Psychiatric Comorbidity in Children after the 1988 Earthquake in Armenia

ARMEN K. GOENJIAN, MD; ROBERT S. PYNOOS, MD, MPH; ALAN M. STEINBERG, PHD; LOUIS M. NAJARIAN, MD; JOAN R. ASARNOW, PHD; IDA KARAYAN, MFCC; MICHELINE GHURABI, BS; LYNN A. FAIRBANKS, PHD

Accepted February 6, 1995.

Dr. Goenjian, Dr. Najarian, Mrs. Karayan, and Ms. Ghurabi are with the Western United States Armenian Relief Society Clinics of Armenia. Drs. Goenjian, Pynoos, and Steinberg are with the Trauma Psychiatry Program, UCLA. Drs. Asarnow and Fairbanks are with UCLA.

Reprint requests to Dr. Goenjian, Pacific Hospital of Long Beach, 2776 Pacific Avenue, Long Beach, CA 90806.

JOURNAL OF THE AMERICAN ACADEMY OF CHILD & ADOLESCENT PSYCHIATRY 1995;34:1174-1184

ABSTRACT

Objective. To determine current rates of posttraumatic stress disorder (PTSD), depressive disorder, and separation anxiety disorder (SAD) among children 1 1/2 years after the 1988 earthquake in Armenia; to determine current rates of comorbid PTSD and depressive disorder; and to assess the contribution of exposure, gender, loss of family members, and loss of residence.

Method. Two hundred eighteen school-age children from three cities at increasing distances from the epicenter were evaluated using the Child Posttraumatic Stress Disorder Reaction Index, the Depression Self-Rating Scale, and the section on SAD from the Diagnostic Interview for Children and Adolescents.

Results. On the basis of these evaluations, high rates of current PTSD, depressive disorder, and their co-occurrence were found among victims residing in the two heavily impacted cities. SAD was comparatively less frequent, although symptoms of SAD had been pervasive throughout the region. Severity of posttraumatic stress and depressive reactions were highly correlated. Extent of loss of family members was independently correlated with each.


On December 7, 1988, an earthquake with a magnitude of 6.9 on the Richter Scale struck Armenia (population 3.5 million). The tremor lasted approximately 1 minute, followed by an aftershock 4 minutes later of magnitude 5.8. The Spitak earthquake, named after the city closest to the epicenter, was one of the most devastating natural disasters of this century. It caused the destruction of four cities and 350 villages, killing at least 25,000 people according to Soviet estimates and as many as 100,000 according to some European sources, leaving 530,000 people homeless (Poghosyan, 1989; Ryan, 1989). [39,44]

The earthquake occurred late in the morning when many of the children were in their classrooms. The majority of buildings in Spitak, population 30,000, were destroyed. In some schools, upwards of one-half of the children were killed as the buildings collapsed. Approximately 50% of buildings in Gumri, the second largest city of Armenia, 20 miles from the epicenter with a population of 280,000, were destroyed. Yerevan, the capital of Armenia, 47 miles from the epicenter, sustained mild damage and no significant loss of life. Nearly all of the children in Spitak and Gumri experienced significant direct life-threat, witnessed
mutilating injuries and grotesque death(s), and heard agonizing screams for help and cries of distress from victims trapped in the rubble. Children were often separated from their parents for a considerable number of hours without information regarding each other's welfare.

The extent of morbidity and mortality after natural disasters is strongly related to the prevailing level of economic development. In the majority of developing countries, disasters are associated with major public health problems (Weisaeth, 1993) [54]. Berz (1989) [7] reported that of 109 disasters that occurred between 1960 and 1987, 41 disasters in developing countries killed 758,000 people, compared to 11,441 killed by 68 disasters in developed nations. In accord with these observations, recent studies of psychiatric morbidity among children and adult survivors of massive disasters in the Third World are reporting rates that far exceed those found for disasters in US communities (Goenjian et al., 1994; Lima et al., 1989; Pynoos et al., 1993) [24,30,42].

Studies of the psychological consequences of disasters among adults have expanded the psychiatric assessments to include other psychiatric disorders in addition to posttraumatic stress disorder (PTSD). Shore et al. (1986) [47] reported the exposure-related onset pattern of combined PTSD, generalized anxiety disorder, and depression after the Mt. St. Helen's volcanic eruption. Durkin (1993) [18] found higher rates of PTSD after the 1985 earthquake in Chile compared with rates after the 1983 Coalinga earthquake, while the rates of depression were similar. Of note is that these assessments were conducted at different postdisaster intervals. Maida et al. (1989) [32], after the Baldwin Hills fire, reported that PTSD was associated with exposure, whereas depression was associated with home and property loss.

