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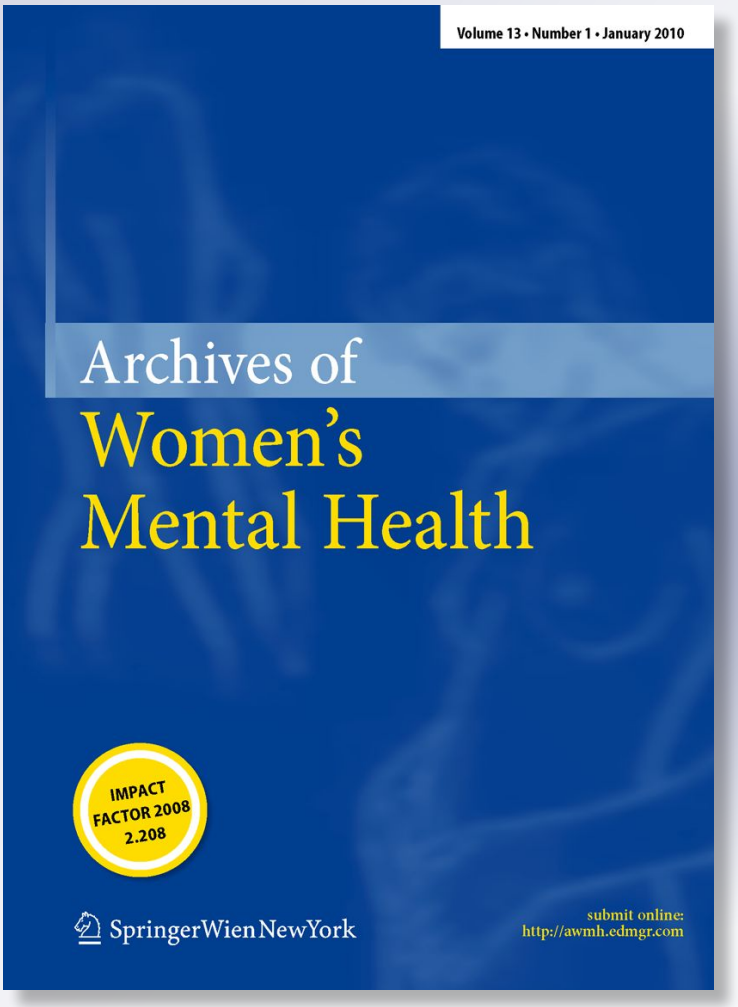

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ORIGINAL ARTICLE

Posttraumatic stress disorder and depression among new mothers at 8 months later of the 2008 Sichuan earthquake in China

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Abstract On May 12, 2008, a magnitude 8.0 earthquake struck China's southwestern Sichuan province. Recent studies have identified mental health problems among the survivors, but little is known about the impact of the Sichuan earthquake on the mental health of new mothers in the area. The main objective was to assess the impact of the Sichuan earthquake on the posttraumatic stress disorders (PTSD) and depression of new mothers. A total of 317 new mothers were interviewed in the hospital from January 2009 to March 2009. Symptoms of PTSD were measured using the impact of event scale-revised, and symptoms of postpartum depression were measured using the Center for Epidemiologic Studies Depression scale. The prevalence rates of PTSD and postpartum depression were 19.9% and 29.0%, respectively. Women with high earthquake exposure had higher risks of PTSD (odds ratio (OR), 5.91; 95% confidence interval (CI), 1.75–19.97; $P<0.001$) and postpartum depression (OR, 7.28; 95% CI, 2.51–21.08; $P<0.001$) than women without earthquake experience. In addition, women with low monthly family income and farm workers had a higher risk of having PTSD; women who were unemployed or with lower monthly family income and poor sleep had a higher risk of having depression. Earthquake experience increased the risks of having PTSD and depression among new mothers at 8 months later of the earthquake.

Keywords PTSD · Depression · New mother · Earthquake

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Introduction

On May 12, 2008, a magnitude 8.0 earthquake struck the northwestern Sichuan province of China. It killed 69,227 people, injured 374,643, and left 17,923 missing and millions of people homeless (State Council Information Office of China 2008). Mental health problems of natural disaster survivors have been reviewed by many studies (Van Griensven et al. 2006; Chou et al. 2003; Wang et al. 2000; Cao et al. 2003). Studies on the impact of Sichuan earthquake on the mental health of survivors found that the prevalence rates of posttraumatic stress disorder (PTSD) were from 9.4% to 45.5% (Wang et al. 2009; Kun et al. 2009), and some prior studies found that women were more sensitive to the impact of disaster and more likely to have PTSD and other mental health problems after experiencing traumatic events (Karamustafalioglu et al. 2006; Salcioglu et al. 2003; Kessler et al. 1995; Irmansyah et al. 2010). Perinatal mental health problems, such as depression and anxiety, not only adversely affect women's health in the postnatal period (Sayil et al. 2006), but also impact on infants' nutrition status, illness (Rahman et al.

