30%–70% of young victims have diagnoses of psychiatric illnesses (Phillips, Li et al., 2002; Xiao, Wang, & Xu, 2003; Zhang & Li, 2011) compared to more than 90% of suicide cases in the West who have died with a psychiatric diagnosis (APA, 2003; Conwell et al., 1996). The *Report on Injury Prevention in China* revealed that Chinese suicide rates were 22.6, 22.4, 22.1, 19.3 and 19.3 per 100,000 in 1995, 1998, 2000, 2003 and 2005, respectively (Disease Prevention and Control Bureau of Ministry of Public Health, 2007), accounting for about 287,000 suicide deaths every year (Phillips, Li et al., 2002; Phillips, Yang et al., 2002; Yang et al., 2004; Yip et al., 2005).

A national psychological autopsy study ($N = 519$) in all age groups reported that the main suicide method in China (62%) is ingestion of a kind of agricultural chemical (Phillips, Yang et al., 2002). The Beijing Suicide Research and Prevention Centre showed that 58% of suicide victims killed themselves by taking pesticide. Another study by the Fuyang Disease Control and Prevention Centre in Anhui province (China) showed that nearly 74% of rural suicides

between March 2007 and January 2008 occurred by ingesting pesticides (Zhu, 2010). Another study also found the main suicide method in rural China was ingestion of agricultural chemicals (Kong & Zhang, 2010).

It is believed that restricting access to pesticides could prevent suicide in rural China (Kong & Zhang, 2010). However, restricting the access to pesticides is only the tertiary prevention of suicide and it cannot prevent suicide behaviour fundamentally. One study found that 35% of Chinese people who had carried out a serious suicide attempt first considered harming themselves within 10 minutes or less before making the attempt (Li et al., 2005). Even if pesticide is not available, another suicide method could be selected. It is argued that the reduction of the Chinese suicide rate in the past 20 or so years (Zhang & Jing, 2011) was not attributed to restricting access to pesticides or controlling mental disorders but probably the

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nation's improved economic development (Wang et al., 2008). Although the reasons of the suicide rate decrease are under investigation, it is important to know the characteristics of those who killed themselves by pesticides in rural China and to carry out measures for primary prevention.

The aim of this study is to investigate the environments, social and personal characteristics, and other correlates of the suicides by pesticides in rural China so as to inform suicide prevention measures there, as well as in other areas of the world.

Methods

Research design and procedures

Data for study were from a psychological autopsy study conducted in rural China from October 2005 to June 2008, in which 392 suicides aged 15–34 years were consecutively enrolled from 16 rural countries of three provinces (Liaoning, Hunan and Shandong). The three provinces were selected because of their geographic locations in China, representing respectively, an industrial province in the North East China, an agriculture province in Central South China and economic prosperity in both industry and agriculture halfway between North and South China.

When a suicide occurred, a personal visit was paid by the local health agency or the village administration to obtain agreement for an interview with family members and close friends. One family member and one close friend were identified as the proxy informants. After a verbal agreement with the selected informants, the interview was scheduled within two to six months after the suicide to reduce the impact of acute grief on the interview. Before each interview, informed consent was read and signed by the informant. All this was accomplished with the assistance of the local centres for disease control and prevention (CDCs). To ensure that no case of suicide was missed or erroneously reported, whenever necessary the village board members, the village doctor and villagers were always consulted.

The community-living control group was a random sample stratified by age range and county, and did not exclude individuals who had been diagnosed with mental disorders. We interviewed two informants for each suicide victim and each living control. However, we did not use the control data in the current study.

At least two informants were interviewed for each suicide victim. The first informant was always a parent, spouse or another important family member, and the second was always a friend, a co-worker or a neighbour. The individual most familiar with the subject's life and who consented to participate in our study was interviewed by the research team. We used a standardized method to note the informant characteristics, such as most recent contact, frequency of contacts in the last month and last year, how many years the

informant had known the target, the informant's relationship with the subject, and the informant's impression of his/her familiarity with the target person.

However, when marital infidelity and family oppression were the possible reasons of the suicide, we avoided recruiting those associated with family disputes to minimize the reports bias. What is more, informants had to be over 18 years. Each informant was interviewed separately by one interviewer in a private place such as a hospital/clinic, the informant's home, the village committee office, and so on. Due to the fact that cases were deceased, blinding of raters to case status was not possible. Inter-rater reliability was established and maintained by limiting the principal data-gathering role to the 24 trained clinical interviewers and by comparison of duplicate ratings of the interviewers on a regular basis. The same interviewers participated in data collection for both case and control samples, promoting inter-rater reliability across the study. The protocol as well as the major instruments used in the study were earlier validated in a pilot study conducted by the research team (Zhang et al., 2003).

