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Prevalence and Determinants of PTSD 3 Years After an Earthquake in Iran

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Abstract

Post-Traumatic Stress Disorder (PTSD) is one of the most debilitating and costly mental health problems that can develop following exposure to natural disasters. Nevertheless, much remains unknown about how to best address PTSD and other mental health needs in disaster-stricken areas, particularly in rural and under-resourced areas. The present study is a population-based cross-sectional study conducted in rural areas that were affected by a destructive earthquake in Iran. The aim of the research is to explore the prevalence and determinants of PTSD among survivors 3 years after the earthquake. A multi-stage cluster random sampling technique was used to obtain a sample of 600 respondents between the ages of 18- and 87-years-old in affected areas. In the present sample, 224 individuals (37.3%) reported some PTSD symptoms. Factors associated with an increased likelihood of developing PTSD included being in a severely-stricken (as opposed to moderately-stricken) village and being female. However, there were no significant associations between PTSD and age groups, marital status, profession, and educational status. These results underscore the need for improved psychosocial interventions following disasters.

Keywords Iran · Disaster · Earthquake · PTSD

Introduction

On August 11, 2012, two earthquakes occurred 11 min apart near the cities of Ahar, Heris and Varzaghan in the east Azarbaijan province in northwest Iran. The earthquakes measured 6.3 and 6.4 on the Richter scale, respectively. At least 300 people died and more than 3000 others were injured, primarily in the rural and mountainous areas to the northeast of Tabriz (the capital of East Azarbaijan Province). Many survivors were exposed to psychological trauma due to the loss of family members and friends, physical injury, and destruction of property and assets (Rafiey et al. 2017).

One common psychological outcome of natural disasters (such as earthquakes) is the development of post-traumatic stress disorder (PTSD), a chronic and debilitating psychiatric disorder. PTSD can develop following exposure to actual or threatened death, serious injury, or sexual violence and is characterized by symptoms such as hyper-arousal, re-experiencing and avoidance. PTSD often is comorbid with major depressive disorder and anxiety disorders (Austern et al. 2018). Individuals with PTSD report a lower quality of life (Bovin et al. 2015).

The prevalence of PTSD following exposure to earthquakes varies widely in the literature. Relatively low prevalence estimates were found in survivors of the 1999 Taiwan earthquake (10–34.3%; Goenjian et al. 2005), whereas higher rates were found following the 2008 Wenchuan earthquake 21.5–40.1%; (Goenjian et al. 2005; Wu et al. 2009) and the 2010 earthquake in Haiti (36.8%; Cenat and Derivois 2014). Very high rates of PTSD were estimated after the

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2003 Bam earthquake in Iran (Farhoudian et al. 2013) and the 1988 Armenian earthquake (Goenjian 1993).

Although PTSD prevalence rates following earthquakes is clearly variable, it should be noted that the rates reported above are also likely affected by study methodology. Such methodological aspects that can impact prevalence rates are the manner in which PTSD cases are diagnosed and the amount of time that lapses between the disaster and the assessment. Regarding the latter, it is well documented that PTSD can develop at any point following a traumatic event and symptoms can wax and wane over time, often as a result of psychosocial interventions and increased social support (Tian et al. 2014). Several studies have illustrated that PTSD tends to arise after more prolonged periods rather than in a short timeframe following the stressors (Sadock et al. 2015). For example, PTSD prevalence increased significantly from 14.9% (5 months after Katrina Hurricane) to 20.9% (1 year after Katrina Hurricane) (Kessler et al. 2008). In contrast, there were twice as many PTSD cases among survivors of the Turkey earthquake 1 month following the disaster as compared to 13 months following the disaster (Altindag et al. 2005). These varying prevalence rates underscore the need for assessing PTSD symptoms at multiple time intervals following a disaster.

Prior research has identified numerous risk factors for PTSD following a traumatic event. One common finding in the literature is that the prevalence of PTSD tends to be elevated in women compared to men (Giannopoulou et al. 2006; Goenjian et al. 2005; Zhang et al. 2012). This vulnerability may be related to various styles of coping and adaptation, as well as differences in socio-economic status associated with gender (Gavranidou and Rosner 2003). The degree to which the individual was personally affected by the natural disaster also influences PTSD, with elevated rates among those whose family members died (Ma et al. 2011; Roussos et al. 2005; Tian et al. 2014) or were injured (Liu et al. 2010; Zhang et al. 2012) and those who were injured themselves (Goenjian et al. 2005). Protective factors against PTSD have also been identified in the literature (e.g., physical activity, social support; Tian et al. 2014).

