

# Post-Traumatic Stress Disorder Symptoms Among Children of Kathmandu 1 Year After the 2015 Earthquake in Nepal

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## ABSTRACT

**Objective:** The 2015 earthquake in Nepal affected the country in terms of economy, and by causing damage and stress reactions. This study aimed to estimate the prevalence and determine individual child- and family-level predictors of post-traumatic stress disorder (PTSD) symptoms.

**Methods:** A community-based cross-sectional study was carried out in Kathmandu district 15 months after the earthquake. Multistage cluster sampling was adopted to collect 800 earthquake-affected children aged 7-16 years and a face-to-face interview was conducted. Trauma exposure questionnaire and Child PTSD Symptoms Scale were used for assessment of the level of exposure and PTSD symptoms. Multilevel generalized linear regression analysis was used to explore individual and family-level predictors.

**Results:** Among the children, 51% had moderate-to-severe PTSD symptoms. Children of school age (adjusted odds ratio = 2.83 [1.45-5.49]), those attending lower-secondary school (2.26 [1.21-4.21]), those having a higher exposure to the severity of the earthquake, and those with low psychosocial acuity [1.70 (1.10-2.60)] were more likely to have more severe PTSD symptoms compared with those who were adolescents and in higher-secondary school, whereas children from a family living in an urban (0.33 [0.19-0.59]) setting and following Hindu religion (0.31 [0.16-0.60]) were less likely to have PTSD symptoms compared with children from suburban areas and those following Buddhist religion.

**Conclusion:** PTSD symptoms were prevalent among children of Nepal more than a year following the earthquake. Family-level indicators cannot be excluded when studying children's trauma reactions. (*Disaster Med Public Health Preparedness*. 2018;12:486-492)

**Key Words:** post-traumatic stress disorder symptoms, children and family, earthquake

The 2015 earthquake was the most destructive disaster that had occurred in Nepal since the 1934 Earthquake. It is estimated that 10,000 people died and that more than 22,000 persons were injured. Likewise, 8308 schools and 963 public health facilities were damaged.<sup>1</sup>

Earthquakes have a range of negative psychological impacts on children. A review reported that 30%-50% of disaster-affected children demonstrated moderate to severe post-traumatic stress disorder (PTSD) symptoms.<sup>2</sup> The prevalence of PTSD symptoms and other mental health consequences are reportedly higher in natural disasters when compared with other kinds of trauma,<sup>3,4</sup> ranging from 11.2%-11.3%<sup>5</sup> at 12 months, 12.4%-13.9%<sup>6</sup> at 15 months, and 76%-95%<sup>4</sup> at 18 months after earthquakes among young children and early adolescents.<sup>7</sup>

PTSD symptoms are consistently associated with individual objective factors like trauma severity,<sup>8-11</sup>

psychosocial support,<sup>12-14</sup> post-trauma environment, and severity of the event as well as with subjective factors like the demographics of the individual<sup>15,16</sup> and perceived threat.<sup>17,11</sup> Children and adolescents are a vulnerable population during and after a disaster. Disaster-related stress tends to decrease over time<sup>2</sup> but prolonged disturbance in the family may lead to persistent symptoms, which may be due to shared trauma exposure that influences family dynamics. A disaster tends to increase family conflicts, and difficulties in the family environment increase the vulnerability of children to negative psychological consequences.<sup>18</sup>

However, factors like family environment and functioning are rarely studied<sup>19</sup>; thus, it is essential to consider family-level characteristics when studying children's reactions in the aftermath of a disaster. Moreover, on the basis of existing reviews, it is found that child-centered disaster research has to explore components of family and how they relate to the mental health of children and adolescents.

Disaster affects rich and poor countries in different ways. Understanding and integrating the family-level characters in reducing post-disaster distress among children for a poor country like Nepal will be an important achievement. This study therefore aimed to estimate the prevalence of PTSD symptoms and to determine individual-level and family-level predictors of PTSD symptoms among children affected by the 2015 earthquake in Nepal.

## METHODS

### Study Design and Setting

A community-based cross-sectional study was carried out in Kathmandu District, Nepal. Kathmandu was one of the districts most affected by the 2015 earthquake.