There is an emerging body of literature that addresses different types of psychopathology among children and adolescents after disasters (Belter et al., 1991; Burke et al., 1986; Earls et al., 1988; Lonigan et al., 1991; Yule and Udwin, 1991) [6,14,19,31,59]. These studies have noted the occurrence of symptoms of PTSD, anxiety, depression, and aggressive and regressive behaviors. After Hurricane Hugo, Lonigan et al. (1991) [31] found a small elevation in anxiety symptoms among children with mild to moderate PTSD symptomatology. Belter et al. (1991) [6] did not find a significant elevation of depression among children with moderate levels of PTSD symptomatology. After a catastrophic transportation disaster, Yule and Udwin (1991) [59] found a positive correlation of PTSD, anxiety, and depression. Symptoms of anxious attachment have been reported in the literature; however, separation anxiety disorder per se has not been assessed after disaster. Postdisaster studies of children have not reported comorbidity rates for these disorders.

There is an expanding epidemiological and clinical literature regarding comorbidity of anxiety and depression in children and adolescents (for review, see Angold and Costello, 1993) [3]. In these studies, either PTSD was not specifically assessed, or, when assessed, because of its low frequency, rates of PTSD-related comorbid conditions could not be determined. Depressive disorders have been found to be associated with the co-occurrence of conduct and anxiety disorders. There is a relatively smaller rate of comorbid depression among children and adolescents with anxiety disorders, although rates of depressive comorbidity may vary by type of anxiety disorder (Last et al., 1992) [28]. Symptoms of both depression and anxiety have been noted to be more severe when these conditions co-occur (Strauss et al., 1988) [48].
The present study evaluated children from three cities at increasing distances from the epicenter 1 1/2 years after the 1988 earthquake in Armenia to derive estimates of current rates of PTSD, depressive disorder, and separation anxiety disorder and current rates of comorbid PTSD and depressive disorder. The relationship of exposure, gender, loss of family members, and loss of residence to these disorders was also investigated.

METHOD

Sample

The three cities included in this study were located at increasing distances from the epicenter of the earthquake. Eight schools from the three cities were selected, two from Spitak, six from Gumri, and one from Yerevan. The schools were located within the two major regions of Spitak and the four major regions of Gumri. All children in the selected classrooms were interviewed. The average classroom was composed of 20 students. A total of 218 children were evaluated 1 1/2 years after the earthquake. The three groups were as follows: Spitak (n = 63), 22 males, 41 females, mean age = 13.7; Gumri (n = 94), 34 males, 60 females, mean age = 13.1; Yerevan (n = 61), 26 males, 35 females, mean age = 12.1. A demographic profile from each child was obtained, which included information regarding age, sex, extent of loss of relatives, and destruction of residence. Information regarding loss of nuclear family members was verified with the children's primary teachers. This sample included a subsample of children whose posttraumatic stress reactions have been described previously (Pynoos et al., 1993) [42]. Ratings of posttraumatic stress reaction, depression, and separation anxiety disorder were obtained at the same time interval for this subsample as well as the additional subjects included in this study. None of the children included in this study had received prior evaluation or treatment.

Instruments

Posttraumatic Stress Disorder. The Child Posttraumatic Stress Disorder Reaction Index (CPTSD-RI) is a 20-item self-report scale designed to assess posttraumatic stress reactions of school-age children and adolescents after exposure to a broad range of traumatic events. The frequency of occurrence of symptoms is rated by using a Likert 5-point scale ranging from "none" (0) to "most of the time" (4) (Nader et al., 1990) [36]. Previous unpublished empirical comparisons of CPTSD-RI scores with a diagnosis of PTSD in clinical populations have suggested the following guidelines: a total score of 12 through 24 indicates a mild level of PTSD reaction; 25 through 39, a moderate level; 40 through 59, a severe level; 60 or greater, a very severe reaction. Our previous findings have indicated that the "severe" and "very severe" categories correctly identified 78% of subjects who met DSM-III-R criteria for PTSD (American Psychiatric Association, 1987) [2]. Of those subjects who scored 40 or greater (the cutoff for "severe"), 90% met the DSM-III-R diagnostic criteria for PTSD (Pynoos et al., 1993) [42].

Scores for the three symptom categories of PTSD (B, C, and D), as defined in DSM-III-R, were derived from the CPTSD-RI by grouping items related to these categories and calculating the mean item score for each symptom category. Category B (Intrusion) included seven items: experiencing reminders of the earthquake, intrusive images, intrusive thoughts, recurrent distressing dreams, fear of recurrence, feeling afraid with reminders of the earthquake, and feeling upset or tense when thinking about the earthquake. Category C (Avoidance) included five items: diminished interest in activities, interpersonal distancing, numbing of feelings, constricted affect, and avoidance of activities. Category D (Arousal) included five items: jumpiness and exaggerated startle, sleep disturbance, difficulty concentrating, thoughts of the earthquake interfere with learning, and problems with impulse control.

