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Prevalence and Correlates of Suicidal Behaviors among College Students in Northeastern China: a Cross-Sectional Study

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Abstract The present study aimed to investigate the prevalence and correlates of suicidal behaviors among college students in Jilin Province, China. A cross-sectional survey was conducted in 2016, using a self-reported questionnaire. Convenience sampling method was used to select college students as participants. The analysis was based on a sample of 730 college students. We use multivariate logistic model to determine the risk factors of suicidal behaviors.The prevalence of suicidal ideation, suicidal plan, suicidal attempts were respectively 13.2%, 3.3% and 3.4%. After controlling for the potential confounding factors, history of family psychiatric illness, depression and quality of life were significantly associated with

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suicidal ideation. Besides, suicidal plan was predicted significantly by not living together with university roommates and depression. In terms of suicidal attempts, not living together with university roommates and history of family psychiatric illness were its risk factors. Comprehensive interventions regarding aims at risk factors may be critical as effective strategies to protect college students from suicide.

Keywords Suicidal ideation · Suicidal plan · Suicidal attempts · College students · Correlates

Introduction

The prevention of suicidal behaviors has been recognized as a significant public health challenge. In total, over 800,000 people worldwide die by suicide every year, accounting for 1.4% of all deaths [1]. Based on current trends, the number of suicide deaths is expected to reach nearly 1.53 million around the world by the year 2020, in spite of growing prevention efforts [2]. In China, which has almost 1.3 billion inhabitants, suicide is among the top five causes of death [3]. In addition, suicide is the second-leading cause of death among college students in the United States [4], accounting for approximately 1100 deaths each year [5]. College students are reported to have high levels of suicidal ideation, planning and attempts [6]. There is general agreement on the importance of effectively identifying and treating potentially suicidal college students.

Suicidal behaviors comprise a series of actions, including suicidal ideation, suicidal planning and suicidal attempts [7]. Suicidal ideation, the beginning of the suicide process, is defined as thinking about harming or killing oneself with the intent to end one's life [8]. In previous literature, the rate of suicidal ideation among college students ranged from 6% to 39.2% in different countries [9–11], which was relatively high. A meta-analysis reported that the prevalence of suicidal ideation in Chinese college students was 10.72% [12]. Moreover, age was inversely related to the risk of suicidal ideation; adults aged 18–34 years were 10.3 times more likely to have suicidal ideation compared to adults aged 65+ years [13]. Suicidal planning refers to the formulation of a specific method by which one intends to die [14]. A national survey of college students at 70 colleges and universities found that 38% of undergraduates had made a specific plan to commit suicide [15]. Finally, suicide attempt is engaging in self-injurious behavior intentionally and voluntarily, thus endorsing some degree of intent to die [16]. It was observed that the prevalence of suicidal attempts was approximately 1.4% in a survey of over 46,000 college students across 74 college campuses [17]. It is estimated that a suicidal attempt occurs at least 10–20 times for every suicide completion [18].

Many suicidal attempters are life-long disabled individuals, which aggravates the possibility of recurrent attempts. Every suicide death will affect 2–3 families and 7–8 persons, who in turn might be more likely to engage in suicidal behaviors than other population groups. In the context of a college environment, suicidal behaviors affect not only the nearly 1100 college student victims whose lives are claimed by suicide each year and their families but also all parts of each victim's tightly knit college community, including students, faculty members, and administrators [19]. In general, the injury due to suicidal attempts will require medical attention [20]. Medical care, the total cost of completed suicide, and the loss of workforce members result in direct and indirect economic losses, which are very large.

Suicide is the leading cause of death for young people in China; however, suicide in this population has been investigated very little, and relevant findings of significant correlates are meager compared with those of Western countries [21]. Although some studies indicate a lower rate of suicidal behavior for college students compared with same-aged peers [15], the risk for suicide is often higher among college students, compared with same-aged non-collegiate peers [22]. College is often viewed as an important and stressful developmental period [23]. University students, who are a unique group of people, are in a critical transitional period [3]. They may face a variety of transitions in the social and psychological aspects of their individuals' lives and may experience different levels of difficulties in terms of academic pressures, occupational choices, and life goal decisions [24]. Unfortunately, some students may commit suicide as a solution to their problems [25]. A tough challenge for China's higher education institutions is how to prevent college students from committing suicide and how to detect early the individuals at high risk of suicide [12]. Thus, it is imperative to investigate the status of related suicidal behaviors among Chinese college students and to explore associated risk factors.

