

Acute Screening for PTSD Among Child Earthquake Survivors in Palu, Sulawesi, Indonesia

Ahmad, A, Faculty of Medicine, Asia Metropolitan University, Malaysia

Marzo, RR, Faculty of Medicine, Asia Metropolitan University, Malaysia

Win, MT, Faculty of Medicine, Asia Metropolitan University, Malaysia

Bahari, R, ²Faculty of Medicine, University of Cyberjaya, Malaysia

Ghaffar, NA, Faculty of Medicine, Asia Metropolitan University, Malaysia

Amlasi, N, Faculty of Medicine, Asia Metropolitan University, Malaysia

ABSTRACT

Background: Post-traumatic stress disorder (PTSD) is one of the most common neuropsychiatric disorders that may develop following traumatic life events (Chiba, 2019). This study is an acute screening for Post-Traumatic Symptoms among children who survived the 2018 earthquake and subsequent tsunami and soil liquefaction in Palu, Sulawesi, Indonesia. These events were notable, as they were among the worst disasters in the world and caused massive deaths and destruction in the region.

Objectives: The general objective of this study was to determine whether child earthquake survivors in Palu are affected by PTSD. This study also specifically focused on the age, gender, and ethnic group of the children earthquake survivors in the different areas of Kayumalue and Jono Oge to determine if any relationship exists with post-traumatic symptoms.

Methods: A cross-sectional survey was conducted in the affected areas in Kayumalue and Jono Oge. Data were collected from 69 children who were affected by the earthquake. The PTSS-10 scale, which is a structured questionnaire consisting of 10 close-ended questions, was used for this study. Correlation of the post-traumatic symptoms scores with age, gender, and the ethnic tribe was also analyzed.

Results: A total of 69 children (26 boys and 43 girls) with a mean age of 10.2 years and are from different ethnic tribes in Kayumalue and Jono Oge participated in this study. The majority (81.2%) showed no obvious post-traumatic symptoms. Some of the children (11.6%) showed borderline post-traumatic symptoms, while a few (7.2%) displayed significant post-traumatic symptoms.

Among the two areas the researchers studied, the child survivors in Kayumalue did not exhibit obvious signs of PTSD, while the children survivors in Jono Oge showed significant effects of PTSD (significant up to $p < 0.05\%$).

Conclusions:

PTSD may develop following exposure to traumatic events. Children, adolescents, those from certain ethnic minorities, and those who experienced a more severe traumatic event have an increased risk of developing PTSD. However, more studies are needed in order to establish the full extent of the problem and determine how best to intervene.

1. Introduction

In September 2018, the Island of Sulawesi, Indonesia was rocked by a strong earthquake. It was recorded to have a magnitude of 7.5 and its epicenter was located 48 miles away from the city of Palu. A few hours later, a huge tsunami reached the city and swept away a large number of houses and buildings. According to the National Disaster Management Agency (NDMA), a total of 832 people died and 580 got injured in that incident. The WHO 2018 Report further stated that a total of 16,732 people were displaced and 4,340 people died due to both the earthquake and tsunami. As a result, it was described as the deadliest earthquake in the world that year. The whole event was then dwarfed by the deaths and destruction that occurred due to the soil liquefaction that followed.

Post-traumatic stress disorder (PTSD) is a mental health condition that frequently develops after experiencing or witnessing a traumatic or life-threatening event, such as disasters. The most common symptoms may include flashbacks, nightmares, and severe anxiety, as well as uncontrollable thoughts about the event. PTSD can be identified by biological changes and is consequently complicated by various types of physical and mental health problems. The incidence of PTSD symptoms in Asia ranges from 8% to 37% and is significantly much higher in areas prone to natural disasters (Math, Nirmala, Moirangthem & Kumar, 2015; Usami, Iwadare, Kodaira et al., 2011; Udomartn, 2018).

