Original Article

Comorbidity of Depressive and General Anxiety Symptoms in Adolescent Survivors of Bam Earthquake (2003) with Posttraumatic Stress Disorder: A Case–Control Study

Javad Mahmoudi-gharaei, MD[1]
S. Sajad Mousavi, MD[2]
Mahdi Bina, MD[3]
Elham Gholampoor, BSc[1]
Saeideh Eisar, BSc[1]

1 Psychiatry and Psychology Research Center, Tehran University of Medical Sciences, Iran
2 Department of Psychiatry, Artesch University of Medical sciences,Tehran, Iran
3 Department of Psychiatry, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Corresponding Author:
Javad Mahmoudi Gharaei, Assistant Professor of Child & Adolescent Psychiatry, Psychiatry and Psychology Research Center, Roozbeh Hospital, Tehran University of Medical Sciences, South Kargar Avenue,13337,Tehran, Iran
Email: Jmahmoudi@tums.ac.ir
Tel: +98-21-5412222
Fax: +98-21-5419113

Objective: Several studies have shown that following disasters, major depressive disorder is the most common psychiatric disorder that occurs with posttraumatic stress disorder (PTSD). Comorbidity of anxiety symptoms have also been shown. The objective of this study was to show the comorbidity of depressive and anxiety symptoms in adolescent survivors of Bam earthquake.
Method: In a case–control study, two groups of PTSD and non-PTSD Bami adolescents were assessed 7–9 months following the Bam earthquake. DSM-IV criteria and Posttraumatic Stress Scale (PSS) were used to diagnose PTSD and assess symptoms; Beck's Depressive Inventory (BDI) and Hamilton's Anxiety Scale were used for assessing the severity of depressive and anxiety symptoms. And the groups were compared.
Results: 284 subjects were included, aged 11–18 years (mean 14.8±2.1 years). 24.3% were boys and 75.7% girls; 45.1% met criteria for PTSD. In the PTSD group, mean BDI and HAS scores were 31.4±11.7 and 22.7±10.9, respectively; in the non-PTSD group, it was respectively 20.6±12.7 and 11.8±8.1. The difference between the PTSD and non-PTSD groups was significant. There was statistical correlation between the severity of depressive and anxiety symptoms and the severity of PTSD symptoms.
Conclusion: Adolescent survivors of Bam earthquake who had PTSD had more severe depressive and anxiety symptoms than the non-PTSD group, which was correlated with the severity of PTSD symptoms. PTSD may be a predictor of depressive and anxiety symptoms.
Key words:
Adolescent, Anxiety, Depression, Iran, Natural disaster, Post-Traumatic Stress Disorder

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Post-traumatic stress disorder (PTSD) occurs as a result of the exposure to to severe stressors like earthquake (1-2). Studies have shown that large earthquakes result in long-term morbidies. In a study on 430 survivors of the earthquake in Turkey in 1999, the occurrence of mental problems like PTSD was directly associated to distance from the focus of trauma and mode of exposure (3). The degree of exposure to threat is a specific predictor of the level of disability. Other associates are avoidant adaptive strategy, female gender, low socioeconomic status, and extremes of age.

It is estimated that 18.3% of the people exposed to such trauma are affected by PTSD (4). In a study in Taiwan, 21.7% of 323 earthquake survivors had symptoms of PTSD (5). However, the prevalence of PTSD from natural disasters ranges from 2.5–33% in adults and 28–70% in children (5). In one study, a history of emotional problems, neurotic defense mechanisms and a high level of exposure to life events have been reported to be associated with the duration of disability from PTSD (6). In children and adolescents, losing the family and social supports, like death of parents, aggravates the symptoms of PTSD (7). Also, comorbidity with other psychiatric problems adds to the problem. A study on comorbidity of psychiatric disorders among 311 casualties of the Vietnam War showed that MDD, panic and bipolar disorder, and social phobia occurred more with PTSD (8). Other studies have reported MDD and social phobia as comorbidities of PTSD (9). Another study showed that the risk of experiencing a first episode of major depressive disorder increases in women with PTSD (10). There is evidence on comorbidity of substance abuse, depression, general anxiety, phobic, and general anxiety symptoms among 2 groups of adolescents with and without PTSD following the earthquake in Bam and its consequences during months 7 to 9 after the catastrophe was assessed, using Beck Depression Inventory (BDI), Hamilton Anxiety -

