

## Original Article

## Post-Traumatic Stress Disorder in Bam-Survived Students Who Immigrated to Kerman, Four Months after the Earthquake

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**Background:** The 6.3 Richter earthquake in Bam killed 26,000 and injured 30,000 people, and destroyed 85% of houses according to the literature. Children are affected more than others by disasters. In this study, we assessed the rate of post-traumatic stress disorder and psychological problems in survived Bam students in Kerman four months after the earthquake and their relations with demographic factors, family loss, house destruction, and body injury.

**Methods:** A group of 433 students attended this cross sectional study. Watson post traumatic stress disorder questionnaire and Symptom Checklist-90 were applied for students older than 15 years of age and Yule post-traumatic stress disorder and Rutter (parents' version) questionnaires were used for students younger than 15. Multiple regression analysis was used to assess the effects of variables on psychopathologies.

**Results:** Post-traumatic stress disorder was detected in 36.3% of the students older than 15 years of age and 51.6% of the students younger than 15. Behavioral problems were present in 31.3% of the children and the mean score of Global Symptom Index was  $1.13 \pm 0.59$ . Body injury and living with family were correlated with post-traumatic stress disorder and Symptom Checklist-90 items in students older than 15. Female sex was correlated with post-traumatic stress disorder and behavioral problems in students younger than 15.

**Conclusion:** The prevalence of post-disaster post-traumatic stress disorder was high in children. Younger age, female gender, living apart from family, geographic living conditions, being in the center of stress or not after the earthquake, body injury, and loss of family members form the basis for developing post-disaster psychopathology.

Due to incomplete presence of post-traumatic stress disorder criteria or high rate of overlooking post-traumatic stress disorder in children, the disorder may be misdiagnosed or remain undiagnosed in them, which warrants more consideration.

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**Keywords:** Bam • earthquake • Iran • post-traumatic stress disorder

### Introduction

Iran is one of the top ten countries struck by natural disasters, and among the first five struck by earthquakes. During the last century, more than 150,000 people were killed in natural disasters, mostly earthquakes.

An earthquake, with a magnitude of 6.3 on the Richter scale, which shook the city of Bam and the

adjacent villages on the 26 December 2003, killed at least 26,000 and injured 30,000 people and destroyed 85% of the houses.

Nearly everybody lost a beloved one or suffered serious psychological trauma.<sup>1</sup> Many children lost one or two parents, siblings, and/or extended family members. They witnessed the most stressful event in their life and were not prepared to deal with the condition. Many had to cope with physical disabilities.<sup>1</sup>

Literature affirms that children are affected by disasters more than others, both directly and indirectly through emulating their parents and other adults.<sup>2</sup>

In an earthquake on the 22 June 2002 in Qazvin, north of Tehran province, Iran, the rate of

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behavioral disturbances in children was 34.2% compared with 20.5% in children who were not exposed. Post-traumatic stress disorder (PTSD) was reported in 47% of children and 77% of adults, which showed high vulnerability to PTSD after disasters in Iran.<sup>3</sup>

This study was designed to assess the rate of PTSD and general psychopathology in survived students who left Bam to Kerman (center of the province with a distance of 150 km) four months after the earthquake and the relationship between PTSD and factors such as demographic variables, family loss, house destruction, and body injury.

The results of this research could provide a comparison with other results from Bam to plan psychological interventions for those survivors who left the area after the disaster.

## Materials and Methods

The population included all the students who left Bam after the earthquake. The sample of students younger than 15 years of age was from all primary schools which included more than six students from Bam (175 boys and 98 girls), and for students older than 15, student were from two high schools in which most of the survived Bam's high school pupils studied (57 boys and 103 girls).

The applied questionnaires were those used in pervious studies in Iran; for example, in the recent earthquake in Bam, and were as follows:

- Demographic questionnaire for all students including sex, age, questions about house destruction, loss of relatives, living with family, and presence of any physical injury or being buried under rubble.
- Yule PTSD questionnaire for students younger than 15, which has been tailored, validated, and administered for pervious studies in Iran (sensitivity: 83%, specificity: 85%, test-retest reliability: 92%).<sup>3,4</sup>
- Watson interview for PTSD of adults, which is validated in Iran and applied for students older than 15 (internal validity: 86%, reliability: 82%, inter-rater reliability (k): 82%).<sup>3,5</sup>
- Rutter's questionnaire (parent's version), applied to detect the prevalence of mental disorders reported by parents in students under 15.<sup>6</sup>
- Symptom Checklist-90 (SCL-90), applied for the evaluation of psychiatric disorders in students older than 15.

For students under 15 years of age, the questionnaires were sent to their houses (to their parents) and were then collected after a week; and for students older than 15, the questionnaires were completed by four trained university students of psychology under the supervision of a psychiatrist.