Depression. Children's ratings of depressive symptoms were obtained using the Depression Self-Rating Scale (DSRS) (Asarnow and Carlson, 1985) [4], which is a modified version of the Birleson Self-Rating Scale for Depression (Birleson, 1981) [8]. The DSRS contains 21 items that relate to affective, cognitive, and behavioral symptoms of depression. Ratings of the frequency of these symptoms over the previous 2 weeks are made on a 3-point scale: "never" (0), "sometimes" (1), and "most of the time" (2). The total depression score is calculated by summing the scores for the 21 items. Psychometric properties of this instrument have been previously reported (Asarnow and Carlson, 1985; Birleson, 1981; Birleson et al., 1987) [4,8,9]. Clinical validation studies in child inpatients have indicated that a cutoff of DSRS score equal to or greater than 17 yields a specificity of 95% and sensitivity of 51% in detecting the following three depressive syndromes: major depression, dysthymic disorder, and adjustment disorder with depressed mood (Asarnow and Carlson, 1985) [4].
Separation Anxiety Disorder. Ratings of separation anxiety disorder were made using the separation anxiety disorder section from the Diagnostic Interview Schedule for Children and Adolescents (DICA) (Herjanic and Reich, 1982) [27], a structured diagnostic interview designed to assess psychiatric disorders and symptoms in children and adolescents between 6 and 17 years of age. It is based on DSM-III criteria (American Psychiatric Association, 1980) [1].

The instruments were administered to small groups of children by trained mental health professionals. Each item was completed by a child after an explanation of the question was given by the administrator. Translation of the instruments into Armenian followed previously published guidelines, including the use of independent back-translation and pretesting by administration to bilingual subjects (Brislin, 1976) [13].

Loss of Relatives. Extent of loss of relatives was categorized as follows: loss of a parent, loss of one nuclear family member including a parent, loss of more than one nuclear family member including a parent, loss of other relative(s), and no loss of a relative.

<table>
<thead>
<tr>
<th>Loss of Relative(s)</th>
<th>Spitak (n = 63)</th>
<th>Gumri (n = 94)</th>
<th>Yerevan (n = 61)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of a parent</td>
<td>14</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Loss of 1 nuclear family member (including a parent)</td>
<td>25</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>Loss of &gt;1 nuclear family member (including a parent)</td>
<td>8</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Loss of other relative(s)</td>
<td>57</td>
<td>33</td>
<td>7</td>
</tr>
<tr>
<td>No loss of relative</td>
<td>10</td>
<td>34</td>
<td>93</td>
</tr>
<tr>
<td>Loss of residence</td>
<td>90</td>
<td>76</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: Values represent percentages.*

TABLE 1. Loss of Family Members, Relatives, and Residence Due to the 1988 Earthquake in Armenia

RESULTS

Table 1 presents the percentage of children in the three cities who suffered loss of nuclear family members and relatives and loss of residence. Approximately one third of children from each of the two cities close to the epicenter, Spitak and Gumri, lost at least one nuclear family member: 8% in Spitak and 2% in Gumri lost two nuclear family members. Ninety percent in Spitak and 66% in Gumri lost a nuclear family member or relative. Ninety percent in Spitak, and 76% in Gumri, lost their residence.

Dose of Exposure and Levels of Current Severity of Posttraumatic Stress Reaction, Depression, and Estimated 1 1/2-Year Prevalence of Separation Anxiety Disorder

![Figure 1](image1.png)

**Figure 1.** Mean current Child Posttraumatic Stress Disorder Reaction Index (CPTSD-RI) and Depression Self-Rating Scale (DSRS) scores and 1 1/2-year prevalence of separation anxiety disorder across groups.
Figure 1 presents the mean current CPTSD-RI and DSRS scores and 1 1/2-year prevalence of separation anxiety disorder for the three groups. The severity of current posttraumatic stress reactions and depression and the frequency of separation anxiety disorder within the 1 1/2 years after the earthquake for the three groups were associated with proximity to the epicenter of the earthquake. Children in Spitak, the city closest to the epicenter, had significantly higher CPTSD-RI mean scores than children in Gumri, who, in turn, had significantly higher scores than children in Yerevan, the city farthest from the epicenter (Spitak, mean = 54.2, SD = 8.1; Gumri, mean = 44.4, SD = 9.8; Yerevan, mean = 33.6, SD = 10.5; F = 71.9, df = 2,215, p < .001). Similarly, the PTSD B, C, and D symptom category mean item scores followed a dose-of-exposure pattern (Table 2).

Mean DSRS scores followed the same pattern across the three cities (Spitak, mean = 19.2, SD = 3.9; Gumri, mean = 16.4, SD = 5.5; Yerevan, mean = 12.9, SD = 5.4; F = 24.2, df = 2,215, p < .001). The frequency of separation anxiety disorder within the 1 1/2 years after the earthquake across the three cities exhibited a linear trend in the same direction (Spitak, 49%; Gumri, 39%; Yerevan, 23%; chi squared = 9.32, df = 2, p < .01).