Immediately following an earthquake, the primary objectives of communities and relief workers is usually to overcome the physical consequences caused by the earthquake (e.g., reconstructing the residential area) and, unfortunately, mental and social consequences that cause long-lasting impact are often neglected (Rafiey et al. 2017; Tang et al. 2017). In order to enhance comprehensive programs for rehabilitation after accidents and disasters, social and psychological consequences need to be studied precisely. It is possible that comprehensive rehabilitation plans that address social and psychological consequences of disaster may prevent the development of debilitating and costly mental health problems such as PTSD.

Despite the fact that long-term psychosocial consequences of disasters are significant and common, little attention has been paid to the long-term psychosocial consequences of disasters (Rafiey et al. 2017). Recent fallow-up study have highlighted the need for more research on the long term psychosocial outcomes of disasters (Xiao et al. 2011). There is particularly little research in this area conducted in Iran, despite the fact that it is one of the disaster prone countries in the world (Ahmadi et al. 2018). The present study aims to address this gap in the literature by examining the prevalence and correlates of PTSD in adult survivors of the East Azarbaijan earthquake 3 years later.

Method

A population-based cross-sectional study was conducted in August 2015 in three rural areas that were affected by the East Azarbaijan earthquake (2012) in northwestern Iran. The distances of these areas to Tehran (the capital of Iran) are 702, 647 and 682 km, respectively.

Two earthquakes measuring 6.3 and 6.4 on the moment magnitude scale (MMS) occurred within an 11-min interval. At least 306 people were killed and more than 3000 others injured. A multi-stage cluster random sampling technique was used to obtain a sample of 600 respondents between the ages of 18- and 87-years-old in the affected areas. The present data was collected as part of a larger study comparing mental health status among moderately- and severely-stricken villages of Azarbaijan disaster. Moderately-stricken villages are those without any persons killed by the earthquake and severely-stricken villages are those with at least one person killed. For the purpose of increasing the variance of constructs and power of the study, data from both groups of participants were combined. Data collection was conducted by six mental health professionals (psychologists and social workers). All scales were administered via a face-to-face interview and as a result there were no problems with missing data in this study.

Before administering the interviewers, interviewers underwent an initial training that included didactics and role playing. The training included topics such as appropriate contact with participants, maintaining neutral behavior in the interview, administering the questionnaire, and explaining the individual questions. Ongoing supervision was provided to the interviewers throughout the interview period.

The Ethics committee of the University of Social Welfare and Rehabilitation Sciences (USWR) Tehran, Iran approved the protocol of research and all recruitment and assessment procedures. The informed consent was written, and the consent form was also read to those with literacy issues. Participants had the right to withdraw at any time without having to give a reason.

Participants

One adult member (aged 18 years or older) per household was randomly selected using the Kish Method, in with selection from a sample of rural households (primary units) and adults within each household (secondary units). All selected participants agreed to participate in the study and provided written informed consent. A total of 683 participants selected for this study. Of those selected (n = 683), a total of 600 participants returned the questionnaire (response rate = 83%). In oder to be selected, participants had to be 18 years or older residing in earthquake-stricken areas. The selected sample size from each municipality and the prefabricated district were estimated based on the total city population. Individuals living in institutions and those with significant medical and psychiatric illnesses that prevented them from engaging in the interview were excluded from the study. Literacy was not an inclusion criterion as the interviewers orally read the measures to the participants.

Instruments

Post-Traumatic Stress Disorder was assessed using the National Stressful Events Survey PTSD Short Scale [NSESSS-PTSD]. The PTSD Short Scale is a self-report measure consisting of 9 items that correspond directly to the DSM-5 PTSD criteria. Each item is rated on a 5-point Likert scale from 0 (not at all) to 4 (extremely) to reflect the severity of post-traumatic stress disorder during the past 7 days. The range of possible total scores is 0–36. The NSESSS-PTSD has been demonstrated to have high internal consistency and strong convergent validity with PCL scale. Consistent with APA recommendations for the scale, the 9 items were summed to obtain a total raw score, from which an average score is calculated. This average total score reduces the overall score to a 5-point scale, which "allows the clinician to think of the severity of the individual's posttraumatic stress disorder in terms of none (0), mild (1), moderate (2), severe (3), or extreme (4)" (LeBeau et al. 2014). The Persian translation of the scale has demonstrated strong psychometric properties in a sample of Iranian earthquake survivors (in press). In addition, the following demographic information was collected: age, gender, education level, employment, and marital status.

