

Post-traumatic stress disorder among survivors of Bam earthquake 40 days after the event

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الاضطرابات الكربية التالية للرضح بين الناجين من زلزال "بام" بعد مرور 40 يوماً من وقوعه
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الخلاصة: تم إجراء دراسة شملت نحو 145 مشاركاً (83 سيدة و62 رجلاً) باستخدام لقاءات منظمة، وفقاً لمقياس الاضطرابات الكربية التالية للرضح وبنود المقياس المنقح لتأثير الحدث (R-IES)، لاستقصاء مدى انتشار هذه الاضطرابات الكربية بين مجموعة من الناجين من الزلزال الذي ضرب بام في عام 2003. وقد بلغ متوسط عدد أفراد الأسرة من الدرجة الأولى والثانية، الذين لقوا حتفهم في الكارثة نحو 75.7. مجال يتراوح بين صفر و350 شخص. وكان نحو 81٪ من المشاركين مؤهلين لإجراء تشخيص الاضطراب الكربي التالي للرضح وفقاً لمعايير الدليل التشخيصي والإحصائي للاضطرابات النفسية (DSM-IV أو DSM-IV-TR). ولم يشاهد ترابط يُعتدُّ به إحصائياً بين المتغيرات السكانية أو سوابق مرض نفسي وبين قياسات الضائقة النفسية.

ABSTRACT To investigate the point prevalence of post-traumatic stress disorder (PTSD) in a group of survivors of the Bam 2003 earthquake, 145 participants (83 females and 62 males) were studied using structured interviews according to PTSD Symptom Scale (PSS) and Revised Impact of Event Scale (R-IES) items. The mean number of first and second order family members who had died in the disaster was 75.7, range 0 to 350 persons. About 81% of the participants were eligible for PTSD diagnosis according to *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV or DSM IV-TR) criteria. No significant correlation was found between demographic variables or history of psychiatric illness and measures of psychological distress.

État de stress post-traumatique chez des survivants du tremblement de terre de Bam 40 jours après la catastrophe

RÉSUMÉ Afin de déterminer la prévalence ponctuelle de l'état de stress post-traumatique dans un groupe de survivants du tremblement de terre de Bam de 2003, 145 participants (83 femmes et 62 hommes) ont fait l'objet d'une étude au moyen d'entretiens structurés d'après les items du PTSD Symptom Scale (PSS) et du Revised Impact of Event Scale (R-IES). Le nombre moyen de membres de la famille de premier et second degrés qui étaient décédés dans la catastrophe était de 75,7 (extrêmes 0 - 350 personnes). Environ 81 % des participants remplissaient les conditions pour qu'un diagnostic d'état de stress post-traumatique puisse être posé selon les critères du Manuel statistique et diagnostique des troubles mentaux (DSM-IV ou DSM IV-TR). Aucune corrélation significative n'a été trouvée entre les variables démographiques ou les antécédents de maladie psychiatrique et les mesures de la détresse psychologique.

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Introduction

On the morning of 26 December 2003 at 05:28 (local time) a major earthquake measuring 6.5 on the Richter scale struck the city of Bam in Kerman province in the southeast of the Islamic Republic of Iran. According to seismologists, the earthquake was one of the shallowest recorded, with a focal depth of only 10–12 km and the epicentre directly underneath Bam city. Bam is located on a main earthquake fault line.

The Islamic Republic of Iran is ranked as the fourth most disaster-prone country in the world, and this was the worst earthquake to hit the country in more than a decade. According to the latest estimates, about 30 000 people were killed, approximately 30 000 injured (of whom about 10 000 were sent to other cities), and approximately 45 000 people were made homeless in Bam (this figure might increase to 75 000 if we consider those people who returned to the area, the injured people released from hospitals outside the area, and the return of an anticipated 10 000 who have sought refuge with relatives in neighbouring villages and districts). Approximately 1850 children have been registered as unaccompanied and homeless, but this number is expected to increase.

In Bam itself, more than 85% of the buildings were completely destroyed, with damage varying from 95% in the old texture of the city (i.e. the 2500 year-old historic city) to 0.5% in the new texture of the city. Although most of the casualties occurred in Bam itself, the impact on surrounding rural areas was also severe. According to a recent survey, more than 18 000 houses across 250 villages were completely destroyed and will have to be rebuilt.

Based on the lessons learned from the last earthquake that struck the northern

provinces of the Islamic Republic of Iran in 1990, this earthquake will possibly cause a high incidence of post-traumatic stress disorder (PTSD), and there is an urgent need for post-trauma counselling especially for unaccompanied children and other distressed children [1].