We integrated information from the two informants based on the following principle. For the demographic information (age, gender, education, marital status, family annual income, personal annual income, physical health condition, pesticide stored at home, etc.), we relied on the answers from the informant who had best access to the information. With regard to mental disorders, we recorded a symptom as present if any information was given by either informant because the other informant may not have had an opportunity to observe the specific characteristic or behaviour. Validity of proxy data and the ways of information integration were tested in our previous study (Fang & Zhang, 2010).

Measurements

Socio-demographic information, the Suicide Intent Scale (SIS), Dickman Impulsivity Inventory (DII), the Duke Social Support Index (DSSI), Beck Hopelessness Scale (BHS) and the Chinese version of the Structured Clinical Interview for DSM-IV (SCID) were included in our study. Socio-demographic information includes gender, age, marital status, education and family or personal annual average income, pesticides stored at home, belief in superstition or in afterlife, physical health condition, and so on. Eight items (isolation, timing, precautions against discovery/intervention, acting to get help during attempt, final acts in anticipation of death, active preparation for attempt, suicide note, overt communication of intent before the attempt) from the SIS were taken into account to understand and measure a victim's suicide attempt in our study. The 23-item DII was designed to assess the personality trait of impulsiveness. DSM-IV axis I diagnoses included mood disorders, schizophrenia and other psychotic disorders, substance use disorders, anxiety disorders and other axis I disorders.

All instruments we used were validated in our previous study (Zhang et al., 2003; Zhang & Norvilitis, 2002).

Age was categorized into two groups: 15–24 and 25–34. The health condition was categorized into ‘poor’, ‘okay’ and ‘good’, and marital status into ‘not currently married’ and ‘currently married’. Never married, divorced, separated or widowed were categorized into the former, and the latter included those who were currently married or involved in a cohabitating relationship.

Ethics

This study was approved by the institutional review boards of State University of New York College at Buffalo; Central South University, Hunan; Provincial Centre for Disease Prevention and Control, Liaoning; and Shandong University, Shandong. Before the interview, every interviewee was informed of the research nature, the background of the project and the details of the rights of him/herself, and then an informed consent was signed. In the interview, whenever the participant wished to discontinue, the interview would stop and another available informant was chosen. For those informants who discontinued the interview, the partially collected data were not discarded.

Statistical analysis

For pesticide suicide victims, we used descriptive analyses, paired *t*-test, Pearson χ^2 test and Mann-Whitney U test to describe and compare demographic variables and psychological characteristics by gender and mental disorders. The same statistics were carried out to describe and compare groups between the means of pesticide ingestion and other suicide methods. All statistical analyses were carried out using SPSS, version 13.0.

Results

Over the study period, we interviewed the proxy informants of 392 suicide victims. A total of 287 (73.2%) cases were deaths by pesticide ingestion, followed by hanging ($n = 41$, 10.5%) and drowning ($n = 20$, 5.1%).

Socio-demographic and psychological characteristics of victims by pesticide ingestion

In the pesticide ingestion group, there were slightly more males than females (151, 70.5% vs 136, 76.4%) (Table 1).

Table 1. Comparison of socio-demographic and psychological characteristics of victims by gender in pesticide ingestion suicide method ($N = 287$).