**Posttraumatic Stress Reactions**

Among children in Spitak and Gumri, the most severe posttraumatic stress reaction symptoms included two from category B (Intrusion): psychological reactivity to reminders and intrusive images and sounds; and two from category D (Arousal): difficulty concentrating and jumpy/nervous/startles easily. Guilt, which is not included in DSM-III-R as a PTSD symptom, was the highest rated symptom among children in Spitak.

Overall, girls tended to score slightly higher on the CPTSD-RI than boys (analysis of variance of gender by city, F = 4.52, df = 1,209, p < .05). Within-city scores were as follows: Spitak-girls (mean = 53.8, SD = 8.0), boys (mean = 55.0, SD = 8.5); Gumri-girls (mean = 45.8, SD = 9.0), boys (mean = 41.4, SD = 11.1); Yerevan-girls (mean = 35.9, SD = 9.8), boys (mean = 30.5, SD = 10.7). There was a significant positive correlation between extent of loss of family members and severity of posttraumatic stress reaction within cities (one-tailed Spearman R: Spitak, r = .22, p < .05; Gumri, r = .21, p < .05). Within cities, loss of residence was not related to presence or absence of PTSD.

**Table 2.** Mean Child Posttraumatic Stress Disorder Reaction Index B, C, and D Symptom Category Scores by Location, 1 1/2 Years after the 1988 Earthquake in Armenia.

<table>
<thead>
<tr>
<th>Category</th>
<th>Spitak (n = 63)</th>
<th>Gumri (n = 94)</th>
<th>Yerevan (n = 61)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B (Intrusion)*</td>
<td>2.9 ± 0.6</td>
<td>2.5 ± 0.7</td>
<td>1.9 ± 0.7</td>
</tr>
<tr>
<td>C (Avoidance)*</td>
<td>2.4 ± 0.6</td>
<td>2.0 ± 0.7</td>
<td>1.5 ± 0.7</td>
</tr>
<tr>
<td>D (Arousal)*</td>
<td>2.5 ± 0.8</td>
<td>2.0 ± 0.7</td>
<td>1.3 ± 0.8</td>
</tr>
</tbody>
</table>

_*Category B (Intrusion): F = 34.3, df = 2,215, p < .001._

_*Category C (Avoidance): F = 25.7, df = 2,215, p < .001._

_*Category D (Arousal): F = 38.7, df = 2,215, p < .001._

**Depression**
Symptoms that were most frequently endorsed at "2" (most of the time) in Spitak included the following: easily angered (52%); seeing bad and unpleasant things ahead (38%); feeling bored (35%); loss of faith in the future (35%); and inability to enjoy things as much as before (30%). In Gumri, these symptoms were also among the most frequently experienced, but the percentages were lower, underscoring the strong dose-of-exposure effect found for mean DSRS scores. It is striking that these symptoms were among the least frequently experienced symptoms in Yerevan, with the exception of feeling bored (18%). In Yerevan, easily angered was rated "2" by 8% of the children, seeing bad and unpleasant things ahead by 5%, and loss of faith in the future by 7%. Loss of energy, which was twice as prevalent among children in Spitak (29%) compared with the other groups, was the only vegetative symptom that differed across the groups. The other vegetative symptoms were experienced by approximately 13% of children in each group. Having feelings of wanting to die was among the most frequently experienced symptom in children in Spitak (24%) and Gumri (22%), while being the least frequent symptom of children in Yerevan (3%).

In this sample, there were no significant differences in mean DSRS scores between boys and girls within cities. There was a significant positive relationship between extent of loss of family members and severity of depression within Spitak and Gumri (one-tailed Spearman R; Spitak, r = .38, p < .05; Gumri, r = .17, p < .05). Loss of residence was not related to the severity of depression within each city.

Separation Anxiety Disorder

During the 1 1/2 years after the earthquake, symptoms of separation anxiety were pervasive among children in all three cities. The average number of separation anxiety symptoms endorsed within each group was 7 out of 11. Worry about something bad happening to parents was the most common separation anxiety symptom, endorsed by at least 95% of children in each group. The next three most frequently endorsed separation anxiety symptoms were feeling sad and not wanting to play or do school work when parents are not around, worrying that something bad might happen to you so that you could not see your parents, and feeling afraid to leave home.

