Pathway Analysis of Risk Factors for Severe Suicidal Ideation: A Survey in Rural China

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ABSTRACT

Background: Many studies have suggested that strategies of suicide prevention must be developed with a detailed understanding of the role of multiple risk factors. The aim of the current study was to explore the pathways of multiple risk factors for severe suicidal ideation (SSI) and provide empirical data and recommendations for suicide interventions.

Methods: A door-to-door survey was administered to 3,821 rural residents aged 15 and older in rural China. The risk factor variables were socio-demographic characteristics, depression, social support, quality of life and negative life events. Univariate and multivariate logistic regression models were used to analyze risk factors related to SSI, and structural equation modeling was used to analyze the pathways of risk factors for SSI.

Results: Depression, socio-economic status and negative life events had direct effects on SSI. Socio-economic status and negative life events had indirect effects on SSI via depression. The most influential factor of the direct effects was depression, and the most influential factor of the indirect effects was socio-economic status.

Conclusions: The direct and indirect effect pathways of risk factors contribute to the understanding of the role of multiple risk factors as well as the corresponding intervention strategies. The intervention in the acute phase perhaps should be mainly targeted on the direct factor of depression; before the acute phase (or even earlier) or after the acute phase, it should be mainly targeted on the indirect factor of socio-economic status.

Key words: Pathway analysis; suicidal ideation; crisis intervention; socio-economic status; depression

La traduction du résumé se trouve à la fin de l'article.

Can J Public Health 2011;102(6):472-75.

Suicide is a serious public health problem worldwide and one of the leading causes of loss of life, which is harmful to social, family and personal safety.¹ According to a report of the World Health Organization, suicide has been one of the top ten causes of death in the general population, and the second or third cause of death in the population aged 15-34 years.² In China, the suicide rate was estimated to be 23 per 100,000 individuals from 1995 to 1999, and suicide was the fifth leading overall cause of death and the most common cause of death among individuals aged 15-34 years.^{3,4}

In China and elsewhere, it is widely accepted that numerous risk factors contribute to suicide, which is never the consequence of one single cause.⁵⁻⁷ These factors can be categorized as distal or proximal, direct or indirect, individual- or population-related, or as biological, psychological or social. Suicide prevention programs that concentrate on a single risk factor are unlikely to reduce suicide rates substantially; as many studies have suggested, preventive efforts should focus on individuals exposed to multiple risk factors.⁸⁻¹⁰ However, the strategies of suicide prevention must be developed with a detailed understanding of the pathways of risk factors and further research is required to separate out the role of the different risk factors.^{6,10-12} To the best of our knowledge, existing research has seldom studied the above questions in depth.

In the suicidal process, suicidal ideation is an important step, preceding suicide attempts and completed suicides. The risk factors of suicidal ideation paralleled those of the suicide attempts and completed suicides, including socio-economic, adverse life events,

social support, and depressive mood, and so on.^{3,4,10,13-15} To advance knowledge regarding suicide, the current study analyzed the possible direct and indirect pathways of important risk factors on severe suicidal ideation (SSI) using a structural equation model. The aim of the current study was to explore the pathways of risk factors for SSI and provide empirical data and recommendations for suicide interventions.

METHODS

Population

A door-to-door survey was administered to rural residents aged 15 and older from October 2006 to April 2008, in Tuanfeng, Hubei

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Acknowledgement of Support: This study was supported by grants from China Medical Board of New York (CMB). The authors are grateful for technical support provided by Michael R. Phillips, Executive Director of Suicide Research and Training Center of World Health Organization and the Beijing Suicide Research and Prevention Center, Beijing Hui Long Guan Hospital, Beijing, China. The authors are also grateful for survey place support provided by Dr. Xisheng Song, Director of Health Bureau of Tuanfeng City, China.

Conflict of Interest: None to declare.

Province, in central China. We used a stratified random sample of the entire group. In the group of 10 townships in Tuanfeng, 5 townships were randomly selected, and then 22 villages were randomly selected from a total of 94. All residents of the 22 villages were included. The total sample comprised 6,644 individuals; of these, 2,046 (30.8%) were not at home; 492 (7.4%) refused to participate; 233 (3.5%) had a physical disorder/barrier; 12 (0.2%) had a mental disorder/barrier; and 40 (0.6%) had other reasons for not participating. Therefore, the actual sample investigated was 3,821 (57.5%).

This study was approved by the Ethics Committee of Public Health School, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China ([2006]02). Informed consent was obtained from all participants.