Predictor	Male ($n = 151$)	Female ($n = 136$)	$\chi^2/t/Z$	p
Age, years, M (SD)	27.24 (6.7)	26.43 (6.1)	-1.060	.290
15–24, n (%)	50 (49.0)	52 (51.0)	0.820	.365
25–34, n (%)	101 (54.6)	84 (45.4)		
Annual family income, yuan, median (Q_L , Q_U)	10,000 (5,000, 15,000)	10,000 (6,000, 20,000)	-1.464	.143
Personal annual income, yuan, median (Q_L , Q_U)	3,500 (1.5, 7,200)	2,000 (0, 6,000)	-2.516	.012
Education, years, M (SD)	7.3 (2.4)	7.3 (2.8)	-0.208	.836
Currently married	58 (38.4)	92 (67.6)	24.515	.000
Physical health condition (%)			9.816	.007
Poor	43 (28.5)	20 (14.7)		
Average	23 (15.2)	34 (25.0)		
Good	85 (56.3)	82 (60.3)		
With mental disorder (%)	79 (52.3)	43 (31.6)	12.546	.000
Believe in superstition, n (%)	29 (19.2)	35 (25.7)	1.761	.185
Believe in afterlife, n (%)	10 (6.6)	22 (16.2)	6.593	.010
SIS total score, M (SD)	8.4 (3.2)	7.9 (3.3)	-1.343	.180
Impulsivity, M (SD)	13.6 (6.0)	14.5 (5.4)	-1.304	.193
Functional	6.8 (2.9)	7.5 (2.7)	-1.940	.053
Dysfunctional impulsivity	6.7 (3.9)	7.0 (3.6)	-0.610	.542
Hopelessness total score, M (SD)	70.9 (13.0)	66.5 (12.6)	-2.892	.004
Feelings about the future	23.7 (5.7)	22.3 (5.3)	-2.108	.036
Loss of motivation	29.6 (5.2)	27.4 (5.8)	-3.567	.000
Expectations	17.7 (3.2)	16.7 (3.2)	-2.520	.012
Social support score, M (SD)	29.6 (5.9)	30.9 (6.3)	1.439	.152
Social interaction	6.3 (1.8)	6.5 (1.6)	0.519	.605
Subjective support	13.8 (3.2)	15.2 (3.2)	3.565	.000
Instrumental support	9.1 (2.9)	9.5 (3.0)	1.127	.261

Note: Differences tested with two-tailed *t*-test. During the study period, the exchange rate was approximately seven yuan to one US dollar.

Compared to the females, the males scored higher on personal annual income (3,500 vs 2,000 yuan, $p = .012$), lower on physical health condition ($p = .007$) and higher on mental health disorder (79, 52.3% vs 43, 31.6%, $p = .000$), and they were less likely to be married (58, 38.4% vs 92, 67.6%, $p = .000$). The males' BHS total score (70.9 vs 66.5, $p = .004$), including feelings about the future (23.7 vs 22.3, $p = .036$), loss of motivation (29.6 vs 27.4, $p = .000$) and expectations (17.7 vs 16.7, $p = .012$), were all higher than females'. Although there was no significant difference in the DSSI score, male victims' subjective support was lower than females' (13.8 vs 15.2, $p = .000$). There was no significant difference in age, family annual income, education level, SIS total score or the DII score between the two genders.

However, victims who died from ingesting pesticides were different in many aspects, including psychological characteristics between those with and without mental illness. Table 2 compares the victims of pesticide ingestion between those with and without mental disorders by gender. The deceased males with psychiatric illnesses had higher SIS total scores (9.1 vs 7.7, $p = .011$) but lower DII scores (12.3 vs 15.0, $p = .006$) than those without. Both the male and female victims with mental illnesses had a higher BHS total score than those without (male: 73.9 vs 67.6, $p = .003$; female: 72.2 vs 63.9, $p = .000$); this was also true for subscales of feelings about the future (male: 24.8 vs 22.4, $p = .013$; female: 24.8 vs 21.3, $p = .000$), loss of motivation (male: 30.7 vs 28.3, $p = .005$; female: 29.5 vs 26.2, $p = .002$) and expectations (male: 18.4 vs 16.9, $p = .006$;

female: 17.9 vs 16.2, $p = .005$). The males without mental disorders had a higher BHS total score than females without mental disorders (67.6 vs 63.9, $p = .048$), especially on subscales of loss of motivation (28.3 vs 26.2, $p = .011$). Although victims with or without mental disorders in both genders were not significantly different in the total DSSI score, the males and females without psychiatric illnesses scored higher on the subscale of social interaction than those with (male: 6.6 vs 5.9, $p = .032$; female: 6.6 vs 5.6, $p = .001$).

Socio-demographic and psychological characteristics of suicide by pesticide ingestion and by other methods

Table 3 lists the socio-demographic and psychological characteristics of the suicides by pesticide ingestion and by other means. Significant differences were found in three areas: mental disorder status, availability of pesticides at home and hopelessness. Compared to the suicides using other methods, those by pesticide ingestion were less likely to be mentally disordered and hopeless, especially for women, and more likely to have pesticides stored at home.

Discussion

In this psychological autopsy study, we identified 392 suicide cases in the selected rural areas of China over the 2.5-year study period. Among all the suicide cases in the study, pesticide ingestion ($n = 287$, 73.2%) was the most common

Table 2. Comparison of psychological characteristics of victims in pesticide ingestion suicide method with and without mental disorders by gender ($N = 287$).