Methods

Study Population

A cross-sectional survey was conducted in Jilin University, which is a comprehensive key university affiliated with the Ministry of Education, from April to May 2016. The university is located in Changchun, Jilin Province, China. The study employed a convenience sampling method to produce a sample of college students. Students were recruited via ads and were asked to complete the paper questionnaire in the classroom. A total of 781 students were approached, and 730 completed the survey; thus, the valid response rate was 93.47%. Of the sample, 20.6% (n = 150) were freshmen, 31.5% (n = 230) were sophomores, 34.1% (n = 249) were juniors, and 13.8% (n = 101) were seniors.

It took the respondents approximately 30 min to complete the evaluation questions. During this process, all invited participants were volunteers and were guaranteed confidentiality. A small gift was given to them as compensation for their time spent on the survey.

Measures

Socio-Demographics

The socio-demographic variables that were assessed included the following: age; gender (male = 1, female = 2); and the student lived together with whom (with family = 1, with university roommate = 2, with others = 3).

Physical Illness and Family History of Psychiatric Disorders

A question regarding the diagnosis of serious physical illness was used. The possible responses were yes (1) and no (0). A question asked whether any family member was diagnosed with psychiatric disorders by a physician, and the answer of yes was given a value of 1. An answer of no was given a value of 0.

Learning Status

Learning status was assessed with two items. Professional satisfaction was measured with the question "Do you like your current major?" Possible responses included the following: "Dislike = 0", "Moderate = 1" and "Like = 2".

Learning pressure was measured with the question "How do you think about the learning pressure?" Possible responses included the following: "No pressure (0)", "Some pressure, but acceptable (1)", and "Greater pressure (2)".

Suicidal Behaviors

Suicidal behaviors were captured by questions adapted from National Comorbidity Survey [26]. We identified the 12-month prevalence of suicidal ideation, suicidal planning and suicidal attempts. It included the following three questions: "In the past 12 months, have you ever thought about committing suicide?", "In the past 12 months, have you ever planned to committed suicide?", and "In the past 12 months, have you ever made an attempt to commit suicide?" All the items were answered with "yes" or "no".

Depression

Depressive symptoms were measured by the Beck Depression Inventory (BDI-II) [27]. It is a 21-item self-report questionnaire using a four-point rating scale and generating a total score between 0 and 63. The Chinese version of the BDI-II has been validated and reliable in the Chinese population [28]. The internal consistency reliability was 0.94. Scores of 0, 14, 20, 29, respectively, represented the low limits of no, mild, moderate and severe depression.

Quality of Life

The Chinese version of the World Health Organization's QOL Questionnaire-Brief Version (WHOQOL-BREF) was used [29]. It is composed of 26 items on a five-point Likert scale. A score of 1 indicates "not at all" and 5 indicates "extremely". The WHOQOL-BREF generates four domains: physical health domain, psychological domain, social relationships domain and environment domain. In addition to the four domains, the WHOQOL-BREF contains two stand-alone questions, one concerning the participants' rated QOL and one regarding their satisfaction with their health. Total scores range from 26 to 130, with high scores demonstrating better quality of life.

Statistical Analysis

Our aim was to identify the likelihood of experiencing suicidal ideation, suicidal planning and suicidal attempts and risk factors for the abovementioned suicidal behaviors. First, descriptive statistics were calculated, including counts and percentages. Second, cross-tabulations were used to estimate the prevalence of suicidal behavior and differences in categorical variables. Third, we ran univariate logistic regression models to calculate odds ratios in separate models for potential influencing factors. Fourth, all significant factors at $p<0.05$ in the univariate logistic regression analysis were added to a multivariate logistic regression analysis, which was used to determine the risk factors. Data were analyzed using the SPSS software for windows, version 18.0 (SPSS Ltd.). A significance level of $p<0.05$ was used for all analyses.