Table 1. Demographic variables in PTSD and non-PTSD subjects

Demographic variable		PTSD N (%)	Non-PTSD N (%)	Total N (%)
Gender	Boys	28 (21.9)	41 (26.3)	69 (24.3)
	Girls	100 (78.1)	115 (73.7)	215 (75.7)
Occupation	Unemployed	22 (17.2)	21 (13.5)	43 (15.1)
	Employed	6 (4.7)	10 (6.4)	16 (5.6)
	Student	100 (78.1)	125 (80.1)	225 (79.2)
	Retired, redundant	26 (20.3)	38 (24.4)	64 (22.5)
Father's occupation	Worker, farmer	15 (11.7)	31 (19.8)	46 (16.2)
	Businessman	35 (27.3)	30 (19.2)	65 (22.9)
	Teacher, governmental work	23 (18)	17 (10.9)	40 (14)
	Others	20 (115.7)	34 (21.8)	54 (19)
	Deceased	9 (7)	6 (3.8)	15 (5.2)
Residence	Urban	23 (18)	44 (28.2)	67 (23.6)
	Rural	52 (40.6)	53 (34)	105 (37)
	Camp	53 (41.4)	59 (37.8)	112 (39.4)

Scale regard to possible factors of influence.

Materials and Methods

Using the case–control methodology, we compared the severity of major depressive and general anxiety symptoms in two groups of adolescents who had survived Bam earthquake with and without PTSD. All the participants had directly been exposed to the trauma and were 11–18 years of age. The individuals with prior history of serious psychiatric problems, PTSD from other events, mental retardation, and those who did not consent were excluded from the study.

Since the population distribution was unknown and we did not know the contribution of children and adolescents to the population, we had to do the sampling in the following method:

The affected areas were divided into 13 regions, of which 2 urban, 2 rural, and 2 camp regions were randomly selected. The adolescents in the selected regions were interviewed by two psychiatrists and two trained local psychologists who were familiar with the geography of the regions. Demographics were recorded in a designed questionnaire. PSS, BDI, and HAS were respectively used to assess PTSD, depressive and anxiety symptoms. PSS is an 18-item scale with 3 subscales on symptoms of re-experiencing, avoidance, and arousal, as well as questions on loss of function and duration of the disorder. Severity of symptoms are scored 0–3 in an increasing order. In a prior pilot study on validation of PSS in the Iranian population, a Cronbach's alpha of 0.84 was determined. Its reliability with K-SADS semi-structured interview, with a cut-off point of 2 for each symptom, was 0.92. This cut-off point had the strongest diagnostic association. BDI is a self-report questionnaire of 21 items that scores depressive symptoms 0–3, in an increasing order. HAS consists of 13 questions in 2 groups of questions on psychic and somatic symptoms of anxiety, scoring 0–4, in an increasing fashion.

This scale is completed by the interviewer. Both BDI and HAS had been previously used in the Iranian population.

Based on the scale scores and the DSM-IV criteria, the participant were assigned to PTSD and non-PTSD groups. The groups was compared for demographics and the impact of the catastrophe on the individuals were assessed using factors such as mean age, gender, mean level of education, family's socioeconomic status, entrapment under debris, physical injury, physical handicap, loss of first degree relatives, using the statistical tests of independent sample Student's t-test, and Mann-Whitney. Mean depressive and anxiety scores of the groups were compared using ANOVA and regression analysis at alpha: 0.05 all with SPSS 11.5 for Microsoft Windows.

Results

Demographics

284 adolescent survivors of Bam earthquake (aged 11 to 18 years, mean age 14.8±2.1) were enrolled in the study. Their mean level of education was 8.3±2.3 grades. All the subjects had witnessed the earthquake: 24.6% (n=70) had been entrapped, 20.1% (n=57) had physical injuries and 4.2% (n=12) had permanent physical disability. Sixty-seven adolescents (23.6%) had lost at least one first-degree relative in the catastrophe.