Children are greatly at risk of developing PTSD. The American Academy of Pediatrics reported that around 25% of child populations are affected by mental illnesses, such as depressive disorders, generalized anxiety disorders, and PTSD, after exposure to disasters. For instance, a study involving the notorious earthquakes of Wenchuan and Lushan in China, which occurred in 2008 and 2013 respectively, found out that children and adolescents were prone to getting somatic and depressive symptoms (Xu, Wang & Tang, 2018). In another study, the researchers found an increased prevalence of psychological problems or mental health illnesses, especially PTSD, among the school children in China (Zang, Zu & Du, 2015). This may be due to their lack of experience with negative events, as well as poor coping mechanisms (Usam, Iwadare & Kodaira, et al, 2018).

Since there is plenty of evidence that children and adolescents are at risk of PTSD following disasters, a strong earthquake followed by a huge tsunami and major soil liquefaction, such as the one that occurred in Palu, will definitely be disastrous to their mental health. Hence, it was important to find out if these child survivors have indeed been affected by post-traumatic stress symptoms (PTSS). The purpose of this study was to determine whether the child earthquake survivors in Palu were affected by PTSD after exposure to the earthquake, tsunami and soil liquefaction. Furthermore, the researchers wanted to find out if the ages, genders, ethnic groups, and geographical distribution of these children have a bearing on the risk of developing PTSD.

2. Methodology

2.1 Study Design

The approach for this research was a cross-sectional survey with guided questionnaires. The data were then collected and descriptively analyzed. The target populations of this study were children earthquake survivors in two separate relocation camps, namely:

- Kayumalue relocation camp along the seaside near the tsunami-affected area
- JonoOge relocation camp in Balaroa, near the liquefaction area

2.2 Sample Population

All willing children who agreed to participate had ages ranging from age 7 to 12. However, they were only allowed to partake in this study if consent was given by their caretaker or parents.

- Kayumalue relocation Camp: 47 children
- JonoOge relocation Camp: 22 children

2.3 Sampling Method

The research was conducted using non-probability sampling and the sampling method used was convenience sampling. This method was carried out by choosing two big relocation camps in the earthquake-affected areas. Paramedics and health workers were recruited and trained to administer the questionnaires to these child survivors. The data was then collected and analyzed.

2.4 Survey Instrument

The Post-traumatic Symptom Scale (PTSS-10) has 10 questions that determine the well-being and typical reactions that occur as a result of stress of every individual. A cut-off score greater than or equal to 35 predicts a diagnosis of Post-Traumatic Stress Disorder. Patients with scores between 27 and 35 may be considered to have post-traumatic stress symptomatology in the subsyndromal area of PTSD.

The content validity index was 0.916. Furthermore, the face validity revealed that the questionnaire was easy to answer (93.5%) and had an easy-to-understand appearance and layout (94.3%) and displayed clarity of words (96.5%). Internal consistency reliability was done by computing the Cronbach's alpha, which was 0.83 (>0.70). Therefore, the questionnaire is reliable.

2.5 Data Analysis

The primary data analysis was coded and analyzed in SPSS Version 18. Descriptive statistics were used to describe the demographic features of the participants, and tables with frequency and percentages were used to interpret the results. The correlation of the post-traumatic symptoms score with age, gender, and ethnic tribes were also analyzed.

2.6 Ethical Consideration

The protocols were reviewed by the Medical Research Ethical Committee (MREC) of the Asia Metropolitan University to ensure full protection of the rights of the subjects of this study. Following the acquisition of MREC approval, the questionnaires were distributed to the subjects. And to assure confidentiality, all the information collected was handed over to and kept by the researchers alone.

3. Results

69 children between the age of 7 and 13 were considered valid participants for this study. These children belonged to the different ethnic tribes located in Kayumalue and JonoOge. Further demographic details are presented in the following table (Table 1).

Table 1: *Demographic Characteristics of the Respondents*

	Demographic variables	n	%
Gender			
	Male	26	37.7
	Female	43	62.3
Ethnicity Tribe			
	Kayumalue	47	68.1
	JonoOge	22	31.9
Age	Mean: 10.21		
Total		69	100%

Although the majority of these children did not suffer from post-traumatic symptoms, 7.2% of them showed symptoms that suggest the presence of post-traumatic stress (Table 2). The most commonly reported symptom was the fear of situations or places that reminded them of the event (n=24, 34.7%). Also, the children were discovered to be least affected by frequent mood swings (n=5, 7.2%).