Variables

We considered risk factors from five broad domains: socio-demographic characteristics, depression, social support, quality of life and negative life event variables. Socio-demographic characteristics included gender, age, marital status, ethnicity (Han nationality, other ethnic minority), years of schooling, number of relatives living together (1, 2-4, ≥ 5), medical insurance (yes or no), family economic status in general in the previous year (good, fair or poor) and religious affiliation (yes or no). Degree of depression was assessed using the Beck Depression Inventory-II, a 21-item scale designed to measure symptoms of depression.¹⁶ Individual item scores are summed to obtain an overall composite score, with higher scores suggesting more symptoms of depression. Social support was assessed using the Social Support Rating Scale, SSRS.¹⁷ This 10-item questionnaire reflects subjective support, objective support and support utilization in the previous year. Negative life events were assessed using a 12-item scale (serious illness in oneself, serious illness in the family, financial difficulties, conflict with spouse, conflict with other family members, conflict with other people in the village, conflict between family members, infertility issues, problems at work or school, problems in an intimate relationship, abuse and other events). For each life event that occurred in the last year, or that occurred earlier but continued to have a psychological effect during the previous 12 months, the respondent indicated when the life event occurred, its effect (positive or negative) and the length of time over the last year that the psychological effect lasted. We used the sum of the number of life events with a negative effect as a measure of negative life events.¹⁰ Quality of life was assessed using a 6-item scale (physical health, psychological health, personal economic situation, work status, family relationships, and relationships with non-family associates in the previous month). Responses were reported on a 5-point Likert scale (1 = very poor to 5 = excellent).¹⁰ Degree of suicidal ideation (SI) was assessed using a 2-item scale (In the last 6 months, how often have you had thoughts of suicide? In the last 6 months, how often have you attempted suicide or engaged in intentional self-injury?).¹⁰ Responses were rated on a 4-point Likert scale (0 = never, 1 = rarely, 2 = sometimes, 3 = always) and total scores of 5-6, 3-4, 1-2 and 0 were defined as severe, moderate, mild and no SI, respectively.

Analysis

The data analysis involved several steps. First, descriptive analysis procedures were performed to demonstrate demographic information. Second, a univariate logistic regression model was used to ana-

Table 1. Rates of Severe Suicidal Ideation in Groups With Different Demographic Characteristics of the Study Population

Variables	Overall (%)	Severe Suicidal Ideation (%)
Gender		
Male	1505 (39.4)	57 (3.8)
Female	2316 (60.6)	135 (5.8)
Ethnicity		
Han nationality	3793 (99.3)	190 (5.0)
Other ethnic minorities	28 (0.7)	2 (7.1)
Age group, years		
15-34	447 (11.7)	6 (1.3)
35-59	2030 (53.1)	90 (4.4)
≥ 60	1344 (35.2)	96 (7.1)
Years of schooling		
0	1418 (37.1)	111 (7.8)
1-6	1192 (31.2)	52 (4.4)
7-9	949 (24.8)	20 (2.1)
≥ 10	262 (6.9)	9 (3.4)
Marital status		
Never married	203 (5.3)	12 (5.9)
Married	3102 (81.2)	127 (4.1)
Remarriage / cohabitation	86 (2.3)	11 (12.8)
Other	430 (11.3)	42 (9.8)
Medical insurance		
Cooperative medical system	3108 (81.3)	147 (4.7)
Other	713 (18.7)	45 (6.3)
Number of relatives living together		
1	352 (9.2)	38 (10.8)
2-4	2783 (72.8)	127 (4.6)
≥ 5	686 (18.0)	27 (3.9)
Economic status of family		
Good	301 (7.9)	1 (0.3)
Fair	1975 (51.7)	47 (2.4)
Bad	1545 (40.4)	144 (9.3)
Religion		
No	3616 (94.6)	177 (4.9)
Yes	205 (5.4)	15 (7.3)

Figure 1. Pathway analysis of risk factors for severe suicidal ideation from structural equation modeling analysis

Note: YOS = Years of schooling; FES = Family economic status; OS = Objective support; SU = Support utilization; SS = Subjective support.

lyze risk factors for SSI. Third, the variables with a p-value ≤ 0.05 in the univariate analysis were entered into a multivariate non-conditional logistic regression model. Screening methods were stepwise regression and inclusion, and exclusion criteria for both were 0.10. Finally, results from previous analyses regarding the relationship of risk factors were further tested using structural equation modeling (SEM). This method has several advantages related to this study: it identifies the pathways over multiple variables, assesses direct and indirect effects, allows for the use of latent and observed variables and uses full information maximum likelihood estimation.^{18,19} Regression analyses were carried out using SPSS, version 10.0 (SPSS Inc, Chicago, IL, USA). We conducted SEM using AMOS 7.0 SEM software from SPSS.