### Participants

The study population included children aged 7-16 years and their parents or first-degree relatives (direct care giver), who had been living in Kathmandu before the 2015 earthquake and for at least 6 months before the date of interview. Data collection was conducted in September and October 2016, which was 15 months after the 2015 earthquake. Multistage cluster sampling was carried out. In the first stage, 2 out of 5 urban and 3 out of 6 suburban municipalities of Kathmandu Valley were selected. In the second stage, from each selected municipality 10 wards were selected with probability proportional to size-based on number of households in each ward. In the final stage, 800 children from the selected wards were chosen randomly. Mapping of the selected wards was carried out and houses were chosen randomly, taking either a school or health service center as a reference starting point. All eligible subjects in the selected households were included, and in case a house did not meet the inclusion criteria, a house from second list of houses in the wards was chosen. A total of 3 community health volunteers and a child psychologist were trained and employed to interview eligible subjects at their home.

Ethical approval was taken from Nepal Health Research Council (ref no. 150) and Prince of Songkla University (ref no. 59-183-18-5). Verbal and written consent was taken from family and children. Anonymity and confidentiality was maintained throughout the study.

### Instruments

A face-to-face structured interview questionnaire was developed. The questions included those on socio-demographic characteristics of children and family, level of exposure to earthquake, PTSD symptoms, psychosocial support, and family function assessment. The questionnaire was reviewed by experts who were bilingual child psychologists.

### Level of Exposure to Earthquake

Level of exposure to earthquakes among the children was evaluated with the During and After Earthquake Trauma

Exposure Questionnaires. It was adapted from a Hurricane Exposure questionnaire and from previous disaster studies.<sup>20,21</sup> Each item was based on a “yes/no” choice. The total number of items was 29 and the scoring was on a continuous scale.

### Child-PTSD Symptoms Scale (CPSS)

PTSD symptom severity was assessed using the CPSS, a translated and validated version of a questionnaire based on the Diagnostic and Statistical Manual of Mental Disorder diagnostic criteria for childhood PTSD. CPSS has 17 items for severity of PTSD symptomology, each on a 4-point Likert scale (0 = never, 1 = once in a week, 2 = 2-4 times in a week, and 3 = 5 or more times in a week); therefore, the range of the total score is from 0 to 51, a higher score indicating more severe PTSD symptoms. In the present study, the total score was categorized into score  $\leq 20$ —no and mild PTSD symptoms—and score  $> 20$ —having moderate-to-severe PTSD symptoms. The clinical cut-off score, 20, was derived for classifying children with PTSD symptoms indicating the need for treatment from a validation study in Nepal.<sup>22,23</sup>

### Psychosocial Support Questionnaire

The researcher-constructed psychosocial support questionnaire has 12 items on 5-point Likert scales to assess received psychological and material support and respondents' satisfaction with received and perceived social support. The questionnaire was adapted from a social support questionnaire and modified based on country context.<sup>24,25</sup> Mean score was used as cut off for categorizing high-acuity social support and low-acuity social support. The questionnaire was checked for face validity by a group of experts. Cronbach's internal consistency index from the pilot study was 0.83.

### Statistical Analysis

Epi-data 3.1 was used for data entry and Statistical Software R version 3.3.2 was used for data management and analysis. Descriptive data are presented as percentages, mean and standard deviation. The main outcome variable was having PTSD symptoms. Univariate analysis was performed using the  $\chi^2$  test. A mixed-effects random-intercept model was used to identify factors predicting PTSD symptoms among variables found to have  $P$ -value  $< 0.2$  from the univariate analysis. Finally, a  $P$ -value of  $< 0.05$  considered statistically significant.

## RESULTS

Among 800 children and 410 households approached, no one refused to cooperate, making an overall response rate of 100%. Twenty-nine children had lost their fathers, 4 of them had lost their mothers and 126 children had lost their relatives and friends. 326 children saw dead bodies and 124 children were trapped in ruin in the earthquake.

### Demographic Characteristics

The mean (SD) age of the children was 11.6 (2.65) years and children were grouped into school-age (7-12 years) and adolescent-age (13-16 years) groups.<sup>7</sup> About half of them were in the adolescent-age group, female (52%), and had primary-level education (45.1%). A majority of them followed Hindu religion (71.4%). About half of the children's families had an upper-middle income level (49.5%) and stayed permanently in Kathmandu (51.6%).

### Prevalence of PTSD Symptoms by Individual-Level Characteristics

Of all 800 respondents, three had no symptoms of PTSD, 48.5% of children had mild PTSD symptoms, and 51.1% of children had moderate-to-severe symptoms of PTSD, with a higher prevalence among school-aged children (53.1%), female respondents (51.9%), children going to lower-secondary school (58.1%), following Buddhist religion (62.0%), and those with low acuity of psychosocial support (56.7%). Breakdown of individual-level characteristics is presented in Table 1.