PSS results revealed that 128 subjects (45.1%) had PTSD, who constituted the case group, and the remaining 156 subjects (54.9%, non-PTSD) were taken as the control group. Means of age for cases and controls were respectively 15.03±2.08 and 14.6±2.2 years. Mean level of education was 8.5±2.1 grades for cases and 8.17±2.4 grades for controls. Using the independent sample t-test, the mean age and mean level of education did not differ significantly between cases and controls ($p>0.05$). Table 1 summarizes the demographics of subjects.

Table 2. Comparisons of mode of exposure and type of injury in PTSD and non-PTSD boys and girls

Gender	Variables	PTSD		Non-PTSD		Z	P
		(%)	N	(%)	N		
Boys	Entrapment under debris	35.7	10	34.1	14	–0.13	0.89
	Physical injury	32.1	9	24.4	10	–0.70	0.48
	Physical handicap	3.6	1	4.9	2	–0.25	0.79
	Loss of first degree relatives	28.6	8	17.1	7	–1.12	0.25
Girls	Entrapment under debris	24	24	19.1	22	–0.86	0.38
	Physical injury	20	20	15.7	18	–0.83	0.40
	Physical handicap	5	5	3.5	4	–0.55	0.57
	Loss of first degree relatives	27	27	21.7	25	–0.89	0.37
Total	Entrapment under debris	26.6	34	23.1	36	–0.67	0.49
	Physical injury	22.7	29	17.9	28	–0.98	0.32
	Physical handicap	4.7	6	3.8	6	–0.35	0.72
	Loss of first degree relatives	27.3	35	20.5	32	–1.3	0.17

Mann-Whitney U test did not show any difference between demographics of cases and controls (p>0.05). Table 2 presents a comparison of the groups regarding mode of exposure and type of injury.

PTSD symptoms

Our results imply that although the 'control' group did not meet the DSM-IV criteria for PTSD, they had some PTSD symptoms: respectively 76.9% (n=120), 18.6% (n=29), and 33.3% (n=52) had at least one PTSD symptom of re-experience, avoidance, and hyperarousal. The average number of PTSD symptom for cases and controls were 11.1%±2.5 and 4.5±2.7. The average number of PTSD symptoms for boys and girls in cases and controls were 11.5%±2.8 and 11.1±2.4 (p=0.46), and 4.2±2.6 and 4.7±2.7 (p=0.33), respectively.

Depressive and anxiety symptoms

Mean BDI scores were 25.3±13.3 for all the subjects, 31.04±11.7 for the PTSD group, and 20.6±12.7% for the non-PTSD subjects. Given the near to normal distribution of the variables, and similarities of the case and control groups in regard with mode of exposure and type of injury, anxiety symptoms was used as the covariant of severity of depression and the comparison of means for boys and girls was done using ANCOVA (p<0.001).

According to HAS, the mean score of general anxiety symptoms was 16.7%±10.9 for all the subjects. Mean scores for psychic and somatic symptoms of anxiety were 9.02±5.4 and 7.7±6.5, respectively. Mean scores for anxiety symptoms were 22.7%±10.9 and 11.8±8.1 for cases and controls, respectively. The average number of psychic symptoms for cases and controls was 10.8±7.07 and 6.7±4.4.

Table 3. Association between PTSD, depression and anxiety variables and demographics and characteristics of the stressful event

Variables	Severity of Depressive Symptoms			Severity of Anxiety Symptoms		
	Beta	T	P	Beta	T	P
Age	0.136	1.608	0.109	–0.051	–0.622	0.534
Gender	0.142	3.115	0.002	0.040	0.883	0.378
Education	–0.054	–0.688	0.492	0.035	0.449	0.654
Occupation	0.002	0.038	0.970	0.051	0.987	0.325
Father's occupation	0.029	0.645	0.52	0.005	0.124	0.901
Residence	0.032	0.700	0.485	0.031	0.685	0.494
Entrapment under debris	0.101	1.721	0.086	0.037	0.639	0.524
Physical injury	0.002	0.031	0.975	0.036	0.631	528
Physical handicap	0.048	1.003	0.317	0.067	1.424	0.156
Loss of first degree relatives	0.105	1.456	0.146	0.101	1.425	0.155
Total number of lost relatives	0.003	0.043	0.966	0.069	0.928	0.354
Severity of PTSD	0.219	3.933	0.000	0.365	7.097	0.000
Severity of Anxiety	0.462	8.317	0.000	–	–	–
Severity of Depression	–	–	–	0.441	8.317	0.000