The frequency of demographic and other disaster-related variables in addition to the mean scores of PTSD, Rutter, and SCL-90 items were assessed.

Multiple regression model was used to assess the effects of independent variables such as age, sex, family loss, house destruction, body injury, living with family, and being buried under rubble on PTSD and psychiatric symptoms.

## Results

One hundred and sixty students (35.6% males, 64.4% females) older than 15 years were evaluated. Of them, 94% had suffered from loss of at least one family member, 35.6% had complete house destruction, 10.6% had body injury, and 44.5% lived with their family at the time of our research.

Two hundred and seventy-three students (64.1% males, 35.9% females) younger than 15 years of age were evaluated. Of them, 91% had lost at least one family member, 51.3% had complete house destruction, 19% had body injury, and 17.2% lived with their family at the time of our research.

In students older than 15, the mean PTSD score was  $45.88 \pm 18.82$ , and 36.3% of them were affected.

PTSD was more prevalent in males although no statistically significant difference was detected between genders. The presence of body injury had a significant correlation with PTSD symptoms ( $P=0.01$ ); however, this correlation became weaker as the injury affected more distal parts of the body. Living in Kerman, far from parents, had a significant correlation with the presence of PTSD ( $P=0.005$ ) as 54.4% of students lived apart from their parents in dormitories or lived with relatives.

SCL-90, according to sex, showed a significant difference on items of aggressiveness ( $P=0.01$ ), sensitivity to interpersonal relationship ( $P=0.04$ ), paranoia ( $P=0.003$ ), and psychosis ( $P=0.02$ ), which were worse in males. Regarding house destruction, the item of aggressiveness had a significant relationship with the extent of house

destruction ( $P=0.02$ ) as those with complete house destruction showed less aggressiveness.

Age and family loss had no statistically significance relationship with any items of SCL-90.

The relationship between PTSD, SCL-90 and factors such as demographic data and other variables are demonstrated in Tables 1 and 2.

In students younger than 15, the mean score of Yule PTSD questionnaire was  $50.43 \pm 16.61$ , and 51.6% of them were affected.

The prevalence of PTSD was significantly different in males and females as the latter were more affected ( $P=0.007$ ). The rate of family loss was 90.8%, but no significant difference was found when compared to students who had not lost any family members; however, it showed that the closer the deceased person was, the higher the PTSD scores were. The severity of house destruction was insignificantly correlated with PTSD.

The mean Rutter's score was  $10.96 \pm 6.92$ , and 31.3% had behavioral problems.

The relationship between PTSD, Rutter scores and factors such as demographic data and other variables are demonstrated in Tables 3 and 4.

## Discussion

This research was done about four months after the earthquake on Bam's students who left there to Kerman. According to the reported high rates of stressful events, the probable frequency of psychiatric disorders, particularly PTSD, was evaluated.

### Students older than 15 years of age PTSD

PTSD was detected in 36.3% of the participants, slightly more prevalent in males, although no statistically significant difference was reported between genders. Difference in sex was

also noticed in a local research about Bam, in which the prevalence of PTSD, six months after the earthquake, was reported to be lower in male than in female adults by 26%, although men were more probable to remain ill.<sup>7</sup> According to a research of 1999, ten months after Taiwan earthquake, the female gender can be used for prediction of PTSD.<sup>8</sup> The higher rate of PTSD in male adolescents in this research raised questions about whether this age group (15 – 18) of males was more vulnerable to stress than females or some other unknown factors might be responsible.

According to a report from Bam 40 days after the earthquake, 81% had the criteria for PTSD, which is much higher than our report. There were no significant correlations between demographic and psychological distress variables.<sup>9</sup>

Another report one month after Bam's earthquake revealed PTSD in 58.9% of females and 47.5% of males, which is higher than our results (36.3%).<sup>8</sup> They also reported higher rates of PTSD (higher by 32%) in local residents in comparison with those who left there. Being far from the source of stress may have caused the difference; however, future studies are needed to assess the rate of late-onset PTSD to compare the difference between these two populations.

The rates of PTSD following Taiwan earthquake (11.3% at the time of earthquake, 32% after three months, and 60% after 10 months) showed high rates of PTSD symptoms like the results in Iran.<sup>8</sup>

Similar to our report of correlation between PTSD and body injury, the diagnosis of PTSD was significantly related to the presence of injury in a one-year follow-up study of PTSD among earthquake survivors in Turkey.<sup>10</sup>

Leaving the family in the area of disaster or being in a dormitory due to losing close family members in students who live far from family might serve as a serious stressful condition to induce PTSD; just as our research yielded higher

**Table 1.** Multivariate logistic regression model of demographic and other disaster-related variables in students older than 15 years of age and PTSD.

