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Risk factors for rural young suicide in China: A case–control study

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Abstract

Background—Suicide is the fifth most important cause of death in China and the leading cause of death among young adults aged 15–34 years. The suicide rate in rural China is three times higher than the urban suicide rate, and the rate in women is higher than in men.

Methods—Sixteen counties from three provinces were selected as sampling sites in which 392 suicide cases and 416 community living controls were obtained. For each suicide case and control there were two informants who provided the target person's information. A structured questionnaire including demographics, social and familial environments, and personal characteristics was administered to the informants.

Results—Mental disorders and high hopelessness were found to be strongly related to suicide among Chinese rural young adults. Other suicide risk factors among this population were negative life events, never married but dating, suicide history in family, lack of positive coping skills, lack of social support, dysfunctional impulsivity, and not being a Communist Party/League member.

Conclusions—The prevalence of mental disorders, although the strongest risk factor among rural young adult suicides in this study, was markedly lower than that in Western countries. Some of the risk factors found in the comprehensive analyses are specific to Chinese culture. “Being a Communist Party/League member” as a protective factor for suicide among Chinese rural youths requires further study and appropriate interpretation.

Keywords

Suicide; Risk factor; Case-control study; China

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Conflict of interest

All authors declare that they have no conflicts of interest.

1. Introduction

In China the mean annual suicide rate is 23 per 100,000 and there are about 287,000 suicide deaths per year. Suicide accounts for about 3.6% of all deaths in China and ranks number five among the causes of death in the country. Further, among young people 15–34 years of age, suicide is the leading cause of death, accounting for 19% of all deaths, and rural rates are three times higher than urban rates (Wang et al., 2008). Given the large population base in rural areas of China, rural young suicides have contributed to the high rate of suicide and the total suicide casualties of China. Research that focuses specifically on suicide and its correlates among older adolescents and young adults in rural China is a necessary foundation for design and implementation of prevention.

An important difference between China and Western countries is that over 35% of people who die by suicide in China do not have a diagnosable mental illness at the time of their suicidal behavior, even rigorously and culturally adapted versions of internationally accepted diagnostic criteria being applied, whereas over 90% of suicides in the West have died with mental illnesses (Phillips et al., 2002a). Instead, researchers proposed that the main determinant of China's different pattern of suicidal deaths is the frequent use of highly lethal pesticides as a suicide method in rural areas (Yang et al., 2005; Manoranjitham et al., 2010). Because about 58% of fatal suicides are by pesticide ingestion (Phillips et al., 2002a; Kong and Zhang, 2010), earlier researchers argue that pesticide-related preventive strategies are the most likely to rapidly reduce the overall suicide rate (Wang et al., 2008). These large differences between the characteristics of suicide in China and those reported in the West mean that the Western models which focus most preventive efforts on the identification and treatment of mental illness might not be applicable to China (Wasserman, 2001). An earlier study with the Chinese data identified some unique characteristics of Chinese rural young suicides, such as marriage, religion, impulsivity, and psychological strain (Zhang et al., 2010). This study attempts to do a comprehensive investigation with most major risk factors documented in previous research for both Western and Chinese societies. We hypothesize that depression and other mental illnesses are still major predictors of suicide in China, but the importance of certain social and personal factors such as marital status, belief, impulsivity, and negative life events, etc. might also be noticed in Chinese suicide studies.

2. Methods

2.1. Study population and the design

A case–control psychological autopsy study design was used to explore possible risk factors for suicide among Chinese rural young adults. We examined rural young adults aged 15 to 34 years who died by suicide in comparison with community living controls from the same location. Results of pilot work showed excellent feasibility of studying suicide using psychological autopsy method in Chinese social and cultural environments (Zhang et al., 2002; Zhang and Norvilitis, 2002), and that the Western developed instruments were reliable and valid among Chinese populations (Zhang et al., 2003).