2004), and temperament (Misri et al. 2004; Yang et al. 2009), and increase the risk of children's emotional or cognitive problems in a long term (Hay et al. 2008; Talge et al. 2007).

Only a few researchers investigated the impact of natural disaster on perinatal women's mental health and gestational outcomes. A study of 40 pregnant women affected by an earthquake in the USA suggested that the earthquake was rated as more stressful when it occurred early in pregnancy compared with late in pregnancy, and stress experienced early in pregnancy was associated with shorter gestational length (Glynn et al. 2001). A study of 171 pregnant women affected by a Taiwan earthquake revealed that women with starvation experience, higher negative attitude scores regarding the influence of earthquake on pregnancy, and more casualties among relatives were significantly associated with general health problems. Moreover, spouse casualty was significantly correlated with low birth weight neonates (Chang et al. 2002). Some studies (Xiong et al. 2010; 2008; Harville et al. 2009) examined the impact of Hurricane Katrina on the mental health and birth outcomes of surviving pregnant women. They found that the risks of PTSD and depression increased with an increasing number of severe experiences of the hurricane, and low birth weight and preterm birth were more prevalent among women with high hurricane exposure. However, birth outcomes had no significant correlation with PTSD and depression. In contrast, another study (Callaghan et al. 2007) found that the percentages of preterm birth, low birth weight, and very low birth weight in counties and parishes affected by Hurricane Katrina were higher than the averages of the United States.

Little is known about the impact of the catastrophic Sichuan earthquake on the mental health of new mothers in China up to date. This study intends to fill this gap and identify the impact of the earthquake on the mental health (including depression and PTSD) of postpartum women.

Methods

Study design and participants

This study was supported by the Disaster Relief Project of the Ministry of Science and Technology and was approved by the institutional review board of the School of Social Development and Public Policy at Beijing Normal University. It was a randomized sampling cross-sectional survey based on hospital. Study sites are in Mianzhu county and Mianyang city, which are located approximately 30–50 km away from the epicenter. Data were collected in Mianzhu People's Hospital and Mianyang Maternal and Child Health Hospital. The data collection process was implemented from the end of January 2009 to the end of March 2009. Altogether, 341 women agreed to participate in the interview, and 317 completed the PTSD and depression assessments. All participants were new mothers who had delivery within 1 week.

Measurement

Posttraumatic stress disorder symptoms

PTSD symptoms were assessed using the Impact of Event Scale—Revised (IES-R; Weiss and Marmar 1997), which is a self-report instrument widely used in the field of traumatic stress. The IES-R includes 22 items to measure the three major symptom clusters of PTSD: intrusive, avoidance, and hyper-arousal symptoms. IES-R measures are comparable to the Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM-IV) criteria for PTSD issued by the American Psychiatric Association (American Psychiatric Association 1994; Chang et al. 2003) and have good and stable psychometric properties (Creamer et al. 2003). The Chinese version of the IES-R was found to have satisfactory psychometric properties, comparable to the original English version (Wu and Chan 2003; Chen et al. 2005). In this study, each participant was asked to indicate the frequency of their distress (a modification of the standard instructions) using four rather than the standard five response options which themselves were modified (0=not at all, 1=seldom, 3=sometimes, 5=often) (Chan et al. 2011). The internal consistency coefficient (Cronbach's alpha) for the whole scale in the current study was 0.95. Since there is no recommended cutoff point for the IES-R (Christianson and Marren 2008), this study adopted a mean score of 1.8 as a cutoff point for each subscale, which was used by previous studies (Coffey et al. 2006). According to the diagnostic criteria for PTSD in DSM-IV, participants with mean scores of all three subscales of the IES-R equal to or greater than 1.8 were defined as having full PTSD symptoms. Those with mean scores of any two subscales equal to or greater than 1.8 were defined as having partial PTSD symptoms.