	B	SE	df	P	OR	95%CI Lower	95% CI Upper
Constant	-3.546	2.955	1	.230	.029		
Age	.255	.155	1	.100	1.291	.952	1.751
Sex	-.029	.384	1	.940	.972	.458	2.061
Family loss	1.115	.749	1	.136	3.051	.703	13.234
House destruction	.640	.610	1	.294	1.897	.574	6.263
Body injury	-1.123	.478	1	.019*	.325	.128	.830
Living with family	-1.053	.379	1	.005*	.349	.166	.733

B=regression coefficient, SE=standard error, df=degree of freedom, OR= odd's ratio.

**Table 2.** Demographic and other disaster-related variables and SCL-90.

SCL-90 index	Mean±SD	Sex <i>P</i>	Age <i>P</i>	Family loss <i>P</i>	House destruction <i>P</i>	Body injury <i>P</i>	Living with family <i>P</i>
Aggressiveness	1.1±0.92	0.001	—	—	0.02	(-) 0.002	(-) 0.01
Anxiety	1.33±0.85	—	—	—	—	(-) 0.06	(-) 0.00
Depression	1.27±0.78	—	—	—	—	(-) 0.01	(-) 0.002
Sensitive interpersonal	1.27±0.72	0.04	—	—	—	(-) 0.04	(-) 0.04
Obsession, compulsion	1.29±0.76	—	—	—	—	(-)0.04	(-) 0.02
Somatic complaints	0.80±0.62	—	—	—	—	—	—
Phobia	0.83±0.73	—	—	—	—	—	(-) 0.00
Paranoia	1.51±0.82	0.003	—	—	—	(-) 0.05	(-) 0.04
Psychosis	9.76±0.55	0.02	—	—	—	(-) 0.003	(-) 0.003
Additional questions	1.38±0.82	—	—	—	—	(-) 0.01	(-) 0.01
GSI	1.13±0.59	—	—	—	—	(-) 0.01	(-) 0.00
PSDI	2.15±0.50	—	—	—	—	(-) 0.2	(-) 0.03
PST	45.88±18.82	—	—	—	—	(-) 0.03	(-) 0.00

\* The variables which had statistically significant correlations are mentioned in the table.

rates of PTSD in students who lived far from parents, although further studies are needed in this regard.

The extent of house destruction and family loss had no statistically significant correlation with PTSD. Contradictory results from other reports show such a correlation between these factors and PTSD prevalence in adults<sup>7,8,11</sup> which is another surprising difference in this group (15 – 18 years).

### General psychopathology

Males' higher scores in SCL-90 items of aggressiveness, sensitivity to interpersonal relationship, paranoia, and psychosis were not in accordance with those reported from Bam which found more psychopathology in females although the applied test was General Health Questionnaire (GHQ).<sup>7</sup>

A report from Turkey's 1999 earthquake on post-disaster psychological effects showed higher scores in depression, anxiety, and somatization subscales of SCL-90 in females<sup>12</sup>; however, our research showed no significant difference between

males and females on these items. The higher scores in different subscales in males in our report may be a new finding which should be further evaluated in other studies. The difference may be due to different age groups in the two samples; the Turkish study was carried out on adults.

Approximately all the items of SCL-90 including Global Symptom Index (GSI), Positive Severity Distress Index (PSDI), and Positive Symptom Total (PST) were statistically significant in the presence of body injury and living apart from family, which shows that these stressful situations were among the most significant stress-causing factors of psychopathology in survived students of the earthquake who lived in Kerman.

According to several other reports, in spite of higher risk of psychopathologies such as PTSD in females, males tend to suffer more chronically and become disabled.<sup>7,13–15</sup>

Another local research on Bam earthquake reported that, except for PTSD, local residents were not at higher risk of general psychopathologies compared to immigrants,<sup>7</sup>

**Table 3.** Multivariate logistic regression model of demographic and other disaster-related variables in students younger than 15 years of age and PTSD.

	B	SE	df	<i>P</i>	OR	95% CI Lower	95% CI Upper
Constant	2.818	.893	1	.002	16.739	—	—
Sex	-.707	.262	1	.007*	.493	.295	.825
Family loss	-.310	.448	1	.488	—	.305	1.764
House destruction	-.308	.243	1	.204	.735	.456	1.182
Body injury	-.704	.388	1	.070	.494	.231	1.058
Being buried under rubble	.172	.403	1	.669	1.188	.539	2.619

B=regression coefficient, SE=standard error, df=degree of freedom, OR=odd's ratio

**Table 4.** Multivariant logistic regression analysis of demographic and other disaster-related variables in students younger than 15 years of age and Rutter.