Results

Prevalence of Suicidal Behaviors

We examined 219 males (30%) and 511 females (70%) in the study. The participants ranged in age from 16 to 25 years, with a mean age of 20.52±1.42 years (20.64±1.63 years in males, 20.46±1.32 years in females). The prevalence of suicidal ideation, suicidal planning, suicidal attempts were 13.2% (11.8% for 16–20 age group and 14.6% for 21–25 age group), 3.3% (4.0% for 16–20 age group and 2.5% for 21–25 age group) and 3.4%(4.0% for 16–20 age group and 2.8% for 21–25 age group), respectively. The gender ratio (males: females) was 1:2.56 for suicidal ideation, 1:2.00 for suicidal planning and 2.13:1 for suicidal attempts. Moreover, the prevalence of suicidal planning was higher in the 16–20 age group than in the 21-25age group for females ($p<0.05$).There were no additional significant findings in the prevalence of other suicidal behaviors by gender or age ($p > 0.05$) (Table 1).

Characteristics and Comparability of Characteristic Variables for Suicidal Behaviors

Students who were living with university roommates accounted for the vast majority of the sample ($n = 705$, 96.6%). Very few people reported a confirmed diagnosis of physical illness ($n = 15$, 2.1%) or had a history of family psychiatric illness ($n = 31$, 4.2%). A total of 45.1% of students liked their major, compared to 6.6% and 48.3% who disliked and moderately disliked their majors, respectively. The majority of participants declared that they had some learning pressure but that it was acceptable ($n = 515$, 70.5%), followed by participants who had greater pressure ($n = 189$, 25.9%) and no pressure ($n = 26$, 3.6%).

The majority of all the participants had less than minimally depressive symptoms (82.7%). According to the principle of the top and bottom 27%, the quality of life was divided into three groups: high ($n = 190$), medium ($n = 339$) and low ($n = 201$) quality of life. Significant differences in the prevalence of suicidal ideation and suicidal planning were found within groups with different characteristics, such as living with certain people, physical illness, a history of family psychiatric illness, professional satisfaction, learning pressure, depression,

Table 1 Prevalence of suicidal behaviors in males and females according to age groups

Variable	Age group	Males($N = 219$)		Females($N = 511$)		Total($N = 730$)	
		n	PR	n	PR	n	PR
Suicidal ideation	16–20	9	8.7%	35	13.0%	44	11.8%
	21–25	18	15.7%	34	14.0%	52	14.6%
	Total	27	12.3%	69	13.5%	96	13.2%
Suicidal plan	16–20	2	1.9%	13	4.8%	15	4.0%
	21–25	6	5.2%	3	1.2%	9	2.5%
	Total	8	3.7%	16	3.1%	24	3.3%
Suicidal attempts	16–20	3	2.9%	12	4.5%	15	4.0%
	21–25	5	4.3%	5	2.1%	10	2.8%
	Total	8	3.7%	17	3.3%	25	3.4%

PR, prevalence ratio

and quality of life, but not gender. There were no differences in the prevalence of suicidal attempts by gender or learning pressure status (Table 2).

Correlates of Suicidal Behaviors

Table 3 shows the results of univariate logistic regression assessing significant determinants of suicidal ideation, suicidal planning and suicidal attempts. Living with certain people, physical illness, a history of family psychiatric illness, professional satisfaction, depression and quality of life were correlated with suicidal ideation, suicidal planning and suicidal attempts.