The case–control design was the optimal research method given the environment of Chinese rural young suicides and the hypotheses we were to test. The epidemiological assumption was that controls were representative of the general population in terms of probability of exposure (suicide risk) and that controls had the same possibility of being selected or exposed as the cases (Timmreck, 2002). To optimize scientific validity, suicide cases in this study needed to be compared to living and non-suicidal people that were the same as or equal to the population from which the suicides came. The controls were from the same counties and among the living general population within the same age group of the suicides.

2.2. Sampling

Three provinces in China were involved in this study: Liaoning as an industrial province located in Northeast China, Hunan an agricultural province in the Central South China, and Shandong a province with economic prosperity in both industry and agriculture which was located on the east coast of China mid-way between Liaoning and Hunan. A total of sixteen rural counties were randomly selected from the three provinces (6 from Liaoning, 5 from Hunan, and 5 from Shandong). Suicides aged 15–34 years were consecutively enrolled into the study from October 2005 through June 2008. Similar numbers of community living controls were recruited in the same counties during the same time periods. After successful interviews with the informants of the suicides, the information of 392 suicide cases was collected among which 178 were female and 214 male.

In each of the 16 counties, a project coordinator from the county level Center for Disease Control and Prevention (CDC) monitored suicide occurrences. In each of the three provinces, a project director from the provincial CDC or the university the study was affiliated with received reports on suicide cases each month.

Regarding the importance of clearly defined criteria for suicide as a manner of death (Younger et al., 1990), we excluded cases of accidental or natural death based on suicidal intent and other information. As China lacks a medical examiner system and all deaths are required to be sent to a health agency for a death certificate, hospitals are the primary place for the CDC to locate cases for the study. In rural China where villages are often far away from the nearest hospital, village doctors are in charge of the death certificate. In this study, they were required to report the death to the *Xiang* (township) health agency which then forwarded the death report to the county CDC. All suicidal deaths were required to be reported to the county CDC by telephone or fax within 24 h after the suicide was discovered, and the suicide information gathered at the county CDCs was transferred monthly to the provincial CDC. For the suicidal deaths that were not identified by any health agency, the village treasurer, who collected fees for each burial or cremation and were aware of all the deaths in the village, was allowed to notify the *Xiang* health agency or the county CDC. Whenever necessary, an investigation was conducted to determine the cause of death with the help of village board and villagers. These procedures were implemented to make sure no suicide cases were missed, or erroneously reported, and to minimize misclassification.

The 2005 census database of all the counties was used in the sampling of community controls to identify all the individuals living in the same counties and within the same age range (i.e. 15–34 years), and for each suicide case one living control was randomly selected from the eligible candidates. As to gender, the random selection of controls from each county yielded approximately an equal number of males and females, which also approximated the gender distribution of suicide cases in the study.

The control group did not exclude individuals with mental disorders or previous suicide attempts. Therefore, the prevalence of mental disorders could be roughly assessed in the rural young population, and the effects (direct, moderating, and intervening) of mental disorders as a suicide risk factor could be studied. Following were specific sampling methods for suicide cases and living controls.

2.3. Information sources

For each suicide case and living control, two informants were interviewed with very few exceptions (for two subjects only one informant was available for each). However, recognizing the fact that the type of informants rather than the number of informants in psychological autopsy studies is an important and complex consideration (Kraemer et al., 2003), we selected the informants based on the context or environment (how people observe

the target, e.g. home vs. non-home setting). Thus, each informant was carefully selected and the information of their home, work, family and non-family aspects were also collected.