### Prevalence of PTSD Symptoms by Family-Level Characteristics

Altogether, 410 families were included in the study from urban and suburban settings and children from families living in suburban (58%) setting had a higher proportion of moderate-severe PTSD symptoms. Table 2 describes the family-level characteristics.

### Association of Individual- and Family-Level Characteristics With PTSD Symptoms

Multilevel modeling results are shown in Table 3 for PTSD symptoms. Model 1 and model 2 are random-intercept models. This implies that individual-level data were nested within a family and that the impact of predictors on PTSD symptoms was the same across families. Model 2 differs from Model 1 in that an interaction term between psychosocial support and gender is added. In model 1, children with a one unit higher score for level of earthquake exposure (adjusted odds ratio [AOR] = 1.09), and those in the school-age group, were found to be more likely to have moderate-to-severe PTSD symptoms (AOR = 2.83) than were children in the adolescent-age group. Children attending lower-secondary school were more likely to have moderate-to-severe PTSD symptoms (AOR = 2.26) than were children attending higher school levels. Hindu children (AOR = 0.32) were less likely to have severe PTSD symptoms than those who were Buddhist. Regarding family-level characteristics, children of families living in an urban area were less likely to have PTSD symptoms (AOR = 0.33) than those living in suburban areas.

In model 2, after inclusion of interaction between psychosocial support and gender of the children, the effect of

## TABLE 1

Individual-Level Characteristics by Prevalence of Post-Traumatic Stress Disorder (PTSD) Symptoms				
	No/Mild PTSD Symptoms ( <i>n</i> = 391)	Moderate-to-Severe PTSD Symptoms ( <i>n</i> = 409)	Total ( <i>N</i> = 800)	<i>P</i> -Value
<b>Age</b>				
School age (7-12 years)	174 (46.9)	197 (53.1)	371	0.333
Adolescent (13-16 years)	217 (50.6)	212 (49.4)	429	
<b>Gender</b>				
Male	191 (49.7)	193 (50.3)	384	0.690
Female	200 (48.1)	216 (51.9)	416	
<b>Education</b>				
Primary school	191 (52.9)	170 (47.1)	361	0.012
Lower-secondary	122 (41.9)	169 (58.1)	291	
Higher-secondary	78 (52.7)	70 (47.3)	148	
<b>Ethnicity</b>				
Bharamn	50 (50.0)	50 (50.0)	100	0.135
Chettri	111 (54.1)	94 (45.9)	205	
Newar	70 (41.9)	97 (58.1)	167	
Others	160 (48.8)	168 (51.2)	328	
<b>Religion</b>				
Hindu	296 (51.8)	275 (48.2)	571	0.008
Buddhist	62 (38.0)	101 (62.0)	163	
Muslim	5 (33.3)	10 (66.7)	15	
Christian	17 (48.6)	18 (51.4)	35	
Others	11 (68.8)	5 (51.2)	16	
<b>Level of exposure</b>				
Highly exposed	191 (46.4)	221 (53.6)	412	0.163
Less exposed	200 (51.5)	188 (48.5)	388	
<b>Psychosocial support</b>				
High-acuity	224 (54.1)	190 (45.9)	414	0.003
Low-acuity	167 (43.3)	219 (56.7)	386	

high-acuity psychosocial support (AOR = 2.65) was found to be effective among female children (Figure 1).

## DISCUSSION

To our knowledge, this is the first community-based study carried out in Nepal after the 2015 earthquake related to PTSD reactions in children.

The prevalence of moderate-to-severe PTSD symptoms among these children was 51.1%, which is similar to that reported in a study in Turkey 3 months after an earthquake, in which 47.7% had severe PTSD symptoms,<sup>26</sup> and to that in a study undertaken after 32 weeks of Hurricane Andrew, in which 51% had moderate and 38% had severe PTSD symptoms,<sup>27</sup> and was higher than that found in Athens (35.7%).<sup>28</sup> High prevalence of moderate-to-severe symptoms of PTSD even a year after the earthquake was found in Nepal probably because of the