The frequency of separation anxiety disorder reported for the 1 1/2 years after the earthquake was as follows: Spitak, 49%; Gumri, 39%; and Yerevan, 23%. What accounted for the difference across groups in the frequency of separation anxiety disorder was the persistence of these symptoms for a duration of 2 or more weeks as required by the diagnostic criteria. Approximately 15% of those who met the criteria for separation anxiety disorder during the 1 1/2 years after the earthquake reported experiencing worry about separation from parents for 2 or more weeks during the previous month. This indicates that the rate of current separation anxiety disorder was approximately 15% of the 1 1/2-year frequency. Based on this percentage, the current rates of separation anxiety disorder for the three cities would be estimated as follows: Spitak, 7.4%; Gumri, 5.9%; and Yerevan, 2.5%. These rates are substantially lower than the estimated rates of current PTSD and depressive disorder. There was no relationship of sex, extent of loss of family members, or destruction of residence to the frequency of separation anxiety disorder within each city.

Correlation of PTSD and Depression

Levels of posttraumatic stress symptomatology across the three cities were significantly correlated with levels of depression (r = .55, n = 218, p < .01) (Figure 2). Within-city
analyses, controlling for the effect of location, also revealed significant correlations: Spitak ($r = .28, n = 63, p < .01$); Gumri ($r = .45, n = 94, p < .01$); and Yerevan ($r = .40, n = 61, p < .01$).

To investigate whether these correlations are due to shared symptoms in the diagnostic criteria for the two disorders, a regression analysis was performed to identify PTSD symptoms that were strongly correlated with depression score. In this sample, both across and within cities, the six CPTSD-RI items that together best predicted depression score were intrusive imagery, intrusive thoughts and nightmares (category B symptoms), jumpy/nervous/startle and sleep disturbance (category D symptoms), and somatic complaints. Since some category C (Avoidance) and category D (Arousal) symptoms occur with depression, correlation analyses were performed to examine the relationship of severity of PTSD symptom category score and depression score. Severity levels of all three symptom categories were significantly correlated with depression score. A slightly stronger correlation was found for category B (Intrusion) ($r = .46, n = 218, p < .01$) and category D (Arousal) ($r = .46, n = 218, p < .01$), in comparison with category C (Avoidance) ($r = .36, n = 218, p < .01$).

![Figure 2](image_url)  
*Figure 2.* Correlation of Child Posttraumatic Stress Disorder Reaction Index (CPTSD-RI) and Depression Self-Rating Scale (DSRS).

**Estimated Current Frequency of PTSD, Depressive Disorder, and Their Co-Occurrence**

Empirically derived cutoff scores for both the CPTSD-RI and the DSRS were used to derive estimates of the current frequency of PTSD and depressive disorder. Table 3 presents the estimated frequency and comorbidity of PTSD and depressive disorder among children from the three cities.
The estimates in Table 3 indicate that there were extremely high rates of current PTSD, depressive disorder, and their co-occurrence in the two most damaged cities, Spitak and Gumri, at 1 1/2 years after the earthquake. In these two cities, rates of PTSD were higher than those of depression. The frequency of PTSD, depressive disorder, and their co-occurrence was associated with proximity to the epicenter.

**Table 3.** Estimated Frequency and Comorbidity of Posttraumatic Stress Disorder (PTSD) and Depressive Disorder by Location, 1 1/2 Years after the 1988 Earthquake in Armenia

<table>
<thead>
<tr>
<th></th>
<th>Spitak (n = 63)</th>
<th>Gumri (n = 94)</th>
<th>Yerevan (n = 61)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSD</td>
<td>95</td>
<td>71</td>
<td>26</td>
</tr>
<tr>
<td>Depressive disorder</td>
<td>76</td>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>PTSD + depressive disorder</td>
<td>75</td>
<td>41</td>
<td>13</td>
</tr>
</tbody>
</table>

*Note: Values represent percentages.*  
*Based on Child Posttraumatic Stress Disorder Reaction Index cutoff of 40 or greater.*  
*Based on Depression Self-Rating Scale cutoff of 17 or greater.*

**Predictors of Severity of Posttraumatic Stress Reaction and Severity of Depression**

Partial correlation analyses were performed to investigate the independent contributions of exposure, extent of loss of family members, separation anxiety, and gender to predicting severity of posttraumatic stress reaction. After controlling for the effect of all other variables, degree of exposure strongly contributed to predicting severity of posttraumatic stress reaction (partial r = .50, p < .001). Extent of loss of family members (partial r = .14, p < .05), separation anxiety (partial r = .19, p < .05), and gender (partial r = .16, p < .05) all made smaller, but independent, contributions to predicting severity of posttraumatic stress reaction. Similar analyses were performed, including severity of posttraumatic stress reaction with the above variables, to assess their contribution to predicting severity of depression. After controlling for the effect of all other variables, severity of posttraumatic stress reaction was the best predictor of severity of depression (partial r = .37, p < .01). Extent of loss of family members made a smaller, but significant independent contribution (partial r = .16, p < .05). The other variables, including exposure, separation anxiety, and gender, did not make independent contributions to predicting severity of depression.