Based on the above considerations, the following four guidelines were used for the inclusion of informants: (1) proxy informants for cases were recommended by the village head and the village doctor and then selected by the research team based on familiarity with the suicide person's life and circumstances, availability for and willingness to consent to in-person interviews, while control group informants were recommended by the controls themselves and then selected by the research team with similar principles. (2) Although target persons could be as young as 15 years of age, informants had to be 18 years of age or older. Characteristics of the informants for both suicides and controls were noted in a standardized fashion (i.e., most recent contact, number of contacts in the last month, frequency of contacts in the last year, number of years informant has known the target, relationships, and the informant's impression of their familiarity with target persons). (3) For both suicides and controls, informant #1 was always a parent, spouse, or another important family member, and informant #2 was always a friend, co-worker, or a neighbor. (4) Wherever possible we avoided recruiting spouses and in-laws of suicides associated with family disputes. Interviewing these people could result in very biased reports, if marital infidelity and family oppression were possible correlates of the suicide.

2.4. Interviewing procedures

Informants were first approached by the local health agency or the village administration and notified about the interview upcoming. Upon their agreement by written informed consent, the interview was scheduled 2–6 months after suicide. Interviews with living control informants were scheduled as soon as the control targets and their informants were identified. All the interviewers were trained before the investigation and the face-to-face interview was done in a private place where only the interviewer and interviewee were present. The average time for each interview was 2.5 h.

Due to the fact that cases were deceased and controls were living, blinding of interviewers to informant status was not possible. Inter-rater reliability was established and maintained by comparison of duplicate ratings of the interviewers on a regular basis. The same interviewers participated in data collection for both case and control groups, promoting inter-rater reliability across the study.

2.5. Measures

The case–control status was the dependent variable. Predicting variables under this study came from three domains, demographic factors, social and familial environment, and personal characteristics.

Demographic factors included age, gender, education, marital status, living arrangement, family annual income, religion/religiosity, and Party/League membership. The age range was from 15 to 34 years for both case and control groups. Education years ranged from 0 to 16 years for the cases and 2 to 18 years for the controls. The cases and controls were categorized into low (<7 years) and high (≥ 7 years) education level as the first 6 years of formal education in China was elementary. In order to investigate the effect of marriage and marital experience on Chinese rural young suicide, we computed a variable with three categories. The group of “never married and not dating” included those young people who had been unattached in their life, the group “never married but dating” was those who had been involved in a love relationship although never formally married, and the group of “ever married” covered the currently married, separated, divorced, and widowed. The target person's living arrangement was assessed according to whether or not the target person was

living alone during the past 12 months before the suicide or the interview date and was divided into two groups (yes or no). The family annual income was measured with Chinese Renminbi (RMB). Each US dollar was equivalent to about 7.00RMB at the time of this study. There were four items in the protocol to assess religion and religiosity of the cases and controls. The first one asked what religion the target person believed in, and the choices were Taoism, Islam, Protestantism, Catholicism, Buddhism, other, and none. The second item asked about how many times in an average month the target person attended religious events. The third and fourth questions asked if the target person believed in God and an afterlife. The variable of religion/religiosity was the sum total of the four items with all positive responses as “yes” and negative responses as “no.” Communist Party/League Membership was assessed as “yes” or “no” based on the fact that whether or not the target person was a Communist Party or Youth League member.

Social and familial environments included target person’s position in family, target person’s relationship with parents, suicide history in family, negative life events, perceived social support, and pesticide availability. The target person’s position in family was assessed by the question “how do you evaluate his/her position in the family, very high, high, middle, low, or very low?” and the responses are collapsed into two levels as “high” (very high and high) and “low” (middle, low, and very low). The target person’s relationship with his/her parents was divided into two groups “good or excellent” and “ok, not good, or poor.” Suicide history in the target person’s family was also assessed as “yes” (someone in the immediate and extended families has died of suicide) or “no.” Pesticide availability was assessed with a single item asking if any type of farming chemicals were stored at home. A 64-item revised version of Paykel et al.’s (1971) Interview for Recent Life events (IRLE) including 19 culturally specific items was used to measure the number of life events that happened in the past 12 months before suicide incidence or the interview for living controls. The proxy respondents were also asked if the mentioned life event was a positive or negative one for the target person, and only the number of negative life events was involved in this study. The variable was then categorized into three levels, “0–1,” “2–3,” and “4 or more.” Social support was assessed with the Perceived Social Support subscale in the Duke Social Support Index (DSSI) (Landerman et al., 1989). The Perceived Social Support subscale included 7 items scored from 1 to 3 and responses for this subscale were divided into two groups, low (with a total score less than 17) and high (with a total score equal to or greater than 17).