TABLE 2

Family-Level Characteristics by Prevalence of Post-Traumatic Stress Disorder (PTSD) Symptoms				
	No/Mild PTSD Symptoms ( <i>n</i> = 391)	Moderate-to-Severe PTSD Symptoms ( <i>n</i> = 409)	Total	<i>P</i> -Value
<b>Residence</b>				<0.001
Suburban	168 (42.0)	232 (58.0)	400	
Urban	223 (55.8)	177 (44.2)	400	
<b>Income</b>				0.362
Low income	90 (50.0)	90 (50.0)	180	
Lower-middle income	56 (42.1)	77 (57.9)	133	
Upper-middle income	197 (49.7)	199 (50.3)	396	
High income	48 (52.7)	43 (47.3)	91	
<b>Length of stay in Kathmandu</b>				0.190
Six months	2 (50.0)	2 (50.0)	4	
More than 6 months and <1 year	24 (53.3)	21 (46.7)	45	
More than a year	150 (44.4)	188 (55.6)	388	
Permanent stay	215 (52.1)	198 (47.9)	413	

TABLE 3

Association of Individual and Family-Level Characteristics with Post-Traumatic Stress Disorder Symptoms in Children				
	Model 1 <sup>a</sup>		Model 2 <sup>b</sup>	
	Adjusted OR (95% CI)	<i>P</i> -Value	Adjusted OR (95% CI)	<i>P</i> -Value
<b>Intercept</b>	0.52 (0.17-1.57)	0.247	0.40 (0.13-0.127)	0.121
<b>Individual-level characteristics</b>				
<b>Age</b>				
Adolescent	1		1	
School age	2.83 (1.45-5.55)	0.002	2.67 (1.36-5.26)	<0.001
<b>Gender</b>				
Female	1		1	
Male	0.85 (0.58-1.26)	0.426	1.30 (0.75-2.24)	0.354
<b>Education</b>				
Higher-secondary	1		1	
Primary	0.75 (0.32-1.78)	0.518	0.78 (0.33-1.86)	0.574
Lower-secondary	2.26 (1.21-4.21)	0.011	2.24 (1.19-4.21)	0.012
<b>Level of earthquake exposure × Religion</b>	1.09 (1.04-1.15)	<0.001	1.10 (1.04-1.15)	<0.001
Buddhist	1		1	
Hindu	0.31 (0.16-0.60)	<0.001	0.31 (0.16-0.60)	<0.001
Muslim	1.46 (0.25-8.61)	0.675	1.39 (0.23-8.34)	0.716
Christian	0.58 (0.16-2.06)	0.395	0.60 (0.17-2.18)	0.438
Others	0.24 (0.04-1.57)	0.136	0.24 (0.03-1.61)	0.140
<b>Psychosocial support</b>				
High-acuity	1		1	
Low-acuity	1.70 (1.10-2.60)	0.018	2.65 (1.44-4.88)	0.002
<b>Family Level</b>				
<b>Area of residence</b>				
Suburban	1		1	
Urban	0.33 (0.19-0.59)	<0.001	0.33 (0.19-0.60)	<0.001
<b>Psychosocial support (high-acuity) × gender (male)</b>	-	-	0.42 (0.18-0.94)	0.035

OR, odds ratio.

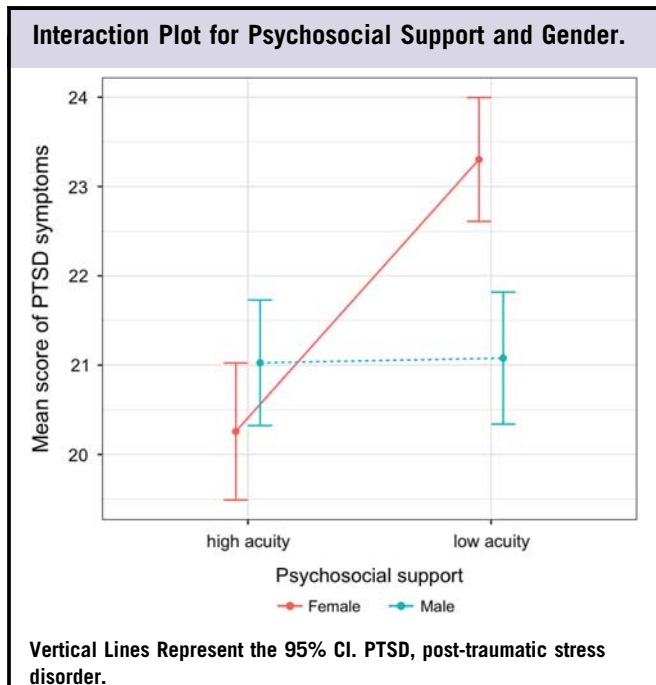
<sup>a</sup>Model 1: Without interaction term.