The point prevalence (i.e. the prevalence at a particular point in time) of PTSD will clearly depend on what traumatic events have occurred and how many people were exposed to them. The proportion of those who go on to develop PTSD varies in part according to the nature and severity of the traumatic event. People who are more severely exposed are more likely to develop a disorder. In a mass disaster like the sinking of the cruise ship *Jupiter*, over 50% of the survivors developed PTSD and the remainder developed other psychopathology [2,3]. About 15%–50% of people exposed to a high level of combat later develop PTSD [4]. A recent survey published about the Bam earthquake survivors revealed that 58% of the respondents suffered from severe mental health problems as measured by the general health questionnaire (GHQ-12) and this was three times higher than the reported psychological distress among the general population [5]. Many scholars feel that the prevalence of PTSD and trauma exposure is higher in the developing world, in part due to the lack of resources to prevent disasters and alleviate their aftermath [6]. Although the National Comorbidity Survey (a mental health survey) in the United States of America found that the male population is more prone to exposure to traumatic events (60%) than females (50%), women were more likely to develop PTSD than were men (12% versus 6%) [7].

The present study was designed to investigate the prevalence of PTSD among survivors of the Bam earthquake.

Methods

The data were collected at least 40 days (range 40 to 52 days) after the traumatic event.

Sample

According to the available census, the population of Bam (residents, excluding aid workers) was about 100 000 people before the earthquake. The National Health Ministry divided Bam after the earthquake into 13 separate zones for management of health service delivery. Three zones were selected randomly for sample collection (zones number 5, 6 and 9). Each zone has 1 to 3 main streets. Sampling was carried out using 1 main street selected randomly (if more than 1 street was available) and taking 10 participants and then moving to the opposite side of the street and taking another 10 participants, then selecting the first sub-street on the left or the right of the street for the remaining sample. Only 1 person from each tent or house was selected for the interview. The person whose birth month number was nearest to the time of interview (month number) and his or her age was above 18 years was requested to take part in the interview. A total of 150 interviews were carried out with this procedure. Final data from 145 participants were entered into the analyses (5 were dropped from analysis due to incomplete or unreliable data, according to the clinical judgement of the interviewers).

Questionnaires

Three questionnaires were utilized as follows:

- A demographic questionnaire was filled, covering information about the resident's name, age, sex, place of residence at the time of earthquake, marital status and past history of medical and psychiatric

problems. Participants were asked about their condition of consciousness during the disaster, whether they had any opportunity for escape or not and the type of action they carried out at the time of the disaster. Data were collected about the number of people in their house at the time of the earthquake and the number of first and second order family members known to the interviewee who died in the earthquake.

- The Revised Impact of Event Scale (R-IES) [8] is a 15-item self-report questionnaire that measures 2 elements of PTSD: event-related intrusion and avoidance. The frequency of these elements is indicated on a 4-point scale. The scale was first translated to Farsi independently by two of the authors and then presented to a professor of English language who was requested to compare the translation to the original form. The final corrected version was utilized for the study. For the entire sample the split-half reliability for the total scale was 0.68; internal consistency (Cronbach's alpha) of the intrusion subscale was 0.82 and that of the avoidance subscale was 0.66. Test-retest reliability (over 1 week) was 0.85 ($n = 30$).
- The PTSD Symptom Scale (PSS) [9] contains 17 items that diagnose PTSD according to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R) criteria [10] and assess the severity of PTSD symptoms. The severity of each symptom is measured on a 4-point scale (score 0 for none; score 1 for ≤ 1 time per week; score 2 for 2–4 times per week; score 3 for 5+ times per week). The Farsi version of the scale was prepared by the same procedure as the R-IES. In addition to the original items, an item describing significant distress

or impairment in social, occupational or other important areas of functioning was added to the scale to be rated by interviewers. This item was added to the scale in order to find the cases that were eligible for PTSD diagnosis according to DSM-IV-TR criteria [11]. For the entire sample, the split-half reliability for the total scale was 0.79; internal consistency (Cronbach's alpha) for the intrusive thoughts, avoidant behaviours and physiological hyperarousal subscales were 0.80, 0.76, and 0.83 respectively for the total sample ($n = 16$). Test-retest reliability after a 1-week interval was 0.88 ($n = 30$).

All participants were examined in their camp or place of temporary residence. An expert clinical psychologist or psychiatrist carried out the interviews on a one-on-one basis and filled in the questionnaires after establishing therapeutic neutral rapport.

Analysis

Descriptive statistics, chi-squared tests, multivariate analysis of variance and Pearson correlation coefficient were used for analysing the data.

Results

Demographic characteristics

The demographic characteristics of participants are shown in Table 1. There were 83

females and 62 males. Males were 8 years older than females (mean age for males was 36.4 years and for females was 28.3 years) but they had about the same years of formal education. All participants were interviewed at about 6 weeks after the disaster. There were more single women (72.3%) in the sample than single men (27.7%). The mean number of first and second order family members who had died in the disaster was 75.7, with a minimum of 0 and maximum of 350 persons.