Personal characteristics included physical illness, mental disorders, hopelessness, approach coping, and dysfunctional impulsivity. Two items in the questionnaire were used to assess the physical status of the target person. The first item asked whether or not the target person had any physical illness at the time when the suicide occurred or the interview happened for suicide and control group respectively. The second item asked about the impact of the physical illness on target person’s daily life which was measured on a scale of 1 to 4 (1=no impact, 2=a little impact, 3=some impact, and 4=severe impact). The target person’s physical illness status was divided into three groups, “no impact,” “a little and some impact,” and “severe impact.” Beck Hopeless Scale (BHS) (Beck, 1978; Beck et al., 1985) was used to assess the target person’s hopelessness, and the responses to the BHS were divided into low and high groups at the median score as the cut-off point. The Approach Coping Scale in the Coping Response Inventory (CRI) (Moos et al., 1990) was employed to assess the target person’s coping skills. It was measured according to the scores of the 24 items in CRI. All responses to coping were categorized into two groups, low (scored less than 31) and high (scored equal to or greater than 31). Dysfunctional impulsivity was measured by a 12-item scale developed and validated by Dickman (1990). The response for each of the 12 impulsivity items was “yes” (1) or “no” (0), with the highest possible score being 12 and the lowest being 0. As 49.4% of the responses had a score of 4 or lower, we

arbitrarily categorized those with a score of 4 or lower into the group of low impulsivity and the rest into the group of high impulsivity.

For mental disorders, we used the Chinese version of the Structured Clinical Interview for the DSM-III-R (SCID) (Spitzer et al., 1988; Gu and Chen, 1993) to generate Axis I diagnoses for both suicides and living controls. Diagnoses were made by the psychiatrists on each interview team in consensus meetings at which all responses from each informant were presented by the interviewers. The interview teams consisted of young faculty and graduate students from the medical or public health schools affiliated to the project. All interviewers received intensive trainings for a total of three weeks for using the SCID in the psychological autopsy proxy data collection. The inter-rater reliability (kappa value) on the mental disorder diagnoses and other instruments ranged from 0.72 to 0.90.

2.6. Integrating the information from different sources

There were two proxy interviews for each suicide case and each living control. The vast majority of the responses for the target person were the same or quite similar. For different responses pertaining to the target person, data were integrated with the following three principles based on previous experiences (Kraemer et al., 2003). For demographic information, we relied on the answers by the informant who had the best access to the information. For example, a family member should be able to tell the target person's age and birth date more accurately than does a friend. To determine a diagnosis with the SCID, we selected the response representing a positive symptom, because the other informant may not have had an opportunity to observe the specific characteristic or behavior. These three guidelines were applied in integrating responses of both cases and controls.

2.7. Statistical analysis

The risk factors for suicide were estimated by multiple logistic regressions using the SPSS (version 16.0). We used $\alpha=.05$ to identify statistically significant results because the analyses were used to examine a priori hypotheses pertaining to the risk factors that were measured.

2.8. Role of the funding source

The US NIMH funded this project but had no role in study design, data collection, data analyses, data interpretation, or the writing of the paper.

3. Results

3.1. General information

The data collection of 2.5 years yielded 392 suicide cases and 416 community living controls. In Liaoning Province, 174 suicides and 179 controls were identified, in Hunan Province there were 119 suicides and 138 controls, and the numbers of suicides and community controls in Shandong Province were both 99. There were a little bit more controls than cases in the sample, but we decide to use them all in this study.