Table 2: *Prevalence of Post-Traumatic Symptoms (PTS)*

Classification	N	%
No obvious PTS (total score <27)	56	81.2
Borderline PTS (total score between 27-35)	8	11.6
Suggestive of PTS (total score >35)	5	7.2

Analyzing the data further, it seemed that age and gender were not correlated with an increased risk of post-traumatic symptoms. However, the difference in ethnicity was discovered to be significantly correlated with higher PTS scores ($r=.536$, $p<0.01$), as seen in Table 3. The researchers also found out that children from the seaside village of Kayumalue where the tsunami occurred had no obvious post-traumatic symptoms, while children from the mountainous region of JonoOge, which experienced soil liquefaction, were significantly affected by PTSD ($p<0.05$).

Table 3: *Correlation of the Post Traumatic Symptoms Score with Age, Gender, and Ethnic Tribe*

Correlations					
		PTSScore	Age	Gender	Ethnic Tribe
PTSScore	Pearson Correlation	1	.057	.017	.536**
	Sig. (2-tailed)		.644	.889	.000
	N	69	69	69	69
Age	Pearson Correlation	.057	1	-.134	-.010
	Sig. (2-tailed)	.644		.272	.937
	N	69	69	69	69
Gender	Pearson Correlation	.017	-.134	1	-.046
	Sig. (2-tailed)	.889	.272		.710
	N	69	69	69	69
Ethnic Tribe	Pearson Correlation	.536**	-.010	-.046	1
	Sig. (2-tailed)	.000	.937	.710	
	N	69	69	69	69
**. Correlation is significant at the 0.01 level (2-tailed).					

5. Discussion

Mental health problems can occur following natural disasters. In particular, the occurrence of the mental condition called PTSD in affected populations is extremely common. Two extreme ages, namely the younger children and older adults, those in the lower socioeconomic strata, and people who suffer from previous mental health problems are comparatively more vulnerable to mental illnesses like PTSD after a post-traumatic event (Asim, Mekkodathi, Sathian, Elayedath, Kumar, Simkhada and Van, 2019). Moreover, the geographical site of countries that lie in the Pacific Ring of Fire, including Indonesia, make them susceptible to experiencing earthquakes and volcanic eruptions. Hence, people from these countries are at greater risk of developing PTSD (WHO, 2018).

In this study, the researchers identified a number of children and adolescents from Palu, Indonesia who survived the 2018 major earthquake, tsunami, and liquefaction as having symptoms of post-traumatic stress. Previous studies have found a huge range in the prevalence of PTSD in children and adolescents following earthquakes, particularly ranging from 4.5% to 95% (Heetkamp and de Terte, 2015), and the value obtained by the researchers fell within that range. This means it is in keeping with recent findings.

Having said that, it is intriguing that the condition can have such a diverse range of prevalence and is not an isolated incident. For example, studies reported that the prevalence of PTSD after the super-cyclone Orrisa, the Gujarat earthquake, the Tamil Nadu tsunami, and the Bihar flood is higher than the total number of diagnosed PTSD cases prior to these natural disasters, with studies found in other countries having generally the same results under the same circumstances (Chadda, Malhotra, Kaw, Singh & Sethi, 2007; Rajkumar, Mohan & Tharyan, 2013). Why is this so? Some believed that it is not the event themselves, but rather, the consequences of such events that may play a role in the causation of PTSD. For instance, the population affected by natural disasters may suffer from unseen stresses, such as physical injuries, fear of dying, and loss of loved ones, as well as social and economic burdens, due to the various effects of such events (Norris, Friedman, Watson, Byrne, Diaz & Kaniasty, 2002; Bhugra & Van, 2006).

