



Depression among Chinese Adolescent Survivors 12 Years Post-Earthquake

Jing An¹, Jinlong An², Siwei Wang³

¹School of Management, Nanjing University of Posts and Telecommunications, Nanjing, China;

²First People's Hospital of Changshu City, Hospital Affiliated to Soochow University, Changshu, China;

³Department of Civil Law, The Open University of Guangdong, Guangzhou, China

Correspondence should be addressed to: Jing An, Jinlong An,

Abstract

This paper aims to investigate the mental health of adolescent earthquake survivors 12 years post-earthquake especially during COVID-19 and the effect of demographics on mental health measured by the Zung Self-rating Depression Scale (SDS). Participants were 394 adolescent earthquake survivors from two secondary schools in Wenchuan county. Descriptive statistics were employed to evaluate the depression level of participants, and to compare the depression group and non-depression group regarding demographics and standard score of SDS. In addition, a logistic regression model was used to prove the demographic influence on mental health. The findings indicated that years of education, marital status of parents, and family monthly income were significant indicators of mental health as measured by SDS. Specifically, participants who had more years of education had less possibilities to report a higher level of depression. Participants whose parents were divorced seemed more likely to have a higher level of depression than those whose parents were married. And participants whose family had earned between RMB1,000 - RMB3,000, earned between RMB3,000 - RMB5,000 or more than RMB5,000 were less prone to a higher level of depression respectively than those whose family had earned less than RMB1,000.

Keywords: depression, adolescent survivors, post-earthquake, Zung self-rating depression scale (SDS)

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I. Introduction

Disaster experiences in childhood and adolescence, such as earthquake, can lead to mental disorders and behavioral problems.^{1,2} Some of the children who had been exposed to life threatening events suffer Posttraumatic Stress Disorder (PTSD), anxiety and depression which may persist throughout most of their lives and cause them lasting problems.^{3,4} Adolescent survivors were troubled with sleeping and stomach pain, and prone to feel tired.⁵ More severely, for young girls who had experienced earthquake-related trauma at preschool age, the prevalence of suicidal ideation (18.5%) was higher than that of young boys 3 years post-earthquake.⁶

For adolescents, the experience of surviving an earthquake has major influence on the levels of depression over time. Depression symptoms prevalence was higher in the child survivors with psycho-social support (case group) in comparison with the child survivors without psycho-social support (control group) one year post-earthquake.⁷ For the relocated children, 30% of them showed signs of severe depression symptoms one year post-earthquake.⁷ Thirty months after the 2010 Haitian earthquake, 46.21% of child and adolescent survivors reported a clinically significant symptoms of depression.⁸ Three years after earthquake, 44.8% of junior high school students had symptoms of depression, and the significant predictors for depression included witness of someone's serious injuries and scared feeling.⁹ Four years after the 2010 earthquake in Haiti, the prevalence of severe symptoms of depression of child and adolescent survivors was 29.69%.¹⁰

Do demographics have effect on adolescent survivors' mental health level? Previous studies found that female adolescent survivors would have increased possibility of developing chronic anxiety over time post-earthquake,¹ and male adolescent earthquake survivors were less likely to show chronic depression 6 months post-earthquake.¹¹ Female child and adolescent survivors had significantly greater prevalence of clinically symptoms of depression than males thirty months post-earthquake.⁸ Child and adolescent earthquake survivors not living with their parents had a significant higher prevalence for depression symptoms.⁸ Moreover, there

were significant differences in distribution of parents' educational level respectively between three groups (relocated adolescent earthquake survivors, non-relocated adolescent earthquake survivors, and normal adolescents) six years after the Turkey earthquake.¹² However, there were no statistically differences in average of age and distribution of gender, family income, and cohabitation of parents (married/divorced/widowed) between the three groups.¹² Age and number of children in the family were not found to have significant association with anxiety of adolescent earthquake survivors.¹ Likewise, age and number of children in the family were not found to have significant association with depression of adolescent earthquake survivors.¹¹ There were no significant differences between adolescent survivor groups (the group with no traumatic experience and the group with traumatic experiences) in age or in parents' divorce, but there lied significant differences in ethnicity, gender, and having a sibling six years post-earthquake.¹³