As shown in Table 1, suicides were slightly older than controls, while there was no gender difference between cases and controls. Suicides were less educated than controls and more suicides lived alone than did controls. Suicides were less likely to be married than the controls but more likely to be in a dating/love situation than the controls. Suicides were at a lower family annual income level than controls. There were more religious individuals and less Party/League members in suicide group than in the control group.

Of the 392 suicides, two hundred and ninety six (75.51%) of the suicides died by ingestion of agricultural chemicals, pesticides or other poisons, 40 (10.20%) died by hanging, 22 (5.61%) died by drowning, 7 (1.79%) died by jumping, and 27 (6.89%) died by other methods. Two hundred and ninety seven (75.77%) suicides happened in their homes while 82 (20.92%) happened in open fields and 13 (3.32) happened in other places. Only 242 (61.73%) suicides received immediate medical aid after they were found, and 67 (17.09%) had a suicide attempt history. However, this information is not available for controls.

3.2. Bivariate analyses

We grouped the predicting variables into three categories: demographic factors, social and familial environments, and personal characteristics. Suicide group and control group differed significantly in many of the predictors and their Odds Ratio and the Odds Ratio were calculated as shown in Table 2. Mental disorder followed by high hopelessness was the most important risk factors for suicide among Chinese rural young adults. Then there were negative life events, physical illness, suicide history in family, low family annual income, poor relationship with parents, and dysfunctional impulsivity. High education level, Party/League membership, high social support, and high approach coping were found to be protective factors for suicide among Chinese rural young adults.

3.3. Multivariate analyses

Unconditional logistic regressions were employed in multivariate analyses and the subjects' age and gender were controlled in the model (see Table 3). Stepwise regression procedures were used and in the final model, mental disorders and high hopelessness were found to be the most important risk factors for suicide among Chinese rural young adults with an OR of 16.8 for mental illness and 12.2 for hopelessness. Other risk factors were negative life events, never married but dating, suicide history in family, low approach (positive) coping, lack of social support, and dysfunctional impulsivity. Being a Party/League member was found to be a protective factor for suicide among Chinese rural youths. After the establishment of the final logistic regression model, diagnoses of multicollinearity, data separation, and outliers were conducted and none of the above problems existed in the final model. The Hosmer–Lemeshow Chi-Square test showed that the Goodness-of-Fit of the model was excellent.

4. Discussion

For each suicide case we had two informants in order to get a better understanding of the deceased before his/her death. We also applied the full scale of the SCID to estimate the psychiatric status of the suicides as well as the community living controls. As a comprehensive study of the risk factors of young adult suicide in rural China, its findings can be compared with what were found by Phillips et al. (2002a) among Chinese suicides of all age groups about 10 years ago. Although the two studies also differed in selection of controls (accidental deaths vs. community living people), our new findings have repeated a number of risk factors identified by Phillips et al.'s earlier study, e.g. high depression symptom, low quality of life, and a blood relative with previous suicidal behavior. In our case–control design with completed suicides vs. community living controls aged from 15 to 34 years in rural China, we have identified nine risk factors for the study in order of importance: (1) mental disorder, (2) hopelessness feelings, (3) negative life events, (4) never married but dating, (5) suicide history in family, (6) lack of positive coping skills, (7) lack of social support, (8) dysfunctional impulsivity, and (9) not being a Communist Party/League member.

