The Symptoms of Posttraumatic Stress Disorder and Depression Among Adult Earthquake Survivors in China

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Abstract: The objective of the study was to examine the relationships between mental health conditions (posttraumatic stress disorder [PTSD] only, depression only, and PTSD and depression) and related factors. A cross-sectional survey was conducted among 1362 adults from two severely affected townships at 6 months after the earthquake. The results of the analyses showed that the prevalence of depression and PTSD were 31.4% and 22.1%, respectively, 6 months after the earthquake. When PTSD and depression were treated as two separate dependent variables, PTSD and depression share almost similar sets of predictive factors. After its four categories (none, PTSD only, depression only, and PTSD and depression) were used as categorical dependent variables, there are different predictive factors. The findings suggest that there are two different groups of individuals, those who develop depression only in response to earthquake exposure and those who develop both depression and PTSD.

Key Words: Posttraumatic stress disorder, depression, earthquake

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Posttraumatic stress disorder (PTSD) is a psychiatric disorder that commonly affects people who have experienced a traumatic event, and depressive disorders commonly occur secondary among survivors (Bonanno et al., 2007; Cascardi and Schlee, 1999). Several studies have examined risk factors for PTSD and depression; findings have been inconsistent concerning the factors that differentiate between those who develop PTSD only and those who develop depression only or PTSD and depression. O'Donnell and his colleagues examined the factors predicting PTSD and depression among traumatic injury survivors, and found that similar sets of factors were predictive, in the longer term posttrauma, of each of these two conditions (O'Donnell et al., 2004). However, a study conducted among Latina immigrants to the United States found that quite different sets of factors correlated with each of these two conditions (Kaltman et al., 2010). Thus, further research examining the risk factors for PTSD only, depression only, and PTSD and depression is needed.

Earthquakes are uncontrollable natural disasters which cause enormous casualties and property damage. Studies of the impact of the Wenchuan earthquake on the mental health of its survivors have found that female gender, older age, lower household income, ethnic minority status, low educational level, living in a shelter or temporary house, death or a bodily injury in one's family, and household damage were important risks factors associated with PTSD (Kun et al., 2009; Wang et al., 2009; Zhang and Ho, 2011; Zhang et al., 2011). Most of these studies focused mainly on acute stress disorder or PTSD. However, relatively few studies have examined PTSD, and depression concurrently. In addition, little is known about the prevalence and severity of PTSD only, depression only, and PTSD and depression among adult survivors of the Wenchuan earthquake. This study thus attempted to answer the following questions: (1) what were the prevalence of PTSD only, depression only, and PTSD and depression after the earthquake? (2) Which socioeconomic and trauma-related factors were predictive of PTSD only, depression only, and PTSD and depression?

METHODS

Participants and Procedure

The study was approved by the institutional review board of the School of Social Development and Public Policy at Beijing Normal University. A cross-sectional survey was conducted among 1362 adults from two severely affected townships at 6 months after the earthquake. The first site was the township of Yong'an (115.7 km from the epicenter), which is located in a mountainous area. Over 90% of the buildings in Yong'an were damaged in the earthquake. The second site was the township of Guangji (58.3 km from the epicenter), which is located on a plain. Over 96% of the buildings in Guangji were damaged in the earthquake. The surveying was conducted through face-to-face interviews. All participants gave verbal consent after being informed about the aims of the survey and their right to refuse to participate. The list-wise approach was employed to deal with missing data in the analyses. Criteria for valid participants included (1) completed all PTSD questions and (2) had no missing values in the sociodemographic variables. Following these criteria, the final number of participants included in the analyses was 1341.

Measurement

PTSD symptom levels were assessed using the Impact of Event Scale-Revised (IES-R) (Christianson and Marren, 2012), a self-report instrument widely used in the field of traumatic stress. Because there is no recommended cutoff point for the IES-R, this study adopted a mean score of 2.0 across all items of the IES-R as the diagnostic cutoff point, as was done in earlier studies (Chan et al., 2011). Depression was assessed using the Chinese edition of the Center for Epidemiologic Studies Depression (CES-D) (Wang, 1999) scale. In our study, we used 21 as the cutoff point, as this has been shown to be a good predictor for major depression in Chinese populations (Cheng and Chan, 2005). Mental health status was a variable with four categories: "depression only" (participants who were classified as having depression but no PTSD), "PTSD only" (those having PTSD but no depression), "PTSD and depression" (those with both depression and PTSD), and "none" (those not having either PTSD or depression), according to study author O'Donnell (O'Donnell et al., 2004). The Social Support Rating Questionnaire (SSRQ), which was developed in China, assessed the level of overall social support that each participant was currently receiving (Xiao, 1994). Exposure to the earthquake was assessed with two

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questions concerning damage to household (little or no, severe) and family member injuries (none, injured or killed).