Depressive symptoms

The Chinese edition of the Center for Epidemiologic Studies Depression (CES-D; Wang 1999) scale was used to assess depressive symptoms. This scale is the most widely used depression-screening scale and has been frequently applied to community-based studies. The Chinese version of CES-D scale shows good reliability and validity across all age groups among urban population (Zhang et al. 2010). The Cronbach's alpha reliability in this study was 0.82.

Radloff (1977) suggested that a score of 16 should be the cutoff point when using the CES-D scale, while some other studies chose 21 or 22 (Chiu et al. 2010). However, studies based in the Chinese cultural context suggested that the

cutoff point of 16 had low positive predictive value (Li and Hicks 2010) and might be too low for China-based studies (Zhang et al. 2010). Other studies indicated that the cutoff point of 21 had better positive predictive value for depression among the Chinese (Cheng and Chan 2005). Therefore, given the complexity of the selection of cutoff points, this study applied the methodology used in the study of Unützer et al. (2002) and Chwastiak et al. (2002), which defined four groups of depressive symptoms: (1) little or no symptoms of depression (CES-D score <16), (2) mild depressive symptoms (16–20), (3) moderate depressive symptoms (21–25), and (4) severe depression (≥26).

Earthquake exposure measures

Earthquake experience was assessed using a 13-item self-constructed scale. It included "got injured in the earthquake," "got trapped in the earthquake," "assisted in earthquake relief," "relatives trapped in earthquake," "saw people being trapped," "saw people being injured," "saw people passing away," "heard about relatives or friends getting injured or lost," "family member died since the earthquake," "loss of family agricultural income," "loss of family commercial income," and "house destroyed and house collapse." Having one experience was counted as 1 point, which makes 13 as the highest score. High earthquake exposure was defined as scoring more than 4. Scoring 1–4 was defined as low exposure, and scoring 0 was considered as nonexposure.

Socio-demographic and health behavior factors

Socio-demographic and health behavior factors included age, ethnicity, living area, marital status, education, employment status, parity, monthly family income, beginning of pregnancy (measured by the time of the last menstruation), sleep duration, smoking behavior, and alcohol use behavior.

Data analysis

Statistical analysis was performed using SPSS 17.0 (SPSS Inc, Chicago, IL). The descriptive analyses of the data were performed for all variables investigated in the study, which include demographic characteristics (age, gender, marital status, levels of education, and average household income), smoking and drinking behavior, trauma exposure indicators, and outcome variables (PTSD symptoms and major depressive symptoms). Chi-square tests were performed to examine the correlation between outcome variables and independent variables. Multivariate ordinal regression was employed to identify predictors of PTSD symptoms and postpartum depression.

Results

The average age of participants was 26.4 years old (min=18.3, max=49.1; SD=5.2). The majority (76.3%) of them were between 18 and 29 years old and with high school or lower level of education (86.0%). More than half (53%) of the women were farm workers. Almost all of them were of Han ethnicity (96.5%), and most of them were married (95.9%). The majority (89.9%) had monthly family income lower than USD 448. Most of them had no smoking history (96.7%) and drinking history (91.9%). Nearly half (47.3%) of the women were primipara. The mean score of earthquake experience was 3.5 (min=0, max=13; SD=3.0) among the participants. Most of them (81.4%) had experienced more than one earthquake-related event, among whom 30.6% had high exposure, and 50.8% had lower exposure.

According to the DSM-IV diagnostic criteria, the total rate of PTSD symptoms was 19.9% (95% confidence interval (CI), 15.8–24.7), among which 9.5% (95% CI, 6.7–13.2) met the DSM-IV criteria for full PTSD, and 10.4% (95% CI, 7.5–14.3) met the criteria for partial PTSD. According to the cutoff point of CES-D scale, 29% (95% CI, 24.3–34.3) of the studied women had depressive symptoms (CES-D score of ≥16), among whom 14.2% (95% CI, 10.8–18.5) met the criteria of moderate depression (CES-D score ≥21) or severe depression (CES-D score ≥26) within 1 week after delivery. Among them, 69.2% (95% CI, 63.9–74.1) gave birth to their children by cesarean.

The results of bivariate analysis showed that earthquake experience has significant correlation with PTSD and depressive symptoms. Additionally, PTSD symptoms were significantly associated with monthly family income and employment. Moreover, postpartum depression is significantly associated with quality of sleep, employment, monthly family income, and education (Table 1).