<sup>b</sup>Model 2: With interaction term (psychological support and gender).

occurrence of multiple aftershocks after the major earthquake, which continued to terrify people for 2 months, and because of the existence of a poor resilience trait in the country.<sup>1</sup>

The prevalence of moderate-to-severe PTSD symptoms was high (53.1%) among school-age children (7-12 years). This is in keeping with findings from studies that PTSD and anxiety

FIGURE 1



symptoms were more pronounced in 6-10-year-old children in L'Aquila<sup>29</sup> and among those children younger than 13 years in Greece. However, this finding is in contradiction to findings from other studies where age had no significant association with PTSD symptomology,<sup>30</sup> reflecting a less-clear relationship between age and PTSD reactions.<sup>31</sup> Many studies have reported that females are more prone to post-traumatic stress and depressive reactions.<sup>32,33,4</sup> Nevertheless, our study is in parallel with a study in Italy and does not support a gender effect on PTSD symptoms or psychiatric reaction of children after a disaster. The prevalence of any PTSD symptoms was nearly equal between male (50.3%) and female children (51.9%). The lack of apparent effect of gender may be because of the roles of other mediating or moderating factors that were not considered in our analysis.

Children in lower-secondary school were more likely to have moderate-to-severe PTSD symptoms compared with those in higher-secondary school. This finding contrasts with most previous findings in which elementary school children had more severe PTSD symptoms compared with junior and high-school children.<sup>34</sup> Children at the primary level may be too young to fully realize the effects of trauma. Another possible reason in context of Nepal may be that most primary-level education has been changed according to the Early Childhood Development (ECD) concept where schools have a child-friendly environment with the availability of a psychological counselor, school nurse, and ECD-trained teachers. This ECD concept is based on the concept of holistic development of children and has grown rapidly after 2008 for addressing issues of the young child.<sup>35</sup> Children at lower-secondary level are in the transitional phase between

childhood and adolescence; thus, they may be vulnerable to an emotional experience.

Hindu religion appeared to be a protective factor against PTSD symptoms in the children. This confirms the findings of some studies explaining an association between religious affiliation and severity of post-traumatic reaction and resilience.<sup>36</sup> A possible explanation for our result is that as Hindus have a strong religious orientation and practice, children in Hindu families may be more protected against a stressful event. However, there is still a lack of study to explain the particular mechanism by which religion protects children against post-traumatic reactions.

Level of exposure to the earthquake was found to be significant in the present study, which is consistent with the findings from previous studies<sup>37-39</sup> that provide support for the "dose-response effect." This trauma exposure was found to be non-discriminating as a categorical variable but demonstrated discriminatory power when it was used on a continuous scale; a similar recommendation was found in a previous study, which reported that use of a continuous scale is likely to be more sensitive.<sup>40</sup>

Consistent with previous research,<sup>41</sup> psychosocial support was associated with PTSD symptoms. In the present study, the effect of psychosocial support was significantly modified by gender. Females were found to be protected from severity of PTSD symptoms if they received and perceived high psychosocial support.

Among family-level characteristics, residence in an urban area reduced the probability of having PTSD symptoms in children, which confirms findings from a previous study.<sup>42</sup> As many rescue programs were urban-focused after the earthquake, an urban setting was more likely to receive social support and appropriate medical assistance, which helped people normalize their lives after the disaster. A previous study explained that family residence had a significant relationship with PTSD outcome, possibly because confounders like family socio-economic status and length of stay in that place were not checked.<sup>42</sup> However, in our study, we tried to control most of these factors, and place of residence remained significantly associated with PTSD symptoms.

There are some limitations in the study. Parental indicators such as parental demographics, parental psychopathology, and parent-child relationships were not included in the study and they may confound associations with the study variables. Finally, the cross-sectional design of this study limits its ability to draw conclusions on a definite causal relationship.

## CONCLUSION

Notwithstanding these limitations, the results of this study have some important implications for psychological service

providers in understanding children exposed to disaster and providing effective intervention to them and their family. This study suggests that various individual factors (level of exposure to earthquake, education, social support, and religion) and family factors (residence) are important risk factors for development of PTSD symptoms. Moreover, increased risk for PTSD symptoms among children living in suburban areas suggests that intervention programs need to focus more on those areas. In addition, children of school age or those at the phase of transition from childhood to adolescence are vulnerable to PTSD reactions, and therefore these populations should be given due attention when developing an intervention strategy.

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