Predictor	With mental disorder		Without mental disorder		<i>t</i>				<i>P</i>			
	Male ($n = 79$)	Female ($n = 43$)	Male ($n = 72$)	Female ($n = 93$)	1	2	3	4	1	2	3	4
SIS total score, <i>M</i> (<i>SD</i>)	9.1 (3.2)	8.1 (3.2)	7.7 (3.2)	7.8 (3.3)	1.545	-0.162	2.582	0.538	.125	.871	.011	.591
Impulsivity, <i>M</i> (<i>SD</i>)	12.3 (5.7)	13.8 (5.8)	15.0 (6.1)	14.8 (5.2)	-1.347	0.298	-2.799	-0.921	.181	.766	.006	.359
Functional impulsivity	6.0 (3.1)	7.1 (2.8)	7.8 (2.5)	7.7 (2.6)	-1.965	0.307	-3.847	-1.086	.052	.759	.000	.279
Dysfunctional impulsivity	6.3 (3.7)	6.8 (3.8)	7.2 (4.1)	7.1 (3.5)	-0.708	0.229	-1.449	-0.434	.480	.819	.149	.665
Hopelessness total score, <i>M</i> (<i>SD</i>)	73.9 (13.4)	72.2 (12.6)	67.6 (11.8)	63.9 (11.7)	0.664	1.993	2.992	3.731	.508	.048	.003	.000
Feelings about the future	24.8 (5.9)	24.8 (4.7)	22.4 (5.4)	21.3 (5.1)	-0.006	1.357	2.521	3.804	.995	.177	.013	.000
Loss of motivation	30.7 (5.3)	29.5 (5.9)	28.3 (4.9)	26.2 (5.5)	1.155	2.559	2.845	3.130	.251	.011	.005	.002
Expectations	18.4 (3.4)	17.9 (3.3)	16.9 (2.8)	16.2 (3.1)	0.774	1.602	2.792	2.861	.441	.111	.006	.005
Social support score, <i>M</i> (<i>SD</i>)	27.5 (7.7)	28.0 (5.6)	29.3 (10.9)	28.9 (5.7)	-0.315	0.288	-1.130	-0.801	.753	.774	.260	.425
Social interaction	5.9 (2.0)	5.6 (1.5)	6.6 (1.8)	6.6 (1.6)	0.814	-.080	-2.168	-3.363	.417	.936	.032	.001
Subjective support	12.4 (6.4)	12.2 (3.1)	13.5 (9.6)	13.2 (2.8)	0.133	0.291	-0.849	-1.735	.895	.772	.398	.085
Instrumental support	9.2 (2.7)	9.9 (2.7)	9.0 (3.2)	9.3 (3.1)	-1.331	-0.617	0.278	0.943	.186	.538	.781	.347

Note: Differences tested with two-tailed *t*-test. *t*1/*p*1 = male (with mental disorder) vs female (with mental disorder); *t*2/*p*2 = male (without mental disorder) vs female (without mental disorder); *t*3/*p*3 = male (with mental disorder) vs male (without mental disorder); *t*4/*p*4 = female (with mental disorder) vs female (without mental disorder).

Table 3. Comparing socio-demographic and psychological characteristics between suicide victims by pesticide ingestion and other methods in rural China ($N = 392$).

Predictor	Pesticide ingestion ($n = 287$)	Other means ($n = 105$)	$\chi^2/t/Z$	p
Male, n (%)	151 (52.6)	63 (60.0)	1.692	.193
Age, M (SD)	26.9 (6.4)	26.8 (6.2)	-0.105	.917
Annual family income, yuan, median (Q_L , Q_U)	10,000 (6,000, 16,800)	10,000 (6,000, 16,000)	-0.377	.706
Personal annual income, yuan, median (Q_L , Q_U)	3,000 (0, 7,000)	3,000 (0, 9,500)	-0.622	.534
Education, years, median (Q_L , Q_U)	8 (6, 9)	8 (6, 9)	-0.759	.448
Pesticides stored at home, n (%)	233 (81.2)	62 (59.0)	20.230	.000
Currently married	150 (52.3)	55 (52.4)	0.000	.984
Physical health condition (%)			0.172	.917
Poor	63 (22.0)	25 (23.8)		
Average	57 (19.9)	21 (20.0)		
Good	167 (58.2)	59 (56.2)		
With mental disorder (%)	122 (42.5)	66 (62.9)	12.754	.000
Male	79 (27.5)	39 (37.1)	1.652	.199
Female	43 (15.0)	27 (25.7)	14.353	.000
SIS total score, M (SD)	8.2 (3.2)	8.5 (3.4)	0.917	.360
Male	8.4 (3.2)	8.3 (3.6)	0.224	.823
Female	7.9 (3.3)	8.9 (3.1)	-1.646	.102
Impulsivity, M (SD)	14.0 (5.7)	13.6 (5.4)	0.437	.661
Male	13.6 (6.0)	14.0 (4.8)	-0.468	.641
Female	14.5 (5.4)	13.2 (6.2)	1.173	.242
Hopelessness total score, M (SD)	68.8 (13.0)	72.0 (14.1)	-2.004	.046
Male	71.0 (13.0)	72.3 (14.9)	-0.668	.505
Female	66.5 (12.6)	71.4 (12.9)	-2.099	.037
Social support score, M (SD)	30.3 (6.1)	30.2 (7.1)	-0.086	.932
Male	29.6 (5.9)	29.6 (7.2)	-0.029	.977
Female	30.9 (6.3)	31.5 (7.0)	-0.325	.746