Mental disorder and hopelessness were found to be the most important predictors for suicide among Chinese rural youths, although the mental disorder rates among Chinese suicides (47.0%) were much lower than those in Western countries (about 90%) (Wang et al., 2008). Distribution of the types of mental disorders among the suicides and controls is illustrated in Table 4. One reason for the low prevalence of mental disorders among Chinese rural young suicides might be that the diagnoses were made by psychiatrists based on the information through proxy informants and then presented by the interviewers and this transmission could cause misunderstanding of the subjects' information. Another reason might be the sensitivity of the SCID instrument in Chinese culture. Although it is noted that the Chinese version of the SCID is a valid measure of mental disorders in Chinese populations, the question remains in terms of how exactly the diagnostic system maps onto psychopathological presentations in China (Kleinman, 1986). However in the current study, all the interviewers were strictly trained for using the SCID for the data collection procedure, and they should be conversant enough with the instrument to identify subtle symptoms. Nonetheless, the low prevalence of mental disorders among Chinese suicides might be true as several other studies in China have also found the pattern (e.g. Phillips et al., 2002a; Qin and Mortensen, 2001; Yip et al., 2005; Zhang et al., 2004). As low prevalence of mental disorders was also found among the suicides in rural south India from a recent study with the SCID (Manoranjitham et al., 2010), further research with more rigorous methodology is needed to scientifically establish this observation in China.

Other two findings from this study that duplicate Phillips et al.'s (2002a) observations in an earlier study in China are the effects of low quality of life and a blood relative with previous suicidal behavior. In our sample, the rural youths with low family income and low education (<7 years) tended to have higher suicide risk than those who were better off in terms of income and education. An individual in our sample who had a family member or relative who had died by suicide was at a suicide risk about five times higher than a person who did not have suicide history in the family.

Negative life events (2 or more in the past 1 year) coupled with dysfunctional impulsivity, low social support, poor relationship with parents, and lack of approach coping skills significantly contributed to the suicide risk for Chinese rural young people. Majority of the negative life events experienced by suicides in our sample were loss of money (business), serious illness, dating disruption, domestic violence, and confrontation with spouses or in-laws. It was also found that female suicides were more likely to be involved in the family related events than did the male suicides in the sample. A unique finding in this study is in suicides' marital status. The rural young adults who were never married while being in a love and dating relationship were at higher risk than those who were not married and not dating. From this we may see marital and dating relationships in Chinese family structure that is different from that in the West.

Though "religion/religiosity" was not in the final model, it was a risk factor in bivariate analyses. In Western counties, religion was generally a protective factor for suicide because of its effect on social integration and social support (Durkheim, 1951). In China, religion was not a mainstream culture or social value (Yao and Badham, 2008) and it could be regarded as a social deviance. Instead, being a member of the Communist Party of China (CPC) or China Communist Youth League (CCYL) was a protective factor for suicide among Chinese rural young adults. Although the membership of the CPC is only about 70 million, accounting for about 5.5% of the total population of China, the Party is the dominating political power in China (Xinhua News Agency, 2006). The CCYL is a companion organization of the CPC and its membership is only for those politically qualified youths between 14 and 28 years of age, while the age requirement for a CPC member is 18 and above (China Communist Youth League, 2009). It is likely that in present

day Chinese society communist party or league membership is a major civic value and reflects high social status. As a replacement of the Chinese religion, CPC and CCYL are well structured and could be a source of social support. However, joining the Party or the Youth League being a protective factor could also be interpreted in another way. Some inherent characteristics of the Party/League members may be the real protective factors. These individuals could be more positive in their lives, more optimistic to the future, and more adaptive to the society and these characteristics make them become Party/League members and not kill themselves.

Pesticide stored at home was not a risk factor of Chinese rural young suicide when other important risk factors were controlled for in the regression model, although poisoning in the form of pesticide swallowing was a major suicide method in Chinese rural areas as well as in our sample. According to the research of Phillips et al. (2002b), the easy access to agricultural chemicals was one important reason for the high suicide rate in rural China. Though the 1982 legislation issued by Bureau of Agriculture and Ministry of Health regulated that all agricultural chemicals should be stored in a safe place by assigned personnel in each village (Ministry of Agriculture, 2009), most rural families kept the agricultural chemicals in their own houses. It was not until the government became aware of the role of agricultural chemicals in its high suicide rates that high lethality agricultural chemicals were prohibited and the regulation on preservation of agricultural chemicals was reinforced. During our investigation, we found that most of the remaining agricultural chemicals after pesticide season were collected and stored in village committee offices. However, agricultural chemicals were still available in grocery stores in the village and some suicides in our study died of ingestion of the pesticides they bought from the stores. Therefore, the variable "pesticide stored at home" was not appropriate enough to evaluate the effect of pesticide in Chinese rural youth suicides and better measurements are needed in future research.