Data Analysis

All analyses were performed using Stata Version 14. We conducted bivariate analysis using Chi square tests and Pearson's correlation to determine the association between PTSD and demographic factors. Because of sparse data penalized logistic regression via data augmentation and stratification by severity of earthquake was conducted to identify

predictors of PTSD (Greenland et al. 2016). The stratified analysis assumes that there is an interaction between the included variables and severity. Variables with a p-value of less than 0.2 in the bivariate analysis were entered into the model. These included gender, age group, educational level, job title and marital status.

Results

The majority of participants in study were male (66.2%) and young (37.3% were in the 25–34 year-old age group). The majority of participants worked as farmers (66%). See Table 1 for full demographic information.

Over one-third of the sample endorsed the presence of some PTSD symptoms (37%; 95% CI 34%, 41%). The rate of PTSD was higher in females (51%) than males (30.4%). Rates were also higher in residents of severely-damaged villages (46.6%) compare to moderately-damaged villages (28%). However, no significant associations were observed between age groups, marital status, profession, and educational status with PTSD (Table 2). Table 2 indicates that age group 18–24 report higher rate of PTSD in comparison to other age group. Surprisingly, married persons reported higher level of PTSD (38.7% compared to single ones 33.3%). As it can be seen in Table 2, housekeepers had more PTSD cases.

Table 3 shows the result of logistic regression model for predictors of PTSD among survivors. In areas with low severity earthquakes, females compare to males have

Table 1 Characteristics of the study sample (n = 600)

Variables	
Age, mean (SD)	35.2 (12.8)
Gender, no (%)	
Male	397 (66.2)
Female	203 (33.8)
Marital status, no (%)	
Single	195 (32.5)
Married	395 (65.8)
Other	10 (1.7)
Educational level, no (%)	
Primary school	162 (27.0)
Primary to diploma	350 (58.3)
University degree	88 (14.7)
Distribution of NSESSS-PTSD scores (n = 600), no (%)	
None	376 (62.7)
Mild	102 (17.0)
Moderate	108 (18.0)
Severe	14 (2.3)
Extreme	0 (0)

Table 2 Distribution of the demographic characteristics of participants by PTSD (n = 600)

Variable		PTSD	
		Yes (n = 224)	No (n = 376)
Gender‡	Female	104 (51.0)*	99 (49.0)
	Male	120 (30.4)	277 (69.6)
Age groups	18–24	41 (41.8)	57 (58.2)
	25–34	86 (38.4)	138 (61.6)
	35–44	55 (33.5)	109 (66.5)
	45–54	22 (37.3)	37 (62.7)
	55–64	10 (35.8)	18 (64.2)
	65 and above	9 (33.3)	18 (66.7)
Job title ‡	Farmer	74 (37.9)	121 (62.1)
	Housekeeper	56 (56.0)	44 (44.0)
	Rancher	65 (32.3)	136 (67.7)
	Self-employment	25 (31.2)	55 (68.8)
	Government employee	4 (16.6)	20 (83.4)
Education level	Primary school	134 (38.4)	215 (61.6)
	Secondary school	54 (33.1)	109 (66.9)
	University certificate	36 (40.9)	52 (59.1)
Marriage status	Single	66 (33.3)	132 (66.7)
	Married	152 (38.7)	240 (61.3)
	Others	6 (60.0)	4 (40.0)
Severity of earthquake‡	High	140 (46.6)	160 (53.4)
	Low	84 (28.0)	216 (72.0)

*N (percent)