Post-traumatic Stress Disorder Symptom Scale and Revised Impact of Event Scale

Table 2 shows the statistics for PSS and R-IES scores for men, women and the entire sample. A multivariate analysis of variance model was used for the analysis of the data for PSS and R-IES separately. The results showed no difference between men and women in scores of the PSS subscales (intrusive thoughts, avoidant reactions, and physiological hyperarousal) [$F(3, 141) = 0.45$; $P = 0.71$]. The same result was also found for R-IES subscales (intrusive thoughts and avoidant reactions) [$F(2, 142) = 0.45$; $P = 0.32$].

The mean score on the PSS was 25.6 (standard deviation = 10.0) for the entire sample ($n = 145$). The subjects were classified according to their scores as no PTSD (i.e. PSS scores ≤ 5), low PTSD (6–16), moderate PTSD (17–36) and severe PTSD

Table 1 Demographic characteristics of the study sample

Variable	Men ($n = 62$)	Women ($n = 83$)	Test	P-value
Years of age [mean (SD)]	36.4 (12.0)	28.3 (13.9)	$t = 3.72$	< 0.0001
Years of education [mean (SD)]	9.0 (4.1)	8.7 (4.2)	$t = 0.44$	NS
Days after disaster [mean (SD)]	43.3 (3.2)	42.9 (3.0)	$t = 0.80$	NS
Married /single (No.)	48/13	49/34	$\chi^2 = 6.18$	0.019

NS = not significant.

Table 2 Mean and standard deviation for Post-Traumatic Stress Disorder Symptom Scale (PSS) scores and Revised Impact of Event Scale (R-IES) scores by respondents' sex

Sex	PSS, intrusion	PSS, avoidance	PSS, physiological arousal	PSS, total	R-IES, intrusion	R-IES, avoidance
Men (<i>n</i> = 62)	6.27 (3.12)	9.39 (4.01)	8.98 (4.27)	24.6 (9.91)	18.4 (4.97)	19.0 (4.60)
Women (<i>n</i> = 83)	6.85 (3.27)	9.69 (4.46)	9.77 (4.47)	26.3 (10.1)	19.3 (4.88)	19.9 (4.34)
Total (<i>n</i> = 145)	6.60 (3.21)	9.56 (4.26)	9.43 (4.39)	25.6 (10.0)	18.9 (4.92)	19.5 (4.46)

(37+). Table 3 shows the frequency of different categories of PTSD among men and women.

The result of the chi-squared analysis showed that men and women were not significantly different in the frequency of severity of degrees of PTSD symptoms. Of the 145 people in the sample, 97.9% scored > 5 and were eligible for a diagnosis of PTSD according to DSM-III-R criteria.

By including the impairment in social functioning criteria of the DSM-IV-TR, 117 subjects (81% of the entire sample) were eligible for a diagnosis of PTSD at the time of interview.

Correlation between PSS and R-IES scores and other demographic factors

Table 4 shows the correlation coefficients between PSS and R-IES scores and other

trauma-relevant factors. There were positive and significant correlations between measures of intrusive thoughts and avoidance behaviours, and total scores of the PSS and R-IES scales. Age of the participants, marital status (single or married), years of formal education, positive or negative history of psychiatric illness and being asleep or awake at the beginning of the disaster did not show significant correlations with scores of PSS scales. The number of family members dying in the disaster showed a positive correlation with all scores of PSS and R-IES.

Discussion

The present study was designed to screen a group of Bam earthquake survivors for PTSD symptoms. An earlier report on the

Table 3 Frequency of scores on the Post-Traumatic Stress Disorder Symptom Scale (PSS), showing the severity of Post-Traumatic Stress Disorder (PTSD) by respondents' sex

Sex	Non-PTSD (PSS ≤ 5)		Low PTSD (PSS 6–16)		Moderate PTSD (PSS 17–36)		Severe PTSD (PSS 37+)		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Men	1	1.6	12	19.4	39	62.9	10	16.1	62	100.0
Women	2	2.4	9	10.8	55	66.2	17	20.5	83	100.0
Total	3	2.1	21	14.5	94	64.8	27	18.6	145	100.0

$\chi^2 = 2.31$; not significant.