In sum, the non-psychiatric risk factors are more observable in Chinese suicides than in the suicides from Western societies. Suicide prevention measures for a developing country like China may have to be modified from the psychiatric model popularly implemented in the West. With the rich literature on the relationship between psychiatric problems and suicidal behaviors documented in the Western societies, suicide research in China with such sophisticated methodologies as psychological autopsy should be conducted over and over again to truly identify the risk factors for the Chinese rural young suicides. Mental illness is without question a major risk factor for Chinese suicide as in elsewhere of the world, but social and non-psychiatric personal factors also account for about half of the suicides in today's rural China.

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Table 1

Demographic characteristics of the sample and comparisons between suicide cases and community living controls.

Demographic variable	Suicide group (n=392)	Control group (n=416)	P for t/X ²
Age	26.84±6.37	25.69±6.17	0.010
Gender			
Male	214 (54.59%)	202 (48.56%)	0.086
Female	178 (45.41%)	214 (51.44%)	
Education level (years)	7.38±2.77	9.15±2.40	<0.001
Marital status			
Never married and not dating	140 (35.71%)	132 (31.73%)	0.020
Never married but dating	46 (11.73%)	31 (7.45%)	
Ever married	201 (51.28%)	251 (60.34%)	
Living alone			
Yes	35 (8.93%)	17 (4.09%)	0.005
No	357 (91.07%)	399 (95.91%)	
Family annual income			
Low (RMB<10,000)	158 (40.31%)	79 (18.99%)	<0.001
Middle (10,000R	134 (34.18%)	126 (30.29%)	
≤RMB<20,000)			
High (RMB≥20,000)	91 (23.21%)	169 (40.63%)	
Religion/religiosity			
Yes	113 (28.83%)	70 (16.83%)	<0.001
No	279 (71.17%)	344 (82.69%)	
Party/league membership			
Yes	89 (22.70%)	186 (44.71%)	<0.001
No	296 (75.51%)	225 (54.09%)	

Table 2

Suicide risk estimate for each of the demographic factors, social and familial environments, and personal characteristics: bivariate analyses using odds ratio (OR) with 95% of confident interval (suicide N=392 and control N=416).

Risk factors	OR (95% CI)	Adjusted OR (95% CI)
<i>1. Demographic factors</i>		
Education level (≥7 years)	0.2 (0.158–0.324)	0.2 (0.155–0.321)
Marital status		
Never married and not dating	1	1
Never married but dating	1.4 (0.837–2.339)	1.3 (0.769–2.255)
Ever married	0.8 (0.558–1.021)	0.5 (0.349–0.812)
Low family annual income	6.4 (4.557–9.070)	6.4 (4.496–8.985)
Living alone	2.3 (1.267–4.179)	2.3 (1.251–4.152)
Religion/religiosity	2.0 (1.420–2.789)	2.1 (1.493–2.967)
Party/league membership	0.4 (0.268–0.494)	0.4 (0.259–0.488)
<i>2. Social and familial environments</i>		
Position in family (low)	2.1 (1.585–2.780)	2.2 (1.651–2.941)
Relationship with parents (poor)	6.2 (4.189–9.169)	6.1 (4.086–8.978)
Suicide history in family	7.6 (4.284–13.350)	7.5 (4.231–13.220)
Pesticide stored at home	1.8 (1.332–2.455)	1.8 (1.319–2.439)
Negative life events		
0–1	1	1
2–3	4.7 (3.274–6.611)	4.8 (3.353–6.817)
≥4	17.6 (10.623–29.144)	18.0 (10.789–30.028)
Perceived social support (high)	0.2 (0.167–0.333)	0.2 (0.170–0.339)
<i>3. Personal characteristics</i>		
Physical illness		
No	1	1
Yes and with mild impact	1.7 (1.091–2.657)	1.7 (1.058–2.597)
Yes and with severe impact	9.1 (5.040–16.274)	8.9 (4.946–16.081)
Mental disorders	33.6 (17.872–63.115)	35.1 (18.535–66.452)
Hopelessness (high)	38.1 (25.545–56.877)	38.5 (25.704–57.679)
Approach coping (high)	0.1 (0.058–0.115)	0.1 (0.058–0.115)
Dysfunctional impulsivity (high)	4.9 (3.605–6.569)	5.2 (3.820–7.077)