‡P < 0.001

Table 3 Logistic regression model result for predictors of PTSD among survivors

		Severity			
		Low (n = 300)		High (n = 300)	
		OR	95% CI for OR	OR	95% CI for OR
Gender	Female	2.27	1.11, 4.65	1.32	0.75, 2.32
Age groups	18–24	1.54	0.75, 3.16	1.17	0.51, 2.67
	25–34	Ref[a]	–	Ref †	–
	35–44	0.46	0.13, 1.55	1.11	0.62, 2.02
	45–54	0.74	0.14, 3.73	1.54	0.71, 3.38
	55–64	0.71	0.14, 3.57	2.30	0.76, 6.91
	65>	2.73	0.76, 9.71	1.17	0.38, 3.55
Job title	Farmer	Ref[a]	–	Ref[a]	–
	Housekeeper	1.82	0.46, 4.64	2.56	1.19, 5.51
	Rancher	1.36	0.67, 2.87	1.36	0.72, 2.57
	Self-employment	1.26	0.43, 3.73	0.85	0.42, 1.74
	Government's employee	1.20	0.69, 2.07	1.50	0.79, 2.85
Marriage status	Single	0.64	0.34, 1.17	0.75	0.45, 1.24
	Married	Ref[a]	–	Ref[a]	–
	Others	2.45	0.62, 9.70	–	–

*P < .05; **P < .001

[a]Reference group

significant higher odds of PTSD (OR = 2.27, 95% CI 1.11, 4. 65). However, in areas with severe earthquake, females did not have significantly higher odds of PTSD compared to males (OR = 1.32, 95% CI 0.75, 2.32). In model for areas with severe earthquake, housekeeper compare to farmers had higher odds of PTSD (OR = 2.56, 95% CI 1.19, 5.51; Table 3).

Discussion

The aim of this study was to examine the prevalence of PTSD and risk factors for PTSD in adult earthquake survivors in rural Iran. To our knowledge, the present study marks the first to consider rates of PTSD in rural areas following these earthquakes and is the first long-term follow up of rural earthquake survivors in Iran.

In the present sample, 37.3% report PTSD symptoms 3 years following the earthquake and over 20% reported symptoms suggestive of moderate or severe PTSD. Notably, these rates are similar to prevalence of PTSD among survivors of Haiti earthquakes (Cénat and Derivois 2014). As expected, individuals living in severely-stricken areas were more likely to report PTSD symptoms than those in moderately-stricken areas. Females reported higher rates of PTSD in the present sample, consistent with what has been reported in previous studies (Cénat and Derivois 2014; Gavranidou and Rosner 2003; Ma et al. 2011). However, of note, this was only true in moderately-stricken areas. In severely-stricken areas, no such gender differences were found. It is thus important for future disaster services to target women in mental health prevention and intervention efforts following natural disasters. Moreover, housekeepers experienced PTSD more than other job categories which should be considered in psychosocial rehabilitation planning.

Significant differences in PTSD rates were not found as a function of age, educational status, or marital status. Correlation to age and PTSD or educational status and PTSD. In relation to age group and educational status, the result have shown that those who aged 18–24 experienced PTSD more than other age groups, which is a similar to Cenat and Derivois (2014) that reported higher rate of PTSD in adolescents. Additionally, similar studies found a significant relationship between loss of property and symptoms of PTSD, which are supported by our results regarding areas with low versus severe damage (Goenjian et al. 2005; Tian et al. 2014).

In the present sample, PTSD rates remain high after 3 years. This is consistent with prior research suggesting that cases of PTSD tend to increase as temporal distance from the trauma increases. The fairly high rates are also likely influenced by the lack of availability of treatments for PTSD and other mental health problems in Iran, particularly in rural areas. The findings highlight the potential benefit of disseminating mental health prevention and intervention efforts into rural areas and enacting programs that last longer than the typical short-term rehabilitation efforts currently employed.

The present findings should be considered in the context of several limitations. First, a cross-sectional research design was utilized and as a result causality cannot be determined. Second, the degree to which the present findings generalize to individuals in other geographic areas or who experience other types of natural disasters is unknown. Third, participants were not formally diagnosed with PTSD by a diagnostic interview in the present study. To address these limitations, future research should be longitudinal in nature and include formal clinical diagnosis of PTSD.

Despite these limitations, the results of this study emphasize the importance of long-term psychological consequences of natural disasters. More attention to long term interventions for disaster survivors in psychosocial disaster rehabilitation plans is needed. Such programs should aid the psycho-social wellbeing of the population by prioritizing these vulnerable groups that have been shown to have high rates of prevalence of PTSD.

Conclusion

To the best of our knowledge, this was the first time in these areas that the prevalence of PTSD was evaluated in 3 years after earthquakes. Hence, a basic data is provided for future researches, intervention and even policy making in natural disasters. It is the first to do a long term follow up in rural Iran and because the methodology utilized and the resultant data could be very useful for other disaster researchers in Iran and beyond.

Compliance with Ethical Standards

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