After controlling for potential confounding factors, multivariate logistic regression analysis revealed that physical illness, depression and quality of life were significantly

Table 2 Prevalence rates of 12 months suicidal behaviors by correlates

Variable		N	Statistic	Suicidal ideation n(PR)	Suicidal plan n(PR)	Suicidal attempts n(PR)
Gender	Male	219		27(13.5%)	8(3.7%)	8(3.7%)
	Female	511		69(12.3%)	16(3.1%)	17(3.3%)
			χ^2	0.185	0.131	0.049
			P	0.382	0.435	0.489
Live with whom	University roommate	705		90(12.8%)	18(2.6%)	21(3.0%)
	Family	19		3(15.8%)	3(15.8%)	1(5.3%)
	Others	6		3(50%)	3(50%)	3(50%)
			χ^2	7.341	51.712	39.971
			P	0.025	<0.001	<0.001
Physical illness	No	715		90(12.6%)	21(2.9%)	22(3.1%)
	Yes	15		6(40%)	3(20.0%)	3(20.0%)
			χ^2	9.666	13.453	12.722
			P	0.008	0.011	0.012
Family history of psychiatric disorders	No	699		86(12.3%)	20(2.9%)	20(2.9%)
	Yes	31		10(32.3%)	4(12.9%)	5(16.1%)
			χ^2	10.349	9.414	15.799
			P	0.004	0.016	0.003
Professional satisfaction	Dislike	48		12(25.0%)	6(12.5%)	5(10.4%)
	Moderate	353		49(13.9%)	10(2.8%)	13(3.7%)
	Like	329		35(10.6%)	8(2.4%)	7(2.1%)
			χ^2	7.884	13.800	8.840
			P	0.019	0.001	0.012
Learning pressure	No pressure	26		2(7.7%)	1(3.8%)	1(3.8%)
	Some pressure, but acceptable	515		47(9.1%)	8(1.6%)	13(2.5%)
	Greater pressure	189		47(24.9%)	15(7.9%)	11(5.8%)
			χ^2	30.700	17.743	4.555
			P	<0.001	<0.001	0.103
Depression	No	604		55(9.1%)	12(2.0%)	14(2.3%)
	Yes	126		41(32.5%)	12(9.5%)	11(8.7%)
			χ^2	50.125	18.626	12.961
			P	<0.001	<0.001	<0.001
Quality of life	Low	201		52(25.9%)	12(6.0%)	12(6.0%)
	Medium	339		38(11.2%)	11(3.2%)	12(3.5%)
	High	190		6(3.2%)	1(0.5%)	1(0.5%)
			χ^2	46.204	9.107	8.777
			P	<0.001	0.011	0.012

Table 3 Univariate logistic regression analysis for predictors of suicidal behaviors in the past 12 months

Variable	Suicidal ideation		Suicidal plan		Suicidal attempts	
	OR(95%CI)	*P*	OR(95%CI)	*P*	OR(95%CI)	*P*
Gender						
Male	1.00		1.00		1.00	
Female	0.90(0.56–1.45)	0.667	1.17(0.49–2.78)	0.717	1.10(0.47–2.59)	0.824
Age(years)						
16–20	1.00		1.00		1.00	
21–25	1.275(0.83–1.96)	0.269	0.62(0.27–1.43)	0.260	0.69(0.31–1.55)	0.367
Live with whom						
University roommate	1.00		1.00		1.00	
Family	1.28(0.37–4.49)	0.698	7.16(1.19–26.76)	0.003	1.81(0.23–14.20)	0.573
Others	6.83(1.36–34.38)	0.020	38.17(7.20–202.21)	<0.001	32.57(6.20–170.99)	<0.001
Physical illness						
No	1.00		1.00		1.00	
Yes	4.63(1.61–13.31)	0.004	8.26(2.17–31.48)	0.002	7.88(2.07–29.91)	0.002
History of family psychiatric disorders						
No	1.00		1.00		1.00	
Yes	3.39(1.55–7.45)	0.002	5.03(1.61–15.73)	0.005	6.53(2.27–18.76)	<0.001
Professional satisfaction						
Dislike	1.00		1.00		1.00	
Moderate	0.48(0.24–0.99)	0.048	0.20(0.07–0.59)	0.003	0.33(0.11–0.97)	0.043
Like	0.36(0.17–0.75)	0.006	0.17(0.06–0.53)	0.002	0.19(0.06–0.62)	0.006
Learning pressure						
No pressure	1.00		1.00		1.00	
Some pressure, but acceptable	1.21(0.28–5.26)	0.804	0.39(0.05–3.28)	0.389	0.65(0.08–5.15)	0.681
Greater pressure	3.97(0.90–17.44)	0.068	2.16(0.27–17.03)	0.467	1.55(0.19–12.48)	0.683
Depression						
No	1.00		1.00		1.00	
Yes	4.82(3.03–7.66)	<0.001	5.19(2.28–11.85)	<0.001	4.03(1.79–9.10)	0.001
Quality of life						
Low	1.00		1.00		1.00	
Medium	0.36(0.23–0.57)	<0.001	0.53(0.23–1.22)	0.135	0.58(0.26–1.31)	0.190
High	0.09(0.04–0.22)	<0.001	0.08(0.01–0.65)	0.018	0.08(0.01–0.65)	0.018