Multivariate analysis indicated that women with high earthquake exposure had significantly higher risks of having PTSD (odds ratio (OR), 5.91; 95% CI, 1.75–19.97; P=0.004) and depression (OR, 7.28; 95% CI, 2.51–21.08; P<0.001) than women without earthquake experience. Women with monthly family income lower than USD 150 also had higher risks of having PTSD (OR, 4.62; 95% CI, 1.00–21.39; P=0.05) and depression (OR, 4.11; 95% CI, 1.18–14.36; P=0.027) than women with monthly family income higher than USD 448. Women farm workers had higher risks of having PTSD symptoms than nonfarm workers (OR, 2.45; 95% CI, 1.25–4.82; P=0.009). Compared with nonfarm workers, being a farm worker (OR, 2.85; 95% CI, 1.58–5.14; P=0.001) and unemployment (OR, 2.15; 95% CI, 1.15–4.03; P=0.017) were more significant in predicting a higher risk of having

Table 1 Chi-square analysis of depression and PTSD symptoms by earthquake experience and socio-demographic characteristics

		CES-D					PTSD			
		<16	16–20	21–25	≥26	*P* value	No	Partial	Full	*P* value
Earthquake experience	>4	55 (93.2)	2 (3.4)	1 (1.7)	1 (1.7)	<0.001	56 (94.9)	2 (3.4)	1 (1.7)	<0.001
	1–4	127 (78.9)	18 (11.2)	11 (6.8)	5 (3.1)		131 (81.4)	19 (11.8)	11 (6.8)	
	0	43 (44.3)	27 (27.8)	16 (16.5)	11 (11.3)		67 (69.1)	12 (12.4)	18 (18.6)	
Age	18–24	113 (70.6)	26 (16.3)	11 (6.9)	10 (6.3)	0.326	131 (81.9)	16 (10.0)	13 (8.1)	0.939
	25–29	61 (74.4)	8 (9.8)	11 (13.4)	2 (2.4)		64 (78.0)	9 (11.0)	9 (11.0)	
	≥30	51 (68.0)	13 (17.3)	6 (8.0)	5 (6.7)		59 (78.7)	8 (10.7)	8 (10.7)	
Living site	Village	166 (67.2)	41 (16.6)	24 (9.7)	16 (6.5)	0.025	195 (78.9)	26 (10.5)	26 (10.5)	0.427
	City	59 (84.3)	6 (8.6)	4 (5.7)	1 (1.4)		59 (84.3)	7 (10.0)	4 (5.7)	
Ethnicity	Han	219 (71.6)	45 (14.7)	25 (8.2)	17 (5.6)	0.202	246 (80.4)	32 (10.5)	28 (9.2)	0.662
	Minority	6 (54.5)	2 (18.2)	3 (27.3)	0 (.0)		8 (72.7)	1 (9.1)	2 (18.2)	
Employment	Farmer	52 (61.9)	11 (13.1)	10 (11.9)	11 (13.1)	<0.001	57 (67.9)	16 (19.0)	11 (13.1)	0.009
	Unemployed	31 (47.7)	20 (30.8)	11 (16.9)	3 (4.6)		51 (78.5)	7 (10.8)	7 (10.8)	