On the other hand, it is also possible that the symptoms of PTSD itself are the cause of the difficult circumstances in the aftermath of disasters. For example, people who survived a major traumatic event, like a tsunami or earthquake, may report difficulty in sleeping or experience nightmares and flashbacks. Moreover, they may experience behavioral and emotional difficulties, such as having a low mood, loss of concentration, self-isolation, substance abuse, and difficulty in thinking straight. These difficulties will be reflected in their social and family life, as well as cause deterioration in their job performance. If these symptoms persist, or/and are severe enough to impair their daily activities, it may eventually lead them to suicidal tendencies (LeBouthillier et al., 2015).

Studies also showed that certain communities in some areas are more affected by traumatic events than others, as they reported a higher tendency to develop PTSD and other mental illnesses (Gruebner *et al.*, 2015). Most of the time, these areas are populated by ethnic minority groups and the socially disadvantaged, which in turn highlights the role of socioeconomic status and social support in the development of PTSD (Atwoli *et al.*, 2015; Tsujiuchi *et al.*, 2016). Again, traumatic events cause more harm than physical injury, as well as cause damage to properties, loss of jobs, displacement, relationship disruption, separation between parents and children, and even distrust in authorities

(Andersson *et al.*, 2005; Samarasinghe, 2006). These were also observed in this study, in which it was found that the children who belong to the ethnic tribes in JonoOge suffered significantly more PTSD symptoms than those in Kayumalue.

However, the type of event experienced may have also influenced the development of the condition. Not all traumatic events produce the same effect. In fact, some events showed a higher risk of acquiring PTSD than others. It had been discovered that adverse events caused by humans have a higher possibility of causing PTSD (Charuvastra and Cloitre, 2008) than those caused naturally. For example, 50% of all women who were sexually assaulted developed PTSD symptoms, which is higher compared to those who experienced other traumatic events (Chivers-Wilson, 2006). The severity of the disaster can also increase the risk. This may explain why children and adolescents in JonoOge significantly showed more PTSD symptoms than those from Kayumalue. The soil liquefaction that occurred was, in fact, more damaging than the earthquake itself, and this perhaps is the more likely explanation as to why those in JonoOge were more affected.

Another possible explanation may lie in terms of the response to the event itself. According to Joseph (2011), the usual human response to traumatic events is resilience. In other words, the usual product of adverse experiences is that the person will learn from it and become a better and stronger person. Hence, most people will be able to cope with traumatic events successfully, but some still have a chance to develop PTSD (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995, Zlotnick, Mattia, & Zimmerman, 2001). In addition, some researchers are in agreement that it is not only PTSD that is common among those populations, but also other mental health issues, such as major or minor depression, various personality disorders, generalized anxiety disorder, and substance abuse (Bishop, Benz, & Reed, 2017; Bryant *et al.*, 2010; Zlotnick *et al.*, 2001).

Looking at this study's results, although there were no correlations present between PTSD and the age and gender in the selected population, it is possible that this is due to the small number of participants in the study. This is admittedly one of its limitations. Hence, more studies need to be done involving a larger and more widespread sample population so that the full extent of the problem can be better understood.

6. Conclusion

PTSD may develop following exposure to traumatic events. Children, adolescents, those from certain ethnic minorities, and those who experienced a more severe traumatic event are at an increased risk of developing PTSD. However, more studies need to be done in order to establish the full extent of the problem and determine how best to intervene.

References

Trauma Type and Suicidal Ideation: The Mediating Effect of Cognitive Distortions. Available from: https://www.researchgate.net/publication/331603072_Trauma_Type_and_Suicidal_Ideation_The_Mediating_Effect_of_Cognitive_Distortions [accessed Aug 05 2019].

LeBouthillier, D. M., McMillan, K. A., Thibodeau, M. A., & Asmundson, G. J. G. (2015). Types and number of traumas associated with suicidal ideation and suicide attempts in PTSD: Findings from a U.S. nationally representative sample. *Journal of Traumatic Stress*, 28, 183–190. <http://dx.doi.org/10.1002/jts.22010>

Zlotnick, C., Mattia, J., & Zimmerman, M. (2001). Clinical features of survivors of sexual abuse with major depression. *Child Abuse and Neglect*, 25, 357–367. [http://dx.doi.org/10.1016/S0145-2134\(00\)00251-9](http://dx.doi.org/10.1016/S0145-2134(00)00251-9)

Joseph, S. (2011). *What doesn't kill us: The new psychology of posttraumatic growth*. New York, NY: Basic Books.

Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry*, 52, 1048–1060. <http://dx.doi.org/10.1001/archpsyc.1995.03950240066012>

Bryant, R. A., O'Donnell, M. L., Creamer, M., McFarlane, A. C., Clark, C. R., & Silove, D. (2010). The psychiatric sequelae of traumatic injury. *The American Journal of Psychiatry*, 167, 312–320. <http://dx.doi.org/10.1176/appi.ajp.2009.09050617>

Bishop, L. S., Benz, M. B., & Reed, K. M. P. (2017). The impact of trauma experiences on posttraumatic stress disorder and substance use disorder symptom severity in a treatment-seeking sample. *Professional Psychology: Research and Practice*, 48, 490–498. <http://dx.doi.org/10.1037/pro0000165>

https://www.who.int/environmental_health_emergencies/natural_events/en/

<http://www.searo.who.int/indonesia/areas/emergencies/earthquake/en/>

https://en.wikipedia.org/wiki/2018_Sulawesi_earthquake_and_tsunami

Asim M, Mekkodathil M, Sathian B, Elayedath R, Kumar RN, Simkhada P, van Teijlingen E. Post-Traumatic Stress Disorder among the Flood Affected Population in Indian Subcontinent. *Nepal J Epidemiol*. 2019;9(1); 755-758.

Doocy S, Gorokhovich Y, Burnham G, Balk D, Robinson C. Tsunami mortality estimates and vulnerability mapping in Aceh, Indonesia. *Am J Public Health*. 2007;97:S146–S151

Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak: part I: an empirical review of the empirical literature, 1981–2001. *Psychiatry*. 2002;65:207–239.

Bhugra D, Van Ommeren M. Mental health, psychosocial support, and the tsunami. *Int Rev Psychiatry*. 2006;18(3):213–216.

Usami M, Iwadare Y, Kodaira M, et al. Relationships between traumatic symptoms and environmental damage conditions among children 8 months after the 2011 Japan earthquake and tsunami. Campolongo P, ed. *PLoS ONE*. 2012;7(11):e50721–7. <https://doi.org/10.1371/journal.pone.0050721>

Marthoenis M1, Ilyas A2, Sofyan H3, Schouler-Ocak M4. Prevalence, comorbidity and predictors of post-traumatic stress disorder, depression, and anxiety in adolescents following an earthquake. *Asian J Psychiatr*. 2019 May 24;43:154-159. doi: 10.1016/j.ajp.2019.05.030. [Epub ahead of print] <https://www.ncbi.nlm.nih.gov/pubmed/31163313>

John PB, Russell S, Russell PSS. The prevalence of posttraumatic stress disorder among children and adolescents affected by tsunami disaster in Tamil Nadu, Disaster Manag Response. 2007;5(1):3-7. <https://doi.org/10.1016/j.dmr.2006.11.001> PMID:17306747

Kumar MS, Murhekar MV, Hutin Y, Subramanian T, Ramachandran V, Gupte MD. Prevalence of posttraumatic stress disorder in a coastal fishing village in Tamil Nadu, India, after the December 2004 tsunami. *Am J Public Health*. 2007;97(1):99-101. <https://doi.org/10.2105/AJPH.2005.071167> PMID:17138927 PMCID: PMC1716229

Chadda RK, Malhotra A, Kaw N, Singh J, Sethi H. Mental health problems following the 2005 earthquake in Kashmir: findings of community-run clinics. *Prehosp Disaster Med*. 2007;22(6):541-5. <https://doi.org/10.1017/S1049023X00005409> PMID:18709944

Rajkumar AP, Mohan TS, Tharyan P. Lessons from the 2004 Asian tsunami: epidemiological and nosological debates in the diagnosis of post-traumatic stress disorder in non-western post-disaster communities. *Int J Soc Psychiatry*. 2013;59(2):123-9. <https://doi.org/10.1177/0020764011423468> PMID:21997766