Note: Differences tested with two-tailed t -test. During the study period, the exchange rate was approximately seven yuan to one US dollar.

suicide method. This finding is consistent with other reports from rural China (Phillips, Yang et al., 2002).

Although both men and women in rural China were more likely to select pesticide ingestion when attempting suicide, there were also some different characteristics between men and women. For the males ingesting pesticides, poor physical and mental health condition, higher responsibility for family's economy, more hopelessness and being single were the characteristics; the characteristics for the females were believing in afterlife and being in a marriage.

We found in the data that the personal annual income of the male suicides was higher than for the female suicides, but no difference was observed between them in family annual income. This suggests that males have the main responsibility for their family economy. More responsibility for the family economy and increased stress and strain are experienced more by males than females (Kanchan, Menon, & Menezes, 2009). This is a good explanation why males were more hopeless than females, especially those without mental disorders. The strain theory of suicide (Zhang, 2005; Zhang, Dong, Delprino, & Zhou, 2009;

Zhang & Lester, 2008; Zhang & Song, 2006) argues that strain resulting from conflicting and competing pressures in an individual's daily life would precede suicidal behaviour. The strain theory of suicide explains this through relative deprivation strain: males of marriage age but still unmarried, or with poor physical and mental health but still with a higher responsibility for the family's economy.

For the female suicides, both their physical and mental health conditions were better than the male suicides. Therefore, there must be some factors other than health problems influencing females to commit suicide by pesticide ingestion. One factor might be marriage status. A total of 92 cases (67.6%) currently married female suicides ingested pesticides, while only 38.4% of male suicides were in this category. Marriage in rural China matters, especially for young women. In the West, marriage is usually believed to be a protective factor against suicide. In Durkheim's (1987) social integration theory of suicide, marriage is considered a source of social support for individuals. However, Zhang (2010) believes that getting married would not be a protective factor in rural China due to the traditional Chinese culture. In Chinese Confucian

ideology, the Three Cardinal Guides are: (1) rulers guide subjects; (2) fathers guide sons; and (3) husbands guide wives (Tu, Hejtmanek, & Wachman, 1992). In the traditional Chinese culture, women are treated as being of less value at home, and this ideology is still strictly regulated in the majority of rural Chinese families. Under these guides, married women are always in the lower status and receive lower social support. In rural China, married female victims suffer from the strain of conflicting values. On the one hand, they are told when they are young that they should obey the traditional Confucian ideology for their entire life, yet on the other, after they go to school, they are taught that women and men are equal. The lower status and lower social support, as well as the cognition of the unfair relationship, causes married females to have more conflicting values strain and reality and aspiration strain.

Another different characteristic between male and female suicides is that although there were almost the same ratios in superstitious belief for both genders, females were more likely than males to believe in afterlife ($n = 22$, 16.2% vs 10, 6.6%). This indicates that in rural China, superstition and believing in afterlife have different cultural meanings; they influence the cognition of life and understanding of suicide. This suggests that women in rural China lack coping skills (deficient coping strain) for accidental and unexpected events and, in our study, females found it easier to cope with accidental negative life events by committing suicide.