Table 3

Suicide risk factors: multivariate logistic regression analyses using odds ratio (OR) significant at 0.05 or lower.

Risk factors	OR (95% CI)	<i>p</i>
Education level (<7 years)	1.9	0.066
Marital status		
Never married and not dating	1	
Never married but dating	4.8	0.003
Ever married	0.8	0.643
Low family annual income	1.9	0.075
Party/league membership	0.4	0.004
Relationship with parents (poor)	2.0	0.080
Suicide history in family	4.6	0.004
Negative life events		
0–1	1	
2–3	2.4	0.009
≥4	5.5	<0.001
Perceived social support (low)	2.5	0.009
Mental disorders	16.8	<0.001
Hopelessness (high)	12.2	<0.001
Approach coping (low)	3.3	<0.001
Dysfunctional impulsivity (high)	2.2	0.008

Nagelkerke R square=0.801. Hosmer–Lemeshow Chi-Square=10.119, P=0.257.

Table 4

Diagnoses of mental disorders among suicide cases and living controls.

Diagnoses of mental disorders	Cases (n=392)	Controls (n=416)
	N (%)	N (%)
<i>Subjects diagnosed as any axis I mental disorder at time of death or interview</i>	188 (48.0%)	16 (3.8%)
<i>Mood disorders</i>	137 (34.9%)	10 (2.4%)
Major depression disorder	93 (23.7%)	6 (1.4%)
Bipolar disorder	12 (3.1%)	1 (0.2%)
Dysthymia	10 (2.6%)	0
Mood disorder due to GMC	1 (0.3%)	1 (0.2%)
Mood disorder NOS	21 (5.4%)	2 (0.5%)
<i>Schizophrenia and other psychotic disorders</i>	44 (11.2%)	2 (0.5%)
Schizophrenia	40 (10.2%)	2 (0.5%)
Schizoaffective disorder	1 (0.3%)	0
Psychotic disorder due to GMC	2 (0.5%)	0
Psychotic disorder NOS	1 (0.3%)	0
<i>Alcohol and substance use disorders</i>	25 (6.4%)	4 (0.9%)
Alcohol use disorder	23 (5.9%)	4 (0.9%)
Substance use disorder	2 (0.5%)	0
<i>Anxiety disorders and other axis I disorders</i>	8 (2.0%)	2 (0.5%)
General anxiety disorder	3 (0.8%)	0
Phobic disorder	3 (0.8%)	1 (0.2%)
Post traumatic stress disorder	1 (0.3%)	0
Anxiety disorder NOS	1 (0.3%)	1 (0.2%)
<i>Other axis I disorders</i>	2 (0.5%)	0
Acute stress disorder	1 (0.3%)	0
Pathological gambling	1 (0.3%)	0

GMC=general medical condition; NOS=not otherwise specified. Note that the sum of all diagnoses exceeds the subjects with any diagnosis because multiple diagnoses can be given to a subject.