Math SB, Nirmala MC, Moirangthem S, Kumar NC. Disaster management: mental health perspective. *Indian J Psychol Med*. 2015;37(3):261–271. doi: 10.4103/0253-7176.162915. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

Usami M, Iwadare Y, Kodaira M, et al. Relationships between traumatic symptoms and environmental damage conditions among children 8 months after the 2011 Japan earthquake and tsunami. *PLoS ONE*. 2012;7(11):e50721–e50727. doi: 10.1371/journal.pone.0050721. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

Udomratn P. Mental health and the psychosocial consequences of natural disasters in Asia. *Int Rev Psychiatry*. 2008;20(5):441–444. doi: 10.1080/09540260802397487. [PubMed] [CrossRef] [Google Scholar]

Marthoenis M1, Ilyas A2, Sofyan H3, Schouler-Ocak M4. Prevalence, comorbidity and predictors of post-traumatic stress disorder, depression, and anxiety in adolescents following an earthquake. <https://www.ncbi.nlm.nih.gov/pubmed/29861052>

Xu J1, Wang Y2, Tang W3. Posttraumatic stress disorder in Longmenshan adolescents at three years after the 2013 Lushan earthquake. *Gen Hosp Psychiatry*. 2018 Sep - Oct; 54:45-51. doi: 10.1016/j.genhosppsy.2018.05.009. Epub 2018 May 27. <https://www.ncbi.nlm.nih.gov/pubmed/26327455>

Zhang Y1, Zhang J1, Zhu S2, Du C3, Zhang W1. Prevalence and Predictors of Somatic Symptoms among Child and Adolescents with Probable Posttraumatic Stress Disorder: A Cross-Sectional Study Conducted in 21 Primary and Secondary Schools after an Earthquake. *PLoS One*. 2015 Sep 1;10(9): e0137101. doi:10.1371/journal.pone.0137101. eCollection 2015. <https://www.ncbi.nlm.nih.gov/pubmed/26863863>

Heetkamp, T and de Terte, I. PTSD and Resilience in Adolescents after New Zealand Earthquakes. *New Zealand Journal of Psychology* Vol. 44, No. 1, March 2015

Charuvastra, a., Cloitre, M., 2008. Social Bonds and Posttraumatic Stress Disorder. *Annu. Rev. Psychol.* 59, 301–328. doi:10.1146/annurev.psych.58.110405.085650.Social

Chivers-Wilson, K. a., 2006. Sexual assault and posttraumatic stress disorder: A review of the biological, psychological and sociological factors and treatments. *McGill J. Med.* 9, 111–118.

60. doi:10.1007/s10865-012-9400-x

Gruebner, O., Lowe, S.R., Sampson, L., Galea, S., 2015. The geography of post-disaster mental health: spatial patterning of psychological vulnerability and resilience factors in New York City after Hurricane Sandy. *Int. J. Health Geogr.* 14, 16. doi:10.1186/s12942-015-0008-6

Atwoli, L., Stein, D., Koenen, K.C., McLaughlin, K.A., 2015. Epidemiology of posttraumatic stress disorder: prevalence, correlates and consequences. *Curr. Opin. Psychiatry* 28, 307–311.

Tsujiuchi, T., Yamaguchi, M., Masuda, K., Tsuchida, M., Inomata, T., Kumano, H., Kikuchi, Y., Augusterfer, E.F., Mollica, R.F., 2016. High Prevalence of Post-Traumatic Stress Symptoms in Relation to Social Factors in Affected

Population One Year after the Fukushima Nuclear Disaster. PLoS One 11, e0151807.
doi:10.1371/journal.pone.0151807

Andersson, A.-L., Dahlbäck, L.-O., Bunketorp, O., 2005. Psychosocial aspects of road traffic trauma--benefits of an early intervention? Injury 36, 917–26. doi:10.1016/j.injury.2004.09.019

Samarasinghe, D., 2006. Different Disasters, Different Needs. Int. Psychiatry 3, 8–11.