associated with suicidal ideation. Participants with a history of family psychiatric illness (OR = 2.48, 95%CI = 1.03–5.93) or depression (OR = 2.96, 95%CI = 1.75–4.99) were more likely to have suicidal ideation. High quality of life (medium: OR = 0.56, 95%CI = 0.33–0.94; high: OR = 0.17, 95%CI = 0.07–0.44) was a protective factor against suicidal ideation. In addition, suicidal planning was predicted significantly by living with certain people and depression. Living with family (OR = 5.63, 95%CI = 1.37–23.22) or others (OR = 19.87, 95%CI = 2.68–147.49) carried a higher risk of making a suicidal plan. Suicidal planning was more common among those who were living with depression (OR = 3.51, 95%CI = 1.30–9.49). In terms of suicidal attempts, living with certain people and a history of family psychiatric illness were risk factors. Compared with living with university roommates, those who were living with others (OR = 17.47, 95%CI = 2.45–124.67) were more prone to engaging in suicidal attempts, but this likelihood was similar to that associated with living with family (OR = 1.20, 95%CI = 0.14–0.23). A history of family psychiatric illness (OR = 4.36, 95%CI = 1.30–14.65) was also associated with a higher likelihood of suicidal attempts (Table 4).

Table 4 Multivariate logistic regression analysis of correlates of suicidal ideation, suicidal plan and suicidal attempts

Dependent variable	Independent variable	OR	95%CI	*P*
Suicidal ideation	History of family psychiatric disorders			
	No	1.00		
	Yes	2.48	1.03–5.93	0.042
	Depression			
	No	1.00		
	Yes	2.96	1.75–4.99	<0.001
	Quality of life			
	Low	1.00		
	Medium	0.56	0.33–0.94	0.029
	High	0.17	0.07–0.44	<0.001
Suicidal plan	Live with whom			
	University roommate	1.00		
	Family	5.63	1.37–23.22	0.017
	Others	19.87	2.68–147.49	0.003
	Depression			
	No	1.00		
	Yes	3.51	1.30–9.49	0.013
Suicidal attempts	Live with whom			
	University roommate	1.00		
	Family	1.20	0.14–0.23	0.866
	Others	17.47	2.45–124.67	0.004
	History of family psychiatric disorders			
	No	1.00		
	Yes	4.36	1.30–14.65	0.017

Discussion

The present findings demonstrate that 13.2% of the participants had thought about suicide, which was in accordance with previous findings among undergraduates in Yunnan Province, South China [30] but slightly higher than findings among Turkish college students (11.4%) [31]. A study found that 22% of college students in New York City endorsed suicidal ideation in the past year [32]. Our findings regarding the percentage of individuals with a suicidal plan (3.3%) were similar to findings in other Chinese college students at Central South University [33], but the prevalence was 6.6% for college students in Yinchuan, Northwestern China [34]. A study performed in Taiwan reported that approximately 7.5% of college students had planned to kill themselves [35]. Another study recruited participants (n = 1288) from various programs in three UK universities and reported that 17.9% of the sample had attempted suicide [2]. A meta-analysis recorded that the minimum and maximum prevalence of suicide attempts among college students in China were 0.4% and 10.5%, respectively [36]. We found the prevalence of suicide attempts (3.4%) to be in the abovementioned range. The cause of this phenomenon may be attributed to the use of different measuring tools and definitions for suicidal behaviors, as well as differing social and cultural contexts [37]. For Chinese citizens, it is shameful to report suicidal behaviors because suicide is stigmatized by others with harsh rumors and criticism [38]. Although the prevalence estimate found in our research was lower than that of other studies in other countries or areas, our findings warrant greater attention to be directed toward crisis prevention and intervention. China has a special culture with a high degree of emphasis on education. College students are placed under high expectations by their

families and even society as a whole. Many of them are still adolescents, and once they engage in suicidal behaviors, these events will have a major negative influence on their lives.