Table 2. Univariate and Multivariate Logistic Regression Analysis for Factors Associated With Severe Suicidal Ideation

Variables	Univariate Odds Ratio		Multivariate Odds Ratio	
	(95% CI)	p	(95% CI)	p
Gender (female as reference level)	0.64 (0.46-0.87)	0.005		
Age	1.89 (1.48-2.42)	<0.001		
Years of schooling	0.58 (0.49-0.70)	<0.001	0.81 (0.66-0.99)	0.04
Marital status (never married as reference level)				
Married	0.68 (0.37-1.25)	<0.001		
Remarriage / cohabitation	2.33 (0.99-5.52)	0.021		
Other	1.72 (0.89-3.35)	0.078		
Number of individuals living together	0.55 (0.42-0.74)	<0.001		
Economic status of family	4.33 (3.15-5.94)	<0.001	1.52 (1.07-2.15)	0.02
Quality of life	0.10 (0.07-0.14)	<0.001	0.65 (0.43-0.99)	0.04
Depression	9.30 (7.32-11.81)	<0.001	5.93 (4.49-7.84)	<0.001
Objective support	0.45 (0.33-0.62)	<0.001	0.68 (0.47-0.98)	0.04
Subjective support	0.34 (0.25-0.45)	<0.001		
Support utilization	0.77 (0.61-0.97)	0.030		
Negative life events	3.13 (2.68-3.65)	<0.001	1.47 (1.20-1.80)	<0.001

Table 3. Standardized Effects on Severe Suicidal Ideation From Structural Equation Modeling Analysis

Variables	Indirect Effects							
	Total Effects	Direct Effects	Total Indirect Effects	Socio-economic Status	Negative Life Events	Quality of Life	Social Support	Depression
Socio-economic status	-0.482	-0.161	-0.322	–	-0.093	-0.088	0.007	-0.159
Negative life events	0.184	0.032	0.152	–	–	–	–	0.152
Quality of life	-0.102	0.000	-0.102	–	–	–	–	-0.102
Social support	0.033	0.000	0.033	–	0.024	0.009	–	–
Depression	0.515	0.515	0.000	–	–	–	–	–

RESULTS

Table 1 shows the socio-demographic details of the study population and prevalence of SSI. The overall SSI prevalence was 5% (192 participants) and the prevalence of mild and moderate SI were 15% and 9%, respectively. Most respondents were female (60.6%) and old adults (35.2%), since in rural areas the young male farmers are working in the field during the day and do not go home until the evening, so could not be met by our investigators in the daytime. With respect to level of education, 1,418 participants (37.1%) were illiterate; only 6.9% had completed 10 years of school education or more. In addition, the majority was ethnic Han (99.3%) and had no religious affiliation (94.6%). The socio-demographic characteristics were consistent with China's culture and history, and also consistent with existing studies.^{10-12,20-22}

Univariate logistic regression analysis was performed to determine which factors were associated with SSI. Older age, female gender, not being married, fewer years of schooling, lower family economic status, lower quality of life and social support, fewer relatives living together, more severe depression and more negative life events were associated with a significantly higher risk for SSI (Table 2). In contrast, ethnicity, medical insurance and religious affiliation were not significantly associated with SSI. Through stepwise multiple logistic regression models, the following were identified as predictors of SSI: years of schooling, family economic status, quality of life, depression, objective support and negative life events (Table 2). The strongest predictors were the presence of depression (OR 5.93, 95% CI 4.49-7.84), followed by family economic status (OR 1.52, 95% CI 1.07-2.15) and negative life events (OR 1.47, 95% CI 1.20-1.80).

According to the results of stepwise multiple logistic regression analysis, years of schooling and family economic status were extracted into one variable of socio-economic status, which was also consistent with existing studies.^{23,24} Figure 1 shows the structural equation model for the interaction analysis of factors associated with SSI, and standardized path coefficients were presented on each arrow. All factor loadings for the measurement models

within the final structural model were statistically significant ($p < 0.05$). Depression had only direct impacts on SSI. Socio-economic status affected SSI independently, and was simultaneously mediated by social support, negative life events, quality of life and depression. Social support had indirect influences on SSI by three paths, the first path was mediated by quality of life then by depression, the second one was mediated by negative life events and the third one was mediated by negative life events then by depression. Quality of life had indirect impacts on SSI through depression. The final model fit the data reasonably well ($\chi^2 = 12.06$, RMSEA = 0.005, GFI = 0.999, RMR = 0.032, NFI = 0.998, CFI = 1.000).*

Table 3 summarizes the direct, indirect and total effects on SSI. Total effects are the sum of direct and indirect effects. Indirect effects represent effects of one variable on another transmitted through indirect routes. Socio-economic status and negative life events had both direct and indirect effects on SSI. Depression had only direct impacts, while quality of life and social support had only indirect effects on SSI. Of all the standardized total effects, the absolute value of depression was the greatest (0.515), followed by socio-economic status (0.482), and then, negative life events (0.184).