The Zung Self-rating Depression Scale (SDS) has been widely employed to measure depressed affect and symptomatology in people from different countries, including older adults,^{14,15} undergraduates,^{16,17} pregnant women,¹⁸ bilingual Azerbaijani population,¹⁹ college student earthquake survivors,²⁰ high school student earthquake survivors,^{9,21} outpatients,^{22,23} cancer patients,²⁴ chronic pain patients,²⁵ patients with lumbar disease and Parkinson's disease,^{26,27} and persons on probation or parole.²⁸ Research found that the SDS was validated for Chinese people with acceptable sensitivity and specificity.^{15,20,21}

We can see from the literature that earthquake experience has great impact on adolescents' depression levels over time. However, few researchers have explored the long-term effect of earthquake on the mental health such as depression among adolescent earthquake survivors especially during COVID-19. To fill this gap, we aimed to explore the mental health of adolescent earthquake survivors including both the depression group and non-depression group 12 years post-earthquake during COVID-19 with measurement of the SDS, and the effect of demographics on depression, providing empirical evidences for future studies on the mental health of adolescent survivors long-term post-earthquake during COVID-19.

II. Methods

Samples

The samples were recruited from two secondary schools reconstructed after the earthquake in Wenchuan county, the epicenter of the 2008 Wenchuan earthquake in China. A total of 450 adolescents survived in the earthquake were firstly screened between December 2020 and January 2021, of which 230 from one secondary school, and 220 from the other, using the following inclusion criteria: (1) personal experience of the earthquake and no psychological intervention; (2) age < 18 years old.² This process yielded 394 valid samples which were included in this study, of which 201 from school A and 193 from school B. This study was approved by the ethics committee of Changzhou University. Each participant's guardian was informed of the survey and filled the informed consent.

The mean age of the respondents was 14.09 years (SD = 0.90, range = 12–17). Considering gender distribution, 46.4% were male and 53.6% were female. Concerning years of education, 14.9% were in Grade 7, 18.1% were in Grade 8, 66.7% were in Grade 9, and 0.3% were in Grade 10. In terms of ethnicity, 8.4% were Han ethnicity, 2.0% were Hui ethnicity, 39.6% were Zang ethnicity, 49.5% were Qiang ethnicity, 0.3% were Dong ethnicity, and 0.2% were others. There were 16.2% for one child and 83.8% for two children and more in their family. In terms of the marital status of their parents, 89.3% were married, 6.9% were divorced, 1.3% were widowed, and 2.5% were others. Of the participants, 91.6% lived with their parent(s) usually and 8.4% did not. Considering their parents' educational level, 84.7% had graduated from high school or below, 8.4% had graduated from junior college, 5.9% had owned a university Bachelor degree, and 1.0% had completed postgraduate study and above. In terms of family monthly income, 37.4% had an income between RMB3,000 - RMB5,000, 37.4% between RMB1,000 - RMB3,000, 21.1% more than RMB5,000, and 4.1% less than RMB1,000.

Measures

Overall the SDS scale had 20 items with four response choices (a 4-point Likert scale), ranging from none, or a little of the time, to most, or all of the time.¹⁵ Ten were worded symptomatically positive, and ten symptomatically negative.²⁹ Participates rated each item (1-4) according to their feeling during the preceding week.^{20,21} For items D1, D3, D4, D7, D8, D9, D10, D13, D15 and D19, 1 = none, 2 = a little of the time, 3 = most of the time, 4 = all of the time. For items D2, D5, D6, D11, D12, D14, D16, D17, D18 and D20, 1 = all of the time, 2 = most of the time, 3 = a little of the time, 4 = none. The total score of the SDS was converted to the standard score.²⁰ Higher scores denote higher levels of depression.

Statistical Analysis

Descriptive statistics were conducted to mainly depict the depression symptom of participants. Then for both the depression group and non-depression group, demographic and clinical statistics were performed

respectively to show the distribution of gender, age, years of education, ethnicity, number of children in family, marital status of parents, living state with parent(s), parents' educational level, family monthly income, and standard score of SDS. In the third step, the influence of demographics on depression was analyzed with a logistic regression model. The dependent variable the standard score of SDS is further coded as the binary variable, based on the classification of a higher and a lower depression level respectively. The independent variables include 9 demographic indicators (age, years of education, gender, ethnicity, number of children in family, marital status of parents, living state with parent(s), parents' educational level, and family monthly income). We conducted SPSS 22.0 to analyze the data.