	Nonfarmer	142 (84.5)	16 (9.5)	7 (4.2)	3 (1.8)		146 (86.9)	10 (6.0)	12 (7.1)	
Marital status	Others	10 (76.9)	2 (15.4)	0 (.0)	1 (7.7)	0.469	10 (76.9)	1 (7.7)	2 (15.4)	0.76
	Married	215 (70.7)	45 (14.8)	28 (9.2)	16 (5.3)		244 (80.3)	32 (10.5)	28 (9.2)	
Education	Primary school or lower	15 (60.0)	3 (12.0)	4 (16.0)	3 (12.0)	0.012	16 (64.0)	4 (16.0)	5 (20.0)	0.099
	Junior middle school	112 (71.8)	23 (14.7)	12 (7.7)	9 (5.8)		123 (78.8)	19 (12.2)	14 (9.0)	
	High middle school	57 (64.0)	20 (22.5)	7 (7.9)	5 (5.6)		72 (80.9)	8 (9.0)	9 (10.1)	
	College or above	39 (88.6)	1 (2.3)	4 (9.1)	0 (.0)		41 (93.2)	2 (4.5)	1 (2.3)	
Monthly family income	Reject	68 (74.7)	12 (13.2)	7 (7.7)	4 (4.4)	0.015	66 (72.5)	11 (12.1)	14 (15.4)	<0.001
	<USD 150	35 (55.6)	10 (15.9)	10 (15.9)	8 (12.7)		37 (58.7)	16 (25.4)	10 (15.9)	
	150–448	93 (71.0)	23 (17.6)	10 (7.6)	5 (3.8)		121 (92.4)	5 (3.8)	5 (3.8)	
	≥448	29 (90.6)	2 (6.3)	1 (3.1)	0 (.0)		30 (93.8)	1 (3.1)	1 (3.1)	
Smoking history	Yes	6 (60.0)	2 (20.0)	1 (10.0)	1 (10.0)	0.831	6 (60.0)	1 (10.0)	3 (30.0)	0.168
	No	213 (72.0)	44 (14.9)	26 (8.8)	13 (4.4)		241 (81.4)	29 (9.8)	26 (8.8)	
Drinking history	Yes	18 (72.0)	3 (12.0)	3 (12.0)	1 (4.0)	0.929	19 (76.0)	3 (12.0)	3 (12.0)	0.877
	No	200 (70.9)	42 (14.9)	25 (8.9)	15 (5.3)		226 (80.1)	30 (10.6)	26 (9.2)	
Sleep per day (hour)	<7	14 (36.8)	12 (31.6)	7 (18.4)	5 (13.2)	<0.001	29 (76.3)	5 (13.2)	4 (10.5)	0.972
	7–9	125 (77.2)	17 (10.5)	15 (9.3)	5 (3.1)		130 (80.2)	17 (10.5)	15 (9.3)	
	>10	86 (73.5)	18 (15.4)	6 (5.1)	7 (6.0)		95 (81.2)	11 (9.4)	11 (9.4)	
Beginning of pregnancy	0–12 weeks before earthquake	92 (74.2)	16 (12.9)	9 (7.3)	7 (5.6)	0.238	92 (74.2)	17 (13.7)	15 (12.1)	0.087
	0–3 weeks postearthquake	91 (64.1)	25 (17.6)	18 (12.7)	8 (5.6)		115 (81.0)	14 (9.9)	13 (9.2)	
	4–12 weeks postearthquake	33 (80.5)	5 (12.2)	1 (2.4)	2 (4.9)		38 (92.7)	1 (2.4)	2 (4.9)	
Parity	Primipara	109 (72.7)	25 (16.7)	10 (6.7)	6 (4.0)	0.347	124 (82.7)	16 (10.7)	10 (6.7)	0.265
	Others	116 (69.5)	22 (13.2)	18 (10.8)	11 (6.6)		130 (77.8)	17 (10.2)	20 (12.0)	