Statistical Analysis

Data analyses were conducted using SPSS17.0 (SPSS Inc., Chicago, IL). Bivariate analysis was conducted to assess the associations of demographic characteristics with mental health status. Potential predictors whose bivariate associations with mental health status had p value >0.05 were excluded from consideration in the regression analyses. Binary logistic regression was used to examine the effect of each predictor on PTSD, and depression respectively. Multinomial logistic regression was used to identify whether particular mental health status categories were associated with different groups of predictors.

RESULTS

The characteristics of the study sample are displayed in Table 1. The sample consisted of adults aged between 16 and 85 years with a mean age of 48.81 (standard deviation [SD] = 15.20) years. Most of the sample was female (64.0%) and, like the majority of the Chinese population, ethnically Han (96.9%). In addition, as the surveyed townships were both in a rural area, it was unsurprising to find that 71.7% of participants had completed only primary school or less, and that 52.1% of participants had household monthly per capita incomes of less than 200 RMB.

The characteristics of the participants who did and did not have PTSD and depression are also summarized in Table 1. The prevalence of probable PTSD only was 5.5% six months after the earthquake, whereas the prevalence of depression only and PTSD and depression were 14.8% and 16.6%, respectively. Females were more likely to have PTSD and depression than males (18.7% *vs*. 12.7%).

Table 2 presents the results of the binary logistic regression analysis. PTSD and depression share almost similar sets of predictive factors. Guangji people, female gender, over 35 years old, family member injured in the earthquake, and low social support were significantly associated with PTSD and depression.

Table 3 displays the results of the multinominal logistic regression analysis. Mental health status was significantly associated with site, gender, age, exposure, and social support. As compared with participants without any PTSD and depression symptoms, those with depression only were more likely to be from Guangji (OR = 1.65, 95% CI, 1.18–2.31), over 55 years old (OR = 2.37, 95% CI, 1.32–4.25), to have had a family member injured (OR = 3.46, 95% CI, 1.73–6.92), and have suffered damage to their homes (OR = 1.61, 95% CI, 1.13–2.29); people from Guangji (OR = 2.38, 95% CI, 1.41–4.02) were significantly more likely to have PTSD only symptoms. In addition, female (OR = 1.74, 95% CI, 1.22–2.50), being 35 to 55 years old (OR = 4.17, 95% CI, 2.17–7.98), and having low social support (OR = 2.01, 95% CI, 1.42–2.84) independently increased individuals' risk of having PTSD and depression.

DISCUSSION

The current study found the prevalences of comorbid PTSD/depression, depression only, and PTSD only to be 16.6%, 14.8%, and 5.5%, respectively. Compared to the another study (Zhou et al., 2012) that was conducted after the Wenchuan earthquake, the prevalences are higher in our results. Zhou and his colleagues found that 16.7% of adults from seriously damaged communities had PTSD symptoms, and 12.3% of adults had depression 8 months after the Wenchuan earthquake (Zhou et al., 2012). Also, in another previous study, the prevalences of PTSD and depression among adolescent survivors 12, 18, and 24 months after the Wenchuan earthquake were found to be 17.5%, 19.0%, and 16.5%, respectively (Ying et al., 2012). Direct comparisons with these studies, however, are constrained by differences in the study populations, timeframes, and assessment measures. Our study is the first to report the prevalence of PTSD and depression among community adult survivors of the Wenchuan earthquake.