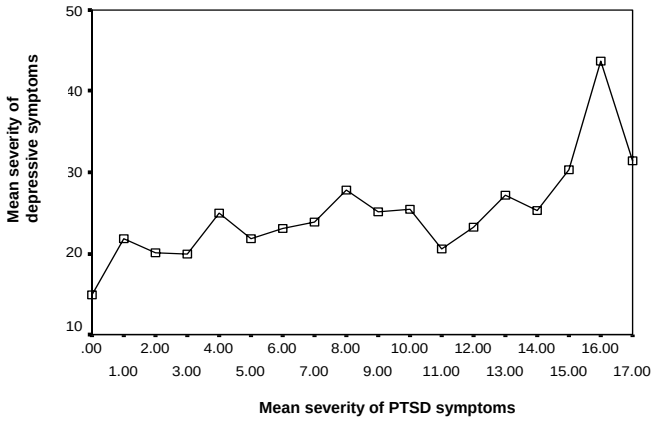

Figure 1. Changes in the average number of depressive symptoms to the average number of PTSD symptoms independent of gender and severity of anxiety symptoms.

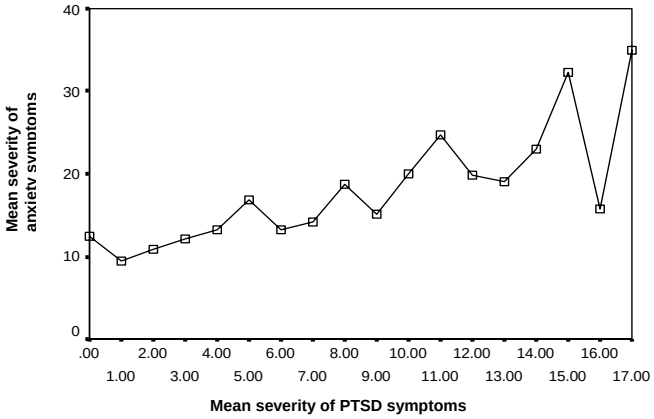

Figure 2. Changes in the average number of anxiety symptoms to the average number of PTSD symptoms independent of gender and severity of depression.

The average number of somatic symptoms was 11.8±5.1 and 5.1±4.7 for cases and controls. Comparisons between genders for the average number of general anxiety symptoms in cases and controls—taking depressive scores as covariant— proved significant ($p<0.001$).

Association of findings

Effects of demographic factors and mode of exposure to the stressful event on severity of depression and anxiety in the study population as a single group were explored using analysis of regression. The results are summarized in Table 3. Given the results in Table 3 that the number of severity of depression—independent of severity of anxiety, and gender ($p<0.001$).

Figure 1 displays the changes of depressive symptoms to changes in PTSD symptoms.

Likewise, we compared the severity of anxiety symptoms by the number of PTSD symptoms—considering the severity of depression as covariant—using ANCOVA ($p<0.00$) (Figure 2).

Discussion

The results of this study are of value since it was done on a large-scale natural catastrophe, and assessed the frequency of PTSD and severity of depressive and anxiety symptoms, 7 to 9 months after the earthquake, in a vulnerable subpopulation (the adolescents). Also, it considered the influence of different factors on the severity of depressive and anxiety symptoms. The results can be used for assessing the level of psychological trauma from the catastrophe of Bam earthquake, and for planning therapeutic interventions in similar situations.

Demographic features

Most participants were girls that was due to uncooperativeness of boys with the study, and also the timing, which was in the summer when many male adolescents take part in agricultural activities away from home.

Our results showed that the distribution of people over urban, rural and camp regions were fairly homogeneous.

Also we found that 20% to 25% of our subjects had been through more severe experience of the event (entrapment, physical injury, loss of a first-degree relative). PTSD and non-PTSD groups did not differ regarding their demographic features and characteristics of the event.

PTSD

We noticed that in months 7–9 following the earthquake, 45.1% of the subjects had PTSD and the remaining 55%, although not meeting a diagnosis of PTSD, they had subthreshold symptoms of PTSD. The symptoms of re-experience were more frequent than avoidance or hyperarousal. Genders did not differ in severity of PTSD symptoms—it holds true for both the case and control groups and implies that PTSD is independent of gender.