DISCUSSION

Single-cause models of suicide do not do justice to the complexity of the suicidal process, and do not provide useful information for suicide intervention in China or elsewhere.^{6,10-12,22} A detailed understanding of the role of the multiple risk factors was needed for developing effective strategies of suicide prevention. The highlight of the current study indicates that there are different pathways of risk factors for SSI: the most important direct pathway was depression, which has no indirect pathway, and the most important indirect pathway was socio-economic status, which also has a direct pathway. In terms of research implications, the direct and indirect

* RMSEA=Root mean square error of approximation; GFI=Goodness of fit index; RMR=Root mean square residual; NFI=Normed fit index; CFI=Comparative fit index

effect pathways contribute to the understanding of the role of the risk factors as well as the corresponding intervention strategies: the intervention in the acute phase perhaps should be mainly targeted on the direct factor of depression; before the acute phase (or even earlier) or after the acute phase, it should be mainly targeted on the indirect factor of socio-economic status.

The current study confirmed some existing research results about the risk factors of suicide, especially depression and socio-economic status.^{6,8-12} Recently, a 3-year prospective follow-up study in a general population in Eastern Finland suggested that depressive mood appears to be a necessary precondition and mediating factor between socio-demographic or socio-economic factors and SI, and negative life events seem not to be true independent risk factors for SI.¹³ The above results were similar to the results of the current study. If this finding is confirmed by results from other studies, the management of depressive mood should be the first or direct need for suicide intervention. In addition, with regard to socio-economic status, the results of the current study suggested there were not only direct effects but also a variety of different indirect pathways on SSI; consequently, suicide intervention is not restricted to medical or psychiatric interventions. Non-health sector organizations will need to address the problem of suicide, with special emphasis on socio-economic status; such an emphasis was rarely noted in the existing research regarding socio-economic status and suicide.

Several limitations of the current study should be noted. First, the overall response rate was 57.5% and the male response rate was only 39.4%, indicating possible selection bias; also, having more older adults as respondents may have overrated the prevalence of SSI. Second, because our sample was confined to the population in a central province of China, the generalizability of the finding to populations in rural China is unclear. Third, the method used to rate the key variable of perceived family economic status is not a conventional one, and perceived "bad" or "poor" status may reflect reality or it may reflect depression. Fourth, the data are from a cross-sectional sample, and thus do not allow causal conclusions. It is therefore necessary to undertake a further in-depth study.

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Received: September 11, 2010

Accepted: June 7, 2011

RÉSUMÉ

Contexte : Selon de nombreuses études, pour élaborer des stratégies de prévention du suicide, il faut avoir une connaissance approfondie du rôle des multiples facteurs de risque. Nous avons voulu explorer les pistes causales de multiples facteurs de risque liés aux idées suicidaires graves (ISG) et fournir des données empiriques et des recommandations d'interventions contre le suicide.

Méthode : Un sondage de porte en porte a été administré à 3 821 résidents de 15 ans et plus en Chine rurale. Les facteurs de risque variables étaient le profil sociodémographique, la dépression, le soutien social, la qualité de vie et les événements négatifs marquants. Au moyen de modèles de régression logistique univariés et multivariés, nous avons analysé les facteurs de risque liés aux ISG; une modélisation par équations structurelles a permis d'analyser les pistes causales des facteurs de risque liés aux ISG.

Résultats : La dépression, le statut socioéconomique et les événements négatifs marquants avaient des effets directs sur les ISG. Le statut socioéconomique et les événements négatifs marquants avaient des effets indirects sur les ISG via la dépression. Le facteur ayant le plus influencé les effets directs était la dépression, et le facteur ayant le plus influencé les effets indirects était le statut socioéconomique.

Conclusion : Les pistes causales des effets directs et indirects des facteurs de risque contribuent à la compréhension du rôle des multiples facteurs de risque ainsi que des stratégies d'intervention correspondantes. Les interventions en phase aigue devraient peut-être principalement cibler le facteur direct qu'est la dépression; avant la phase aigue (ou même plus tôt) ou après la phase aigue, elles devraient principalement cibler le facteur indirect qu'est le statut socioéconomique.

Mots clés : analyse des pistes causales; idées suicidaires; intervention de crise; statut socioéconomique; dépression