Second, the findings indicate that exposure was highly correlated both with depression only and with PTSD and depression, but not significantly associated with PTSD only. This is consistent with the hypothesis that PTSD and depression in the aftermath of trauma are separate constructs. A previous analysis of several different symptom measures after trauma found that a two-factor model of PTSD

TABLE 1. Prevalence of Depression and PTSD by Social Demography Factors, Among Adults in the Wenchuan Earthquake Area in China

Variable		Total	None	Depression Only	PTSD Only	PTSD and Depression	
		% (*N*)	% (*N*)	% (*N*)	% (*N*)	% (*N*)	*p* Value[a]
		100 (1341)	63.2 (847)	14.8 (198)	5.5 (74)	16.6 (222)	
Township	Yong'an	43.8 (589)	72.8 (429)	12.6 (74)	4.1 (24)	10.5 (62)	
	Guangji	56.2 (755)	55.6 (418)	16.5 (124)	6.6 (50)	21.3 (160)	<0.001
Gender	Male	36.0 (484)	68.7 (331)	14.1 (68)	4.6 (22)	12.7 (61)	
	Female	64.0 (860)	60.1 (516)	15.1 (130)	6.1 (52)	18.7 (161)	0.007
Ethnicity	Han	96.9 (1303)	62.9 (818)	14.7 (191)	5.5 (72)	16.8 (219)	
	Minority	3.1 (41)	70.7 (29)	17.1 (7)	4.9 (2)	7.3 (3)	0.432
Age	16–35	17.6 (236)	78.7 (185)	10.6 (25)	5.1 (12)	5.5 (13)	
	35–55	46.9 (631)	62.2 (392)	12.4 (78)	5.2 (33)	20.2 (127)	
	>55	35.5 (477)	56.7 (270)	20.0 (95)	6.1 (29)	17.2 (82)	<0.001
Marital status	Married	90.0 (1209)	62.5 (754)	14.8 (179)	5.4 (65)	17.2 (208)	
	Unmarried	10.0 (135)	68.9 (93)	14.1 (19)	6.7 (9)	10.4 (14)	0.199
Education	Primary school/below	71.7 (963)	59.0 (567)	16.2 (156)	5.9 (57)	18.8 (181)	
	Middle school/above	28.3 (381)	73.7 (280)	11.1 (42)	4.5 (17)	10.8 (41)	<0.001
Capita income per month	<200	52.1 (682)	60.5 (412)	16.0 (109)	5.3 (36)	18.2 (124)	
	≥200	47.9 (628)	65.8 (412)	13.3 (83)	6.1 (38)	14.9 (93)	0.127

[a] p values refer to the results of chi-square tests examining the relationships between mental health status and related variables.

TABLE 2. Results of Binary Logistic Regression for Risk Factors of Depression, PTSD Among Adult Survivors of the Wenchuan Earthquake in China ($N = 1341$)

Variable		PTSD OR (95% CI)	Depression OR (95% CI)
Township	Guangji (ref: Yong'an)	2.15 (1.60, 2.90)	1.84 (1.41, 2.39)
	p value	<0.001	<0.001
Gender	Female (ref: male)	1.58 (1.16, 2.15)	1.48 (1.13, 1.95)
	p value	0.003	0.005
Age	35–55 (ref: 16–35)	2.07 (1.20, 3.59)	2.57 (1.59, 4.13)
	p value	0.009	<0.001
	>55	2.57 (1.56, 4.24)	2.19 (1.43, 3.38)
	p value	<0.001	<0.001
Education	Prim/below (ref: mid-/above)	1.24 (1.56, 4.24)	1.21 (0.87, 1.70)
	p value	0.263	0.260
Injury	Yes (ref: no)	3.11 (1.84, 5.24)	4.09 (2.39, 6.97)
	p value	<0.001	<0.001
House damage	Yes (ref: little/no)	1.34 (0.99, 1.80)	1.59 (1.22, 2.08)
	p value	0.055	0.001
Social support	Low (ref: high)	1.51 (1.13, 2.03)	1.56 (1.12, 1.89)
	p value	0.006	0.005

and depression provided the best account of the data (Blanchard et al., 1998). The authors argued that if PTSD and depression together constituted a general psychiatric response to trauma, a single factor would provide the best fit of the data. Further research exploring the unique predictors of PTSD only, depression only, and PTSD and depression after disaster is needed.