**Interactive Comorbidity Model of Postdisaster Psychopathology**

An interactive model, incorporating the findings from this study, is proposed to conceptualize a number of critical variables which contribute to the postdisaster onset and progression of psychopathology in children and adolescents (Figure 3). The model proposes the primacy of exposure to traumatic experiences, such as direct life-threat and horrifying sounds and sights, to the onset and severity of PTSD. Other factors, such as gender and extent of loss of family members, make a significant, but small, contribution to the severity of PTSD. Exposure is also associated with separation anxiety disorder. Symptoms of separation anxiety disorder and PTSD interact to exacerbate and prolong each other. The model indicates that persistent
posttraumatic stress symptoms play a direct etiological role in the onset and severity of secondary depression. The model also indicates that exposure is associated with loss of significant others, which, in turn, is associated with grief reactions. Grief is associated with depression (Weller et al., 1991) [55]. In addition, PTSD can complicate the grieving process by repeatedly directing attention to the traumatic circumstances of the death (Pynoos, 1992) [40], thereby contributing to depression. PTSD, depressive disorder, separation anxiety disorder, grief reactions, and secondary adversities comprise a pernicious interactive matrix that strongly influences the postdisaster recovery of children and adolescents.

![Figure 3](image)

**Figure 3.** Interactive comorbidity model of postdisaster psychopathology. SAD = separation anxiety disorder; PTSD = posttraumatic stress disorder.

**DISCUSSION**

The present findings indicate the existence of high rates of current comorbid PTSD and depressive disorder, and a lower rate of current separation anxiety disorder among children with high levels of exposure to the 1988 Spitak earthquake in Armenia. Furthermore, the findings indicate that severity of posttraumatic stress reactions, depressive reactions, and frequency of separation anxiety disorder follow a dose-of-exposure pattern.

**PTSD**

The high rates of PTSD found in Spitak and Gumri far exceed those reported in children after other natural disasters, e.g., Hurricane Hugo (Belter et al., 1991; Shannon et al., 1994) [6,46] and the Missouri flood (Earls et al., 1988) [19], and manmade disasters, e.g., the Buffalo Creek dam collapse (Green et al., 1991) [26] and the sinking of the Jupiter (Yule, 1992) [58]. The high rates in Armenia can be attributed to the nature, multiplicity, and extent of disaster-related traumatic experiences during and in the first few days after the earthquake. These experiences included direct life-threat; witnessing destruction, mutilation, and death; and hearing the screams of people in agony trapped under the rubble. The experience of the tremor of the earthquake was generally not described as the worst experience. The lower prevalence of such horrifying disaster-related experiences in the Loma Prieta and Coalinga
earthquakes, which were of similar magnitude to that in Armenia, may explain the considerably lower reported frequency of PTSD in survivors of these two earthquakes (Bourque and Russell, 1993; Durkin, 1993) [11,18].

Factors that contributed to the higher-than-expected level of posttraumatic stress reaction in Yerevan, where there was mild damage and no significant loss of life, included the involvement of some adolescents in rescue or relief efforts in the earthquake zone, loss of their relatives living in the earthquake zone, and prolonged exposure to graphic images and descriptions of the destruction, death, and mutilation from television and other media coverage. Studies have reported an association of posttraumatic stress symptoms with rescue work (Lifton, 1967; McCammon et al., 1988; Wilkinson, 1983) [29,33,56], especially among the inexperienced (Ersland et al., 1989; Taylor and Frazier, 1982; Ursano and McCarrol, 1990) [22,50,52]; with vicarious experiences (Breslau and Davis, 1992; Dixon et al., 1993; Green, 1993; McCann and Pearlman, 1990; Saigh, 1991) [12,16,25,34,45]; and with viewing graphic television images (Nader et al., 1993) [37].

The persistence of posttraumatic stress symptoms at 1 1/2 years after the earthquake may have been related to the unremitting multiple postdisaster adversities and loss of "communality" (Erikson, 1976) [21] which exacerbated symptoms or interfered with their resolution by compromising the recovery environment necessary for adaptation. The adversities in Armenia included separation of family members; lack of employment and housing; crowded living conditions in makeshift, poorly insulated shacks; loss of community services; shortage of food, gasoline, and medical supplies; and the undisposed debris and destroyed buildings which served as constant reminders of the earthquake.

Guilt over acts of omission and/or commission believed to have caused harm to others was the most severe symptom reported by children in Spitak. This finding is consistent with observations by Pynoos et al. (1987) [41], who found that severity of guilt is associated with increased severity and persistence of posttraumatic stress reactions among children and adolescents. Guilt was often directly linked by children to their actions surrounding the injury or death of others, especially family members and peers. These experiences provided the children with real and/or imagined reasons to blame themselves. The severity of guilt among these children exceeded that reported by comparably exposed Armenian adults (Goenjian et al., 1994) [24]. A possible explanation is that school-age children are developmentally vulnerable to excessive self-blame. Pynoos et al. (1995) [43] have described a developmental progression in which school-age children increasingly envision their own self-efficacy in the face of danger and experience a sense of guilt when they fail to avert injury or death to others.