Table 4 Correlation coefficients (r) between Post-Traumatic Stress Disorder Symptom Scale (PSS) scores and Revised Impact of Event Scale (R-IES) scores and other trauma-relevant factors

Factor ^a	PSS, intrusion		PSS, aversion		PSS, physiological arousal		PSS total	
	r	P-value	r	P-value	r	P-value	r	P-value
R-IES, intrusion	0.73	< 0.0001	0.42	< 0.0001	0.69	< 0.0001	0.71	< 0.0001
R-IES, avoidance	0.17	0.04	0.47	< 0.0001	0.16	NS	0.32	< 0.0001
Age	0.09	NS	0.04	NS	0.20	0.016	0.13	NS
Marital status	0.0001	NS	0.12	NS	0.08	NS	0.09	NS
Years of education	-0.013	NS	-0.032	NS	-0.14	NS	-0.054	NS
History of psychiatric illness	0.002	NS	-0.048	NS	-0.027	NS	-0.031	NS
Alertness during trauma	0.003	NS	-0.105	NS	-0.011	NS	-0.049	NS
No. of family members dead	0.27	0.001	0.32	< 0.0001	0.19	0.021	0.31	< 0.0001

^aFactors: age (years); marital status (1 = single; 2 = married); history of psychiatric illness (1 = positive; 2 = negative); alertness during trauma (1 = asleep; 2 = awake).
NS = not significant.

prevalence of psychological distress in this population showed that 58% of the respondents suffered from severe mental health as measured by the GHQ-12 [5]. The results of the present study revealed a high proportion of people eligible for the diagnosis of PTSD. More than 81% of the sample were experiencing moderate to severe PTSD symptoms at the time of interview (about 40 days after the disaster) and received PTSD diagnosis according to the DSM-IV diagnostic criteria. The frequency of PTSD found by this study is higher than earlier reports from different disasters in Asian countries. The frequency of clinical and subclinical diagnosis of PTSD in the 1999 Taiwan earthquake were 10.3% and 19.0% respectively [12]; and the rate of onset of earthquake-related PTSD within 9 months in 2 rural areas in China was 24.2% using DSM-IV criteria and 41.4% using DSM-III-R criteria [13].

There are few reports on the prevalence of PTSD among adult survivors of natural disasters utilizing a longitudinal research

design. MacFarlane used a prospective study with firefighters involved in the 1983 Australian bushfires [14]. About 32%, 27% and 30% of the participants of his study were eligible for a PTSD diagnosis at 4, 11 and 29 months after the disaster. In a retrospective study on a group of survivors 14 years after Buffalo Creek flood in 1972, Green et al. reported a drop in PTSD diagnosis in his sample from 44% in 1974 to 28% in 1986 [15]. Shore et al. reported an exposure-related onset of PTSD, generalized anxiety disorder and depression after the 1980 Mount St. Helen's volcanic eruption [16]. They reported that symptoms of depression and anxiety had abated by 3 years, while symptoms of PTSD tended to persist longer. Finally, Duggan and Gunn reported on a group of adults exposed to different types of disasters [17]. They found 39% of the participants met the criteria for PTSD within a year after the events, with 23% still meeting such criteria after 26 months.

Several factors may account for the higher frequency of PTSD diagnosis reported here. First, the data were collected at the site of the accident. Many survivors of the Bam earthquake left the city immediately after the disaster, although a recent report is available about the higher incidence of psychological distress in a sample of people who left the scene of disaster in contrast to those remaining at the site [18]. Secondly, the data were collected very shortly after the disaster (only 40 days). The average number of family members who died was about 76 people in this sample. Factors that may account for such massive family death in Bam are the people's lifestyle (families living together in the same area; rural lifestyles) and the characteristics of the earthquake (a focal depth of only 10–12 km; the epicentre directly underneath the city). Accordingly, the disaster induced a heavy toll of grief and mourning on survivors and it would be expected that there would be a large number of people with severe symptoms including PTSD. Thirdly, a lack of social and economic support for the survivors makes them more vulnerable to psychological distress. Some of the victims may also be eligible for other diagnoses such as factitious disorder (i.e. patients intentionally produce signs of medical disorders and misrepresent their histories and symptoms in order to gain the sympathy of others [11]). In fact, the PTSD symptoms may be a form of cry for help for

those who remained bereaved, homeless and jobless, bereft of objects of attachment and loved ones.

The present study suffers from a number of methodological problems that limit the generalization of the findings. Future research in the area is necessary to follow the changes in the course of PTSD in the Bam earthquake survivors. A larger sample with greater geographical distribution may be selected for the study. A comparison may be carried out in PTSD symptoms and severity between those who were living in the centre of the earthquake and those who were apart from it and felt the earthquake with lesser degrees, as well as those who have higher level of social support in contrast to those with lower level of social support.

Nevertheless, the data presented here represent the magnitude of the human disaster and the urgent need of the survivors for psychiatric help to control post-traumatic effects. These people also need economic and social support in order to help them to rebuild their houses and their businesses and give them some hope for the future.

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