Third, in the present study, female, middle age, and low social support are independently predictive of PTSD and depression. Previous studies suggest that women's higher PTSD and depression risk may be due to the type of trauma they experience, their younger age at the time of trauma exposure, their stronger perceptions of threat and loss of control, higher levels of peritraumatic dissociation, insufficient social support resources, and gender-specific acute psychobiological reactions to trauma (Gavranidou and Rosner, 2003; Olff et al., 2007). Our finding is also consistent with a previous study, which found that patients with PTSD and depression reported lower social support after adjusting for sociodemographic differences and physical illness (Campbell et al., 2007). In addition, our results additionally indicate that middle-aged people are more vulnerable, which may be explained by their being subject to more stress from juggling careers, and the family burdens of children and elderly relatives. The Wenchuan earthquake was the second earthquake of this magnitude known to have hit China to date,

TABLE 3. Results of Multinomial Logistic Regression for Risk Factors of Depression Only, PTSD Only, and PTSD and Depression Among Adult Survivors of the Wenchuan Earthquake in China ($N = 1341$)

Variable		Depression Only ($n = 198$) OR[a] (95% CI)	PTSD Only ($n = 74$) OR[a] (95% CI)	PTSD and Depression ($n = 222$) OR[a] (95% CI)	*p* Value[b]
Township	Guangji (ref: Yong'an)	1.65 (1.18, 2.31)	2.38 (1.41, 4.02)	2.38 (1.68, 3.38)	
	p value	0.004	<0.001	<0.001	<0.001
Gender	Female (ref: male)	1.38 (0.97, 1.96)	1.60 (0.93, 2.76)	1.74 (1.22, 2.50)	
	p value	0.075	0.089	0.002	0.007
Age	35–55 (ref: 16–35)	1.26 (0.74, 2.17)	1.14 (0.53, 2.46)	4.17 (2.17, 7.98)	
	p value	0.395	0.735	0.001	
	>55	2.37 (1.32, 4.25)	1.59 (0.68, 3.75)	3.42 (1.69, 6.91)	
	p value	0.004	0.288	<0.001	<0.001
Education	Prim/below (ref: mid-/above)	1.30 (0.83, 2.03)	1.55 (0.79, 3.04)	1.21 (0.78, 1.87)	
	p value	0.258	0.202	0.394	0.399
Injury	Yes (ref: no)	3.46 (1.73, 6.92)	2.22 (0.73, 6.76)	5.64 (2.99, 10.66)	
	p value	<0.001	0.161	<0.001	<0.001
House damage	Yes (ref: little/no)	1.61 (1.13, 2.29)	1.16 (0.70, 1.93)	1.62 (1.14, 2.30)	
	p value	0.008	0.562	0.007	0.007
Social support	Low (ref: high)	0.97 (0.69, 1.37)	0.71 (0.43, 1.19)	2.01 (1.42, 2.84)	
	p value	0.880	0.193	<0.001	<0.001

[a]Compared to "neither PTSD nor depression" cases ($N = 847$).

[b]By likelihood ratio test for overall *p* value.

and the results of this study have implications for policy and planning. Health care providers, researchers, and government officials need to continue to address the mental health needs of vulnerable subgroups of those affected, such as female and middle-aged survivors.

The present study has several limitations that should be mentioned. First, as a cross-sectional study, we could observe the correlations of independent variables with dependent variables, but could not establish causal relationships. Future studies should use longitudinal data to further explore the relationship between risk factors and mental health status. Second, not all potential confounding factors were measured and adjusted for in the analysis. More exposure factors, such as previous trauma exposure, should be considered as possible confounders. Third, the IES-R and CESD are self-report screening tools rather than clinical diagnostic tools. Therefore, the prevalences of PTSD and depression were likely overestimated in this study. Future studies should emphasize the role of clinical diagnostic measurement when examining similar topics, so as to improve the credibility of their findings for clinical practice. Despite these limitations, to the authors' knowledge, this study of PTSD only, depression only, and PTSD and depression among adult earthquake survivors is the first such investigation conducted in a non-Western population. It is also one of a handful of studies of the psychological sequelae of catastrophic natural disasters conducted in China.

CONCLUSIONS

The findings suggest that the prevalence of PTSD and depression was high 6 months after the earthquake, and there are two different groups of individuals, those who develop depression only in response to earthquake exposure and those who develop both depression and PTSD.

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DISCLOSURES

The authors declare no conflicts of interest.

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