In Spitak and Gumri, extent of loss of family members was positively correlated with severity of posttraumatic stress reaction. Loss of family members and close friends has been noted as a risk factor for PTSD in adults (Goenjian et al., 1994; Wilson et al., 1985) [24,57]. Loss of family members may have involved witnessing the death and/or viewing the corpse, either of which could lead to painful intrusive imagery. Furthermore, almost all of the children in Spitak and Gumri saw mutilated corpses and heard screams of agony or heard about the agonizing death of others. These experiences may have provided material for their own traumatic reconstruction of the death of their family members, involving horrifying imagery that contributed to posttraumatic stress symptoms.

Overall, girls scored slightly, but significantly, higher than boys on the CPTSD-RI. Other authors have reported similar findings (Green et al., 1991; Shannon et al., 1994; Yule, 1992) [26,46,58]. This may reflect actual differences in symptoms or a differential willingness to endorse symptoms (Vogel and Vernberg, 1993) [53]. The lack of significant CPTSD-RI gender difference in this sample from Spitak may indicate that a differential vulnerability to
certain posttraumatic stress symptoms, if existent, is obliterated at higher levels of exposure. A larger sample size of highly exposed children may help to clarify this issue.

**Depression**

High levels of depression at 1 1/2 years were found in Spitak and Gumri. Very few previous studies have assessed depression in children after natural disaster, and none after one with this magnitude of morbidity and mortality. Belter et al. (1991) [6] noted no significant depression among children 5 months after Hurricane Hugo, where there was relatively minimal loss of life though extensive property damage. Yule and Udwin (1991) [59], after the sinking of the cruise ship Jupiter, where there was extreme life-threat and four deaths, reported that levels of depression among a group of female adolescent passengers studied were comparable (on the Birleson Depression Inventory items of the DSRS) with those among children in Gumri. The level of depression found in Spitak may have been due to the persistence of severe posttraumatic stress symptoms which led to the onset of secondary depression, or contributed indirectly by compromising children's ability to cope with postearthquake stresses or by interfering with the resolution of grief (Pynoos, 1992) [40]. Also, the high level of depression may have been related to the extent of loss of family members. Yule and Williams (1990) [60] noted such a trend in a small sample of adolescent survivors of a ferry disaster, and Weller et al. (1991) [55] noted clinical symptoms of major depressive disorder in a considerable number of bereaved prepubertal children. Furthermore, as a result of pervasive postearthquake stresses and adversities and their own persistent posttraumatic stress symptoms, family members and members of the community may have been less available and supportive to the children. Prior studies have indicated that depressed children exposed to high levels of stress in their home environments experience more persistent depression and have a reduced likelihood of recovery compared with depressed children with less stressful home environments (Asarnow et al., 1993; McCauley et al., 1993) [5,35]. Being easily angered was the most frequently reported symptom in Spitak and Gumri, but one of the least frequently reported in Yerevan. This finding may be explained by the association of this symptom with both PTSD and depression, both of which were prevalent in these two most affected cities. The next most frequently reported symptoms in Spitak and Gumri, which were among the least frequently reported in Yerevan, were related to hopelessness. Loss of faith in the future and envisioning bad and unpleasant things ahead seemed to be reality-based and related to stagnation, e.g., of the economy, community life, and reconstruction. Having feelings of wanting to die were alarmingly prevalent among children in Spitak and Gumri. This finding underscores the extent of suffering in these children and indicates the necessity for postdisaster mental health interventions to evaluate and address such serious symptoms. There were no gender differences with respect to depression within the three groups studied. Yule (1992) [58] noted that girls involved in the sinking of the Jupiter scored higher on depression than boys. However, those subjects were older than subjects in this study. Epidemiological studies indicate that depressive disorders show a marked change in sex distribution after puberty, when rates for girls begin to exceed those for boys (Costello, 1989) [15].

**Separation Anxiety**

Clinging behavior has been noted in children after natural disasters (Bloch et al., 1956; Dollinger, 1985; Ollendick and Hoffman, 1982; Sullivan et al., 1991) [10,17,38,49]. During the 1 1/2 years after the earthquake, symptoms of separation anxiety were pervasive among
children throughout the earthquake zone. However, the 1 1/2-year prevalence of separation anxiety disorder followed a dose-of-exposure pattern. The rates in the three cities, which ranged from 23% to 49%, far exceeded prevalence rates (3.5% to 5.4%) found in psychiatric epidemiological studies in children and adolescents (for review, see Costello, 1989) [15]. The finding that the 1 1/2-year prevalence of separation anxiety disorder followed a dose-of-exposure pattern suggests that experiences of life-threat and witnessing of injury and death generated anticipatory anxiety in these children about their own safety and security as well as concerns about the safety and security of their caretakers. The association of separation anxiety disorder with exposure may also be explained by the higher rates of separation of family members in the more damaged areas. For example, some parents from these areas left their families for employment in other cities that were not destroyed. Also, some children were placed with relatives who could provide better living conditions. The estimated current frequency of separation anxiety disorder was considerably lower than the 1 1/2-year rate, indicating that these symptoms tended to resolve over time, despite the unremitting adversities and persistence of posttraumatic stress symptoms.