Mental illness is a strong risk factor for suicide (Conwell et al., 1996; Harris & Barraclough, 1997; Robins, Murphy, Wilkinson, Gassner, & Kayes, 1959; Zhang, Conwell, Zhou, & Jiang, 2004) in the West, and over 90% of suicide cases have died with a psychiatric diagnosis (APA, 2003; Conwell et al., 1996; Mann et al., 2005). However, in our study only 42.5% of pesticide ingestion victims suffered from mental disorders, which is consistent with another report in China with a figure of only 38% of pesticide ingestion suicide attempts (Xiao, Li, Zhang, & Phillips, 2011). In our study, 165 (57.5%) mental health victims used pesticides to commit suicide. Compared to those with psychiatric diagnoses, they were more impulsive. In our study, 75.2% of suicide victims had pesticides stored at home. This easy access made it very convenient for them to use the pesticides to commit suicide, and the pesticide use is a rational choice under impulsivity.

It is a distinctive characteristic of pesticide ingestion suicides compared to other means of suicide to be less likely to have mental disorders and high levels of hopelessness. Zhang believes that strain may lead to mental disorders, and mental disorders may be an intervener between strain and suicide. Social integration, social regulation and psychological factors are the moderating factors between strain and suicide (Zhang, Dong et al., 2009; Zhang, Wiczorek et al., 2009; Zhang, Wiczorek, Conwell, & Tu, 2011). Strain is still a source of impulsivity.

It is known that different characteristics in suicide methods are shown by different states or areas. Research from the World Health Organization (WHO) mortality database (Ajdacic-Gross et al., 2008) reported that hanging was the predominant method of suicide in most countries such as Estonia, Latvia, Lithuania, Poland and Romania. However, in the USA, as well as in Argentina, Switzerland and Uruguay, the most common suicide method was firearms. In some small and predominantly urban societies such as Hong Kong, Luxembourg and Malta, jumping from a height is a common method of suicide. In our study, 151 males (70.5%) and 136 females (76.4%) selected ingestion of a kind of pesticide for suicide.

Pesticide is a new chemical material without a long history in our modern life. It has existed for only about 60 years in China, but it has come to dominate means of suicide in only several decades. Cantor and Baume (1998) indicated that suicidal behaviour and patterns differ in various populations and cultures, and the choice of suicide method depends on physical availability and sociocultural acceptability.

In the USA, firearms are easily accessible, which explains why their use is the most common method of suicide (Chen, Park, & Lu, 2009; Kaplan & Geling, 1998; Kellermann, 1994; Klieve, Sveticic, & de Leo, 2009; MacDonald & Lerer, 1994). The same situation appears in China: China is the largest producer and consumer of pesticides in the world, with easy availability (in our study, 83.2% of pesticide ingestion suicide victims had pesticides stored at home). High toxicity and lethality of pesticides stored at home may be a good explanation for their use as the most common means of suicide in China (Kong & Zhang, 2010).

However, hanging is the most popular method of suicide for both males and females in India (Kanchan et al., 2009). Socio-acceptability, culture and popularity seem to be the determinants in the choice of methods between the two Asian countries. Socio-acceptability is a measure of the extent to which a person's choice of suicide method is shaped and circumscribed by the traditions and moral attitudes of their culture (Cantor & Baume, 1998). The means of carbon monoxide poisoning by burning charcoal in a confined space in Hong Kong and Taiwan is another example of cultural acceptability (Chen et al., 2009; Liu et al., 2007).

Some researchers hold the view that restriction of access to pesticides would be a good measure to prevent suicide accidents (APA, 2003; Kanchan et al., 2009; Kong & Zhang, 2010; Phillips, Yang et al., 2002; Zhu, 2010). If the government implements some measures such as controlling pesticide access to farmers by organizing professional groups to help them use pesticides, as well as giving subsidies for this kind of financial support, the pesticide ingestion suicide rate in rural China would decrease.

Limitations

A limitation of this study was one of the methodological concerns of a psychological autopsy study. Although we scheduled the interviews two to six months after suicide in order to reduce the potential impact of bereavement and stigma against suicide and mental illness on reporting, the risk of recall bias could have increased. Psychological autopsy studies also limit the sample size due to its costs.

Conclusion

Overall, pesticide ingestion, the most common suicide method in rural China, has its unique characteristics (impulsiveness and no mental illness). Accessibility, high toxicity and lethality of pesticides would be the biggest risk factor for the suicide victims without a mental disorder. Pesticide use is a rational choice, and the safe storage of this kind of farming chemical should be controlled to prevent certain suicides. Strain for different gender (strain of conflicting values for females and relative deprivation strain for males) under the special cultural background would be the explanation for the suicides.

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