Comparisons of major depressive and general anxiety symptoms

The mean severity of depressive symptoms was high for survivors of Bam earthquake—considering the standard deviations of 13.3 and 10.9 for depression and anxiety, about 65% of the subjects had remarkably severe depression and anxiety disorders. However, high constitution of girls in the study population can have affected that.

Comparison between groups reveals that the severity of depressive symptoms was greater in the PTSD group. Since the demographics and characteristics of the stressful event were similar in both groups, depression can be independent of the underlying factors and be associated with PTSD—applying the effect of gender and eliminating the effects of background confounding factors (like severity of anxiety) in ANCOVA— both groups

(PTSD vs. non-PTSD) significantly differed in the severity of depressive symptoms, which further supports that the increased severity of depressive symptoms in the cases is due to PTSD.
Anxiety symptoms, also, were more severe in the case group regardless of demographic features and indexes of the stressful event, and considering the effects of gender and severity of depressive symptoms using ANCOVA, which again indicates that the general anxiety disorder is associated with PTSD.

Associations
Analysis of regression showed that severity of anxiety symptoms and PTSD, respectively, have greatest effects on severity of depressive symptoms. On the other hand, greatest effects on severity of anxiety symptoms were due to severity of depressive symptoms and PTSD. Therefore, it is likely that comorbidity of depression and anxiety is a result of one disorder making the nervous system vulnerable to the other disorder, more than being due to the background factors. Based on the current research that trauma is the etiology for PTSD (2), and PTSD is the earliest disorder after the stressful event (14), comorbidity of depression and anxiety can well be due to PTSD itself. The increase in the means of severity of depression and anxiety with increased number of PTSD symptoms—as pictured in Figures 1 and 2—shows an association independent of the background factors. However, we should be cautious with such interpretation of the results, since there maybe some unknown factors or that the cumulative effects could have been greater than the sum of individual factors.
Other studies have assessed the comorbidities following natural disasters. In a longitudinal study of natural disasters, comorbidities were assessed at months 4, 11, and 29 following the event. They showed that 77% of the subjects had at least one comorbidity, with major depressive disorder being the most common one (15). Another study has reported the comorbidity of PTSD and depressive disorder, and the association between the severities of the two disorders (16). In 187 inpatients, prevalence of depressive disorder was higher among the adolescents with PTSD (16). Our results are in accordance with the 2 aforementioned studies.
Another study has reported comorbidity of dissociative and depressive disorders in PTSD (17). At least one other psychiatric disorder can be found in the PTSD patients, and a significant number of them have 3 or more disorders at the same time, with major depressive, substance use, and anxiety disorders at the top of the list (18). A study has evaluated the comorbidity of depression and suicidal ideas in a population with subthreshold PTSD—less than 6 clinical symptoms. Their results indicate that when the number of PTSD symptoms increases from 1 to 4, the comorbidity of depressive symptoms and suicidal ideas rises (19). which is in support of our findings.

Limitations
Although we observed higher means of major depressive and anxiety disorders in the PTSD than non-PTSD group, and we noticed a clear association between PTSD symptoms and severity of depressive and anxiety symptoms, our findings could be influenced by some confounding factors. Use of Beck's Depression Inventory which more relies on report of the examinee than the clinician's judgment, method and timing of sampling (during the day, and at men's working hours) that resulted in a higher proportion of girls in the study population are among the limitations. Given that sampling method was not cluster, and that inpatients in hospitals and rehabilitation centers and adolescents in Behzisti centers for orphans who have been through greater trauma were not included, as well as the potential presence of some obscure confounding factors might have influenced the results, generalization should be done with caution. For future studies, we suggest more comprehensive questionnaires and cluster sampling methods.

Conclusion
About half of the adolescents who were exposed to the stress of Bam earthquake had PTSD in the 3rd 3-month period following the catastrophe. Severity of depressive and anxiety symptoms was greater in the affected group. It is assumed that severity of depression and anxiety is associated with severity of PTSD symptoms, independent of gender and other background factors. PTSD can precipitate occurrence of other psychological problems such as depression and generalized anxiety.

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