Partial correlation analyses indicated an independent association between severity of posttraumatic stress reaction and separation anxiety disorder. One possible explanation for this association is that the distress caused by severe and persistent posttraumatic stress symptoms resulted in further clinging by the children in an effort to obtain comfort from caretakers. Fear of recurrence of the earthquake may have caused increased anxiety about their own death or injury, resulting in seeking protection from caretakers. Conversely, it is also possible that separation anxiety disorder aggravated some posttraumatic stress symptoms, especially avoidance and arousal symptoms.

In this study, extent of loss of family members was not associated with separation anxiety disorder in Spitak and Gumri. Although this may appear counterintuitive, it is possible that because the exposure of children to losses in these cities was so extensive, the impact of family loss on separation anxiety disorder was obscured. This may not have occurred in the case of depression, possibly because of the stronger association of extent of loss of family members with depression. There were no gender differences with regard to separation anxiety disorder in this study. In general, disaster studies have reported greater anxiety symptoms among girls (Burke et al., 1986; Gleser et al., 1981; Yule, 1992) [14,23,58], although no prior disaster study has specifically assessed separation anxiety disorder.

**PTSD and Depression**

The significant correlation of severity of posttraumatic stress reaction and levels of depression across and within exposure groups found in this study was not wholly attributable to an overlap of posttraumatic and depressive symptoms. Category B (Intrusion) symptoms, which do not overlap with those of depression, were strongly correlated with severity of depression. Furthermore, four symptoms, three from category B and one from D, none of which overlap with depressive symptoms, were among the six CPTSD-RI items most highly correlated with severity of depression. These findings strongly suggest that posttraumatic stress and depressive reactions represent at least partially independent conditions which are interrelated.

Clinical evaluations of 69 Armenian children seen in Gumri by one of the authors (L.M.N.) 3 to 4 months after the earthquake for possible treatment revealed no clinical depression, while 91% of these children met criteria for PTSD. Data from the Armenian Relief Society's mental health clinics in Armenia indicate that rates of depression gradually increased over the 2 years after the earthquake. A similar observation was made by Yule and Udwin (1991) [59], who
found an increase in levels of depression over time among adolescents with posttraumatic stress reactions after a major transportation disaster. The correlational findings from our study and the later onset of depression as noted above, along with the partial correlation analysis indicating that severity of posttraumatic stress reaction is the best predictor of severity of depression, suggest that some depression is secondary to persistent posttraumatic stress symptoms. Other authors have suggested that depression among veterans may be a reaction to, or late manifestation of, chronic PTSD (Engdahl et al., 1991; Tenant et al., 1986) [20,51]. Longitudinal studies would help to clarify the relative contribution of different factors to the onset and progression of these disorders, as well as their complex interrelationship.

Conclusion

This study demonstrates the feasibility of implementing a systematic public mental health approach to the assessment and treatment of children exposed to a major catastrophic disaster. This approach includes a comprehensive initial screening of children, incorporating careful assessment of the nature and severity of traumatic experiences, the type and extent of loss, and the acute secondary adversities. In addition, the clinical evaluation should include assessment of posttraumatic stress reactions, grief reactions, depression, and separation anxiety disorder. This information can be used to guide case-finding and outreach efforts to determine the timing of interventions and the selection of appropriate treatment techniques. The study suggests the need for periodic screening to closely monitor secondary adversities that may interact with primary disaster-related reactions to initiate new-onset disorders. The findings also strongly indicate the need for early clinical intervention for posttraumatic stress reactions, to prevent both chronicity and secondary depression. Clinicians should adopt a multifaceted treatment approach, taking into consideration variations in onset, course, and risks of comorbid conditions. Clinicians and researchers should use a complex interactive model of disaster-related child psychopathology to conceptualize the postdisaster recovery of children and adolescents.

REFERENCES

• Nader K, Pynoos RS, Fairbanks L, Frederick C (1990), Children's PTSD reactions one year after a sniper attack at their school. Am J Psychiatry 147:1526-1530.
• Pynoos RS (1992), Grief and trauma in children and adolescents. Bereavement Care 11:2-10.
• Pynoos RS, Frederick C, Nader K et al. (1987), Life threat and posttraumatic stress in school-age children. Arch Gen Psychiatry 44:1057-1063.
• Taylor AJW, Frazier AG (1982), The stress of post disaster body handling and victim identification. J Hum Stress 8:4-12.