III. Results

Descriptive Analysis of Depression

The internal consistency of Cronbach's alpha coefficient was 0.820. The mean standard score of SDS was 51.46 (SD = 11.28, range = 16–84), indicating that the participants were suffering from a depression at a frequency between a little of the time and most of the time (see Table 1).

Participants reported relatively high average scores (2.79 or more) on Items 2, 16, 12, and 6, which indicates that, for the participants, "morning is when I feel the best", "I still enjoy sex", "I find it easy to do the things I used to", and "I find it easy to make decisions" happened at a frequency between a little of the time and most of the time. Moreover, relatively low mean scores (1.33 or less) were found on Items 7, 8, and 9, implying that the respondents were losing weight, had trouble with constipation, and their heart beat faster than usual at a frequency between none and a little of the time.

Demographics and Clinical Characteristics of the Depression Group and Non-Depression Group

The total standard score of SDS which was greater than 53 would be considered as depression.²⁰ Following this criterion, 50.0% of the participants were more likely to have depression. The demographics and clinical characteristics of the depression group and non-depression group were summarized respectively (see Table 2).

The mean standard score of the depression group (n = 197) was 60.59 (SD = 6.26, range = 53–84), higher than that of all participants, indicating that the participants were suffering from a depression at a frequency between a little of the time and most of the time. The mean standard score of the non-depression group (n = 197) was 42.33 (SD = 6.94, range = 16–51), lower than that of all participants, which implies that the participants were suffering from a depression at a frequency between none and a little of the time.

Demographic Effect

The logistic regression model revealed the effect of demographics on the depression of adolescent survivors 12 years after the earthquake during COVID-19 (see Table 3).

Years of education had significant relationship with the depression of participants ($P < .01$). Adolescent earthquake survivors with more years of education (OR = 0.577) were less prone to a higher level of depression.

Marital status of their parents had significant relationship with the depression of adolescent earthquake survivors as well ($P < .05$). Compared with participants whose parents were married, those whose parents were divorced (OR = 4.321) had more possibility to report a higher level of depression ($P < .01$). However, for respondents whose parents were widowed or others, this kind of significant relationship was not found, although seemingly they had more possibility to report a higher level of depression.

There were significant association between family monthly income and the depression of adolescent earthquake survivors ($P < .05$). Participants with family monthly income between RMB1,000 - RMB3,000 (OR = 0.092), between RMB3,000 - RMB5,000 (OR = 0.079), and more than RMB5,000 (OR = 0.057) had less possibility to report a higher level of depression respectively than those with family income less than RMB1,000.

Seemingly the older the adolescent earthquake survivors were, the more possibility of a higher level of depression they tended to have, but the relationship between them was insignificant. Similarly, the significant relation between gender and depression of participants were not found, although female adolescent earthquake survivors prone to a higher possibility of a higher level of depression than the males. Compared with participants whose family had one child, those whose family had two children and more seemed less likely to have a higher level of depression, however, this kind of association was not statistically significant. Respondents who did not live with parent(s) seemed more prone to a higher level of depression than those living with their parent(s), nevertheless, this kind of relationship was found to be insignificant.

Compared with participants whose ethnicity was Han, those whose ethnicity was Zang and Hui/Dong/others seemed less prone to a higher level of depression, and respondents whose ethnicity was Qiang seemed more prone to a higher level of depression, however, the significant relationship between them was not found.

Compared with participants whose parents had completed high school or below, those whose parents had completed junior college, university study, and postgraduate study and above seemed less likely to have a higher level of depression, however, this kind of relationship was found to be insignificant.

IV. Conclusions

Our research investigated the adolescent survivors group 12 years after the earthquake during COVID-19 in China, employing the SDS scale to depict the characteristics of participants' mental health, of both the depression group and the non-depression group, and exploring the effect of demographics on the depression level of the group with the measurement of this scale.

Similar to results found in previous research,⁸ our results indicated that 50.0% of the adolescent survivors seemed more prone to depression 12 years post-earthquake during COVID-19.

Conclusions of our research are partly in line with previous studies. The results of demographic effect revealed that years of education significantly influenced depression of adolescent earthquake survivors in our research. As shown in previous study that, there were significant differences in distribution of parents' educational level respectively between adolescent earthquake survivors and normal adolescents,¹² nevertheless, the significant association between parents' educational level and mental health of participants was not found in our study. However, years of education was found to have significant relation with depression of the participants. Specifically, participants who had more years of education seemed less prone to a higher level of depression.