While numerous studies have shown that females were more likely to report more suicidal behaviors than males [39, 40], our findings did not reflect this pattern. Previous research has suggested that females may bear more psychological pressure and be more likely to negatively react to stressors [41]. Age group differences were observed in females, with the younger group associated with more risk factors for suicidal planning. This phenomenon may be due to difficulties in adapting to changes in new environments. At a university, almost all the students come from all over the country and are far away from home. However, girls generally need more emotional support.

In our study, college students who did not live with university roommates were more vulnerable to making a suicidal plan and attempting suicide. Compared to living with university roommates, living with others was associated with being 19.87 and 17.47 times likely to engage in suicidal planning and suicidal attempts, respectively. Previous findings indicated that adolescents who did not live with both parents were more likely to endorse suicidal behaviors than their counterparts [42]. Parental support and affection can protect against the increased odds for suicidal behaviors [43]. College students mostly live in university dormitories. During the period of college life, they might need more support from roommates and think highly of such interpersonal relationships.

Previous research has consistently shown that a family history of psychopathology is associated with suicidal attempts [44]. Genetic inheritance and diverse expression, as potential risk factors, increase the odds of suffering from a psychiatric disease [45]. It has been reported that approximately 90% of individuals exhibiting suicidal behaviors had a diagnosis of at least one psychological problem [46]. For example, depression is closely related to suicidal behaviors [47]. Depression has been regarded as an important factor that predicts increased risk for suicidal ideation [48], which supported our study. We also found a significant association between depression and suicidal planning but not suicidal attempts. Moreover, another study found that people with depression were at a higher risk for suicidal attempts [49]. Our study also found that a high quality of life contributed to a decreased risk of suicidal ideation. Very few previous studies have examined this relationship.

The significant associations of physical illness and professional satisfaction with suicidal behaviors were found in the results of both chi-square tests and univariate logistic regression models but not in the results of multivariate logistic regression analysis after controlling for confounding factors. However, a Korean study indicated that individuals who reported having poor health were at high risk for both suicidal ideation and suicide attempt, with odds ratios of more than 3.0 [50]. For profession, a majority of Chinese parents often help children choose which major to study or even impose a major on their children. Thus, these two factors also merit attention.

Conclusion

Our findings have clearly demonstrated that a history of family psychiatric illness, depression, quality of life and not living with university roommates were significantly associated with suicidal behaviors. Suicide is a continuum of behavior, in which the preceding behavior is generally a significant indicator for a subsequent action [51]. Thus, suicide intervention programs should focus on the correlates of each component with regard to suicidal behaviors.

Limitations and Future Research Directions

Because the study was based on a self-report questionnaire, there might be a large number of respondents unwilling to answer the sensitive questions about suicide. It is also possible that data were not missing at random. More objective data collection methods can be used to improve the credibility of findings in the future. In addition, a definitive conclusion cannot be drawn from a cross-sectional survey. Thus, future studies require a longitudinal design. In addition, due to the sample size and convenience sampling, these findings may not be generalizable to all college students. Therefore, a study examining a large sample obtained through stratified random sampling should be conducted in the future. Finally, except for the influence of the correlates we observed, there may be other variables that affect suicidal behaviors, which still need to be further examined.

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Compliance with Ethical Standards

Conflict of Interest There are no conflicts of interest for this paper.

Ethical Approval The study obtained support and permission from the research ethics board at Jilin University. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent During the research process, informed consent was obtained from all individual participants all. The invited participants were voluntary and guaranteed confidentially.

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