	B	SE	df	P	OR	95% CI Lower	95% CI Upper
Constant	-.999	.896	1	.265	.368	—	—
Sex	.117	.275	1	.670	1.124	.656	1.926
Family loss	.123	.461	1	.790	1.131	.458	2.926
House destruction	.229	.254	1	.367	1.257	.764	2.069
Body injury	-.508	.388	1	.190	.602	.282	1.287
Being buried under rubble	.270	.425	1	.526	1.309	.569	3.013

B=regression coefficient, SE=standard error, df=degree of freedom, OR=odd's ratio.

which showed the severity of suffering from disasters in everybody who was involved.

### ***Students younger than 15 years of age PTSD***

PTSD was present in 51.6% of the students. Previous reports from Iran using the same questionnaire showed PTSD in 47.3% of cases one year after Birjand earthquake, north-east of Iran, and in 47% of cases one year after Qazvin earthquake, north of Tehran.<sup>3</sup> Also, the report of Bam showed PTSD in 87.9% of children<sup>1,7</sup> and 55.3% of adults,<sup>7</sup> which emphasized the high vulnerability of children. The difference in the prevalence of PTSD in children in the vicinity of Bam (87.9%) and in Kerman (51.6%) in the present research might be due to living far from the source of disaster. It argues the role of effective supportive care proportionate to the extent of disaster which should be addressed in future studies.

A report of an earthquake in China nine months after its occurrence showed that the PTSD prevalence was lower in situations where supportive care was more. These included temporary housing or tents and help for reconstruction.<sup>16</sup>

Also, significant lifestyle changes which were more persistent in students who lived in the site of disaster may have contributed to the higher prevalence of PTSD, as in victims of Japan earthquake.<sup>17</sup>

The prevalence of PTSD was higher in females in our report, similar to another report from Bam,<sup>7</sup> showing that female children and adults were more vulnerable for developing PTSD and, therefore, require more attention.

No difference on PTSD between children who lost a family member and those who did not might be due to the severity of stress which affected each vulnerable child regardless of the presence or absence of family loss. However, according to a

report from Bam,<sup>7</sup> the risk of PTSD rises by 4% for the loss of each family member. The reason for this difference should be further investigated in future studies.

In a report from Taiwan<sup>8</sup> one month after an earthquake, house destruction was correlated with the prevalence of PTSD; however, in our report, no significant correlation was detected.

### ***General psychopathology***

According to Rutter (parent's version) questionnaire, 31.3% of the students had behavioral problems. Yasamy et al.<sup>7</sup> reported general psychopathology in 78.4% of children who lived in Bam, six months after the earthquake. The higher rate of PTSD in this research in comparison to our results is probably due to living in a more stressful area.

Sex, body injury, family loss, house destruction, and also being buried under rubble had no statistically significant correlation with general psychopathology in this research.

## **Conclusion**

According to this research, a number of risk factors form the basis for developing post-disaster psychopathologies.

Among them, younger age, female gender, living apart from family and geographic living conditions after the earthquake, body injury, and loss of family members were also reported.<sup>1</sup> Surprisingly, being buried under rubble was not correlated with PTSD in our study, for which the timing of our research, four months after the earthquake, might be responsible.

Yasamy et al.<sup>7</sup> reported a 55-fold greater chance of recovery for the adults who received psychosocial interventions compared to those who did not benefit from them seven months after the earthquake. Those who received interventions showed a 7.5-fold greater chance of recovery in

general psychopathology. This may strongly support the effect of intervention on the recovery rate of PTSD.

In a report from Armenia about those who did not take psychosocial interventions, the rate of PTSD symptoms, four and a half years after the earthquake, was similar to those who were studied 18 months after the earthquake which shows the probability of chronicity of the disorder in adults.<sup>18</sup> Good living conditions and adequate social and health services may serve to prevent the chronicity of post-traumatic reactions among earthquake victims.<sup>10</sup>

According to this study, the prevalence of PTSD is high in people younger than 18 (36.3% in <15 years and 51.6% in 15 – 18 years). Due to incomplete presence of PTSD criteria or high rate of overlooking PTSD in children, the disorder may be misdiagnosed or remain undiagnosed in them, which warrants more consideration.<sup>19</sup>

Knowledge of the prevalence of psychopathologies and applying interventions following a disaster seem to be vital to decrease the risk of chronicity and increase the functional well-being of local and also immigrant survivors who seem to receive much less support.

The most important limitation of our study was the absence of a control group which was due to our limited time to access students who were about to finish the study year in the time of our research, which also prevented us from having individual interviews to confirm the PTSD rates according to questionnaires.

Although our research did not include all the young immigrants, it represented the majority of them who lived in Kerman after the earthquake.

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