Marital status of parents had significant relationship with participants' mental health, as shown in our results. To be more specific, participants whose parents were divorced were more prone to a higher level of depression than the reference group whose parents were married, inconsistent with previous research findings that statistically difference in distribution of cohabitation of parents (married/divorced/widowed) was not found.^{12,13}

The significant association between family monthly income and depression of adolescent earthquake survivors was certified as well in our study. Specifically, participants with family monthly income between RMB1,000 - RMB3,000, between RMB3,000 - RMB5,000 or more than RMB5,000 were less prone to a higher level of depression respectively than the reference group whose family had earned less than RMB1,000, inconsistent with previous study findings that statistically difference in distribution of family income was not found.¹²

Effect of gender on earthquake survivors' mental health has been controversial among different researchers. Females had significantly higher rates of negative beliefs, diminished interest, restricted affect and sleep disturbance symptoms than men,³⁰ females scored significantly higher on the SDS than males,³¹ male adolescent earthquake survivors were less prone to depression than females,¹¹ and the prevalence of depression was significantly higher among female child and adolescent survivors than males,⁸ while others inconsistently verified that there were significantly more male adolescent survivors in the group with multiple traumatic experiences than females.¹³ However, in line with previous studies as the third different opinion,^{12,27,32,33} significant gender differences in the level of depression were not found in our research. In line with prior studies,^{1,11,12,13,27} age was not found to have significant relation with depression of participants in this study. Inconsistent with previous finding that there were significantly more ethnic minorities in the group with no traumatic experiences than Han,¹³ no significant relation between ethnicity and depression was found in our study. Inconsistent with prior study,⁸ living with parent(s) was not found to have significant association with depression in our research. Prior research revealed that there were significantly more siblings in the group with no traumatic experiences.¹³ Nevertheless, consistent with other prior research,^{1,11} significant relation between number of children in family and depression was not found in our research.

This study has some limitations. The results may differentiate between one and the other measurement of mental health scales, which needs further exploration in the context of long-term psychological outcomes of adolescent earthquake survivors in China in the future. Moreover, the sample size could be further expanded to improve the robustness of the findings in future studies.

Our research makes contribution to the literature by highlighting the significant indicators of years of education, marital status of parents, and family monthly income of depression of adolescent survivors 12 years post-earthquake during COVID-19. This study indicates that participants who had more years of education were less prone to a higher level of depression. In addition, our study proved that participants whose parents were divorced were more prone to a higher level of depression than those whose parents were married. Furthermore, this study verified that participants whose family had earned more than RMB1,000 were less prone to a higher level of depression than those whose family had earned less than RMB1,000. Psychological support should be provided for these adolescents in the long run,¹³ especially for those with less years of education, those whose parents were divorced, and those whose family had earned less, as shown in this study.

Conflicts of Interest

The authors report no conflicts of interest in this work.

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Table 1 Statistical Description of the SDS Items

Item	Mean	SD	Response Frequencies (%)			
			1	2	3	4
D1. dispirited	1.73	0.70	40.5	47.6	10.7	1.2
D2. morning is the best time	2.96	1.04	39.3	30.3	17.5	12.9
D3. feeling of weep	1.75	0.86	48.1	34.4	12.3	5.2
D4. insomnia	1.77	0.92	48.6	33.3	10.6	7.5
D5. appetite as usual	2.29	1.21	24.0	19.8	17.8	38.4
D6. enjoyment of sex	2.79	1.13	35.6	28.4	15.7	20.3
D7. loss of weight	1.28	0.61	78.1	17.3	2.8	1.8
D8. constipation	1.22	0.55	83.7	12.0	3.3	1.0
D9. tachycardia than usual	1.33	0.61	73.0	21.4	4.8	0.8
D10. prone to fatigue	1.76	0.90	49.5	31.9	12.2	6.4
D11. clear-headed as usual	2.35	1.08	19.0	25.4	27.7	27.9
D12. to do the task easily as usual	2.84	1.01	30.4	35.8	20.7	13.1
D13. restless	1.68	0.84	51.3	33.9	9.9	4.9
D14. hopeful for the future	2.11	1.10	15.1	21.5	22.6	40.8
D15. irritability	1.83	0.94	46.1	32.3	13.7	7.9
D16. decision making easily	2.92	1.01	33.6	38.7	14.2	13.5
D17. feel oneself valuable	2.51	1.05	21.4	29.8	27.3	21.5
D18. full life	2.35	1.09	19.1	26.0	26.0	28.9
D19. others would be better off if I were dead	1.54	0.88	65.2	21.4	7.2	6.2
D20. enjoy the things as usual	2.38	1.12	20.3	27.2	22.6	29.9
Standard score of SDS	51.46	11.28				