depression. Women who slept less than 7 h/day had a higher risk (OR, 3.03; 95% CI, 1.60–5.75; P=0.001) of depression (Table 2).

Discussion

Two main findings can be derived from the results of the study displayed above. First, 8 months after the Sichuan earthquake, the prevalence of PTSD symptoms was 19.9%, and the prevalence of depression was 29.0%. Second, earthquake experience had significant correlation with PTSD and depression. The risks of having PTSD and depression increased along with higher earthquake exposure.

Compared with previous research, PTSD incidence among postpartum women in disaster areas was found to be no higher than that of the other groups. Some studies have found that 50.7% of the participants met the criteria for full PTSD 3 months after the earthquake (Kun et al. 2009), while the same rate turned out to be only 9.5% in this study.

Table 2 Multivariate ordinal analysis of depression and PTSD symptoms by earthquake experience and socio-demographic characteristics

		Depression		PTSD	
		OR (95% CI)	*P* value	OR (95% CI)	*P* value
Earthquake experience	>4	7.28 (2.51–21.08)	0.000	5.91 (1.75–19.97)	0.004
	1–4	2.91 (1.00–8.49)	0.050	2.49 (0.75–8.27)	0.137
	0	–	–	–	–
Age	18–24	1.13 (0.63–2.03)	0.675	1.49 (0.72–3.10)	0.283
	25–29	1.12 (0.58–2.19)	0.729	2.00 (0.89–4.48)	0.092
	≥30	–	–	–	–
Living site	Village	1.33 (0.64–2.76)	0.448	0.67 (0.31–1.45)	0.314
	City	–	–	–	–
Ethnicity	Han	0.74 (0.26–2.09)	0.566	1.33 (0.39–4.47)	0.647
	Minority	–	–	–	–
Employment	Farmer	2.85 (1.58–5.14)	0.001	2.45 (1.25–4.82)	0.009
	Unemployed	2.15 (1.15–4.03)	0.017	1.57 (0.72–3.41)	0.255
	Nonfarmer	–	–	–	–
Marital status	Others	0.63 (0.18–2.25)	0.481	2.02 (0.62–6.64)	0.245
	Married	–	–	–	–
Education	Primary school or lower	1.28 (0.37–4.45)	0.700	4.36 (0.99–19.16)	0.051
	Junior middle school	1.00 (0.34–2.91)	0.999	2.68 (0.70–10.34)	0.152
	High middle school	2.12 (0.75–5.97)	0.157	3.14 (0.84–11.84)	0.090
	College or above	–	–	–	–
Monthly family income	Reject	2.45 (0.72–8.36)	0.153	4.16 (0.92–18.80)	0.064
	<USD 150	4.11 (1.18–14.36)	0.027	4.62 (1.00–21.39)	0.050
	150–448	2.28 (0.68–7.66)	0.183	0.85 (0.17–4.20)	0.844
	≥448	–	–	–	–
Smoking history	Yes	1.88 (0.57–6.17)	0.300	2.54 (0.69–9.34)	0.161
	No	–	–	–	–
Drinking history	Yes	1.10 (0.47–2.55)	0.829	1.22 (0.45–3.32)	0.693
	No	–	–	–	–
Sleep per day	<7	3.03 (1.60–5.75)	0.001	1.34 (0.54–3.29)	0.530
	7–9	0.98 (0.59–1.63)	0.939	1.06 (0.58–1.93)	0.840
	>10	–	–	–	–
Beginning of pregnancy	0–12 weeks before earthquake	1.27 (0.54–3.00)	0.580	2.79 (0.76–10.24)	0.123
	0–3 weeks postearthquake	1.26 (0.56–2.85)	0.579	2.08 (0.56–7.74)	0.272
	4–12 weeks postearthquake	–	–	–	–
Parity	Primipara	1.04 (0.64–1.70)	0.865	0.99 (0.55–1.80)	0.981
	Others				

Lower rates of prevalence were found in this study probably due to two reasons. First, the participants of this study were much younger, with a mean age of 26.4 (versus 34.2 (Kun et al. 2009)), and senior people tend to have a higher risk of having PTSD than the youth (OR, 3.56; 95% CI, 1.57–8.06) according to former studies (Jia et al. 2010). Second, difference in time and location may be critical to the results. For example, Kun's (2009) research was conducted 3 months after the disaster and based in Beichuan, which is a county most severely damaged by the Sichuan earthquake. Further, studies on the impact of Hurricane Katrina on new mothers and neonates found that PTSD prevalence of pregnant women was 4.4% which was lower than the result of this study, and the prevalence of depression was 14.4% (Xiong et al. 2010; 2008) which was close to the result of this study.

This study and previous studies all found significant correlation between earthquake experience and PTSD symptoms and depression (Chang et al. 2002; Xiong et al. 2010; 2008; Chan et al. 2011). Most researchers agreed that earthquake experience could increase the risks of having PTSD and depression among pregnant women and new mothers. The findings of this study suggest that, in addition to the widely recognized issue of depression, PTSD comes to be another mental disorder that is suffered by new mothers after the earthquake. Moreover, the consequences of these mental health issues, such as depression and anxiety, are serious. They can affect the newborn infants in terms of their nutritional status and physical health (Rahman et al. 2004) and temperament (Misri et al. 2004; Yang et al. 2009), and increase the risk of children's emotional or cognitive problems in a long term (Hay et al. 2008; Talge et al. 2007). Thus, it is necessary to pay more attention to the psychological support for pregnant women after the earthquake.

In fact, we found that few pregnant women and new mothers in disaster areas gained access to such support. Moreover, even training courses teaching pregnant women the knowledge about antenatal care, psychological adjustment, breeding neonates, and postpartum recovery were terminated after the earthquake because there was not enough space for them to keep providing services. Further, there were no more instructions and advice for new mothers when they got out of hospital. The results suggest that long-term attention should be paid to the mental health of perinatal women after such catastrophic earthquake. Postdisaster support programs for perinatal women should also focus on improving the mental health of pregnant women in order to support the health of these women and their children.

Limitations

This study has the following limitations. First, the study did not introduce a comparison group from areas that were not struck by the earthquake. Second, the measurements of PTSD and depression applied in this study are screening tools, instead of clinical diagnostic methods. Therefore, the prevalence of PTSD is likely overestimated. Such issues should be paid more attention to by future studies.

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