Table 2 Statistical Characteristics of the Depression Group and Non-Depression Group

	Depression (n = 197)					Non-Depression (n = 197)				
	Frequency (%)	M	SD	Min	Max	Frequency (%)	M	SD	Min	Max
Gender										
Male	44.7					48.2				
Female	55.3					51.8				
Age (years)										

12	9.2					2.0				
13	15.8					14.7				
14	41.3	14.05	1.03	12	17	53.8	14.12	0.75	12	16
15	28.1					27.9				
16	5.1					1.6				
17	0.5					0.0				
Years of education										
7	18.6					11.2				
8	22.7	8.41	0.79	7	10	13.8	8.64	0.68	7	9
9	58.2					75.0				
10	0.5					0.0				
Ethnicity										
Han	8.6					8.1				
Hui	1.5					2.5				
Zang	39.1					40.1				
Qiang	50.3					48.8				
Dong	0.0					0.5				
Others	0.5					0.0				

(Continued)

Table 2 (Continued).

	Depression (n = 197)					Non-Depression (n = 197)				
	Frequency(%)	M	SD	Min	Max	Frequency(%)	M	SD	Min	Max
Number of children in family										
One child	16.2					16.2				
Two children and more	83.8					83.8				
Marital status of parents										
Married	84.3					94.4				
Divorced	10.7					3.1				
Widowed	1.5					1.0				
Others	3.5					1.5				
Live with parent(s)										
Yes	90.3					92.9				
No	9.7					7.1				
Parents' educational level										
High school or below	88.3					81.2				
Junior college	6.6					10.2				

University Bachelor	4.6				7.1				
Postgraduate and above	0.5				1.5				
Family monthly income									
Less than RMB1,000	7.6				0.5				
RMB1,000 - RMB3,000	39.6				35.2				
RMB3,000 - RMB5,000	36.0				38.8				
More than RMB5,000	16.8				25.5				
Standard score of SDS		60.59	6.26	53	84	42.33	6.94	16	51

Table 3 The Effect of Demographics on Depression

	OR	95% CI	Wald χ^2	P value
Age (years)	1.283	0.916-1.799	2.101	0.147
Years of education	0.577	0.382-0.869	6.905	0.009
Gender				
Male	Reference			
Female	1.197	0.776-1.845	0.660	0.417
Ethnicity				
Han	Reference		0.505	0.918
Zang	0.960	0.415-2.220	0.009	0.924
Qiang	1.079	0.476-2.446	0.033	0.856
Hui/Dong/Others	0.706	0.140-3.554	0.178	0.673
Number of children in family				
One child	Reference			
Two children and more	0.928	0.496-1.738	0.054	0.816
Marital status of parents				
Married	Reference		8.325	0.040
Divorced	4.321	1.509-12.370	7.437	0.006
Widowed	1.118	0.154-8.103	0.012	0.912
Others	2.597	0.477-14.147	1.217	0.270
Live with parent(s)				
Yes	Reference			
No	1.211	0.543-2.698	0.219	0.640
Parents' educational level				
High school or below	Reference		1.067	0.785
Junior college	0.677	0.299-1.533	0.877	0.349

(Continued)

Table 3 (Continued).

	OR	95% CI	Wald χ^2	P value
University Bachelor	0.787	0.300-2.066	0.236	0.627
Postgraduate and above	0.687	0.066-7.203	0.098	0.754
Family monthly income				
Less than RMB1,000	Reference		8.102	0.044

Depression among Chinese Adolescent Survivors 12 Years Post-Earthquake

RMB1,000 - RMB3,000	0.092	0.011-0.743	5.011	0.025
RMB3,000 - RMB5,000	0.079	0.010-0.637	5.678	0.017
More than RMB5,000	0.057	0.007-0.475	7.023	0.008
Constant	34.103		2.824	0.093

Abbreviations: OR, Odds Ratio; CI, Confidence Interval.