**Title Page**

**Title:** Post Traumatic Stress Disorder among the survivors after one year of 2015 earthquake in Nepal: A cross sectional study.

**Authors:**

1Manisha Chalise

Assitant Professor

School of Health & Allied Sciences

Pokhara, Nepal.

[manishachalise@pu.edu.np](mailto:manishachalise@pu.edu.np)

2Nanda Lal Gupta

Head of Department

Department of Psychology

Eternal University, Himachal Pradesh, India.

[drnlg.sml@gmail.com](mailto:drnlg.sml@gmail.com)

Corresponding Author: Manisha Chalise

**Declaration**

**Ethics approval and consent to participate:** Ethical Consideration for the study was obtained from the Research Degree Committee of Akal College of Health and Allied Sciences, Eternal University, Himanchal Pradesh, India. Furthermore, approval for the study was obtained from District Public Health Office, Gorkha and Village Development Committee in case of need.

Since many of the people living in this part of the Nepal were illiterate, informed consent was obtained in oral form from each respondent before conduction of the survey. Respondents were informed about purpose of the study and only those willing to participate were included in the survey. Because of this limitation data was also collected using interview method. The research ethics committee knew about the limitation and approved this method of informed consent.

**Consent for public:** Not applicable

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**Abstract**

On April 25, 2015, an earthquake of magnitude 7.8 struck Nepal with epicenter in Barpak VDC of Gorkha district, Nepal. This cross-sectional study was carried out among 246 survivors of Gorkha district to assess prevalence of PTSD after one year of the earthquake. Standard Checklist, Post Traumatic Stress Disorder Cheklist- Specific (PCL-S) was used for the assessment of prevalence of PTSD.

The study revealed mean PTSD score of 29.3374+ 8.36 where 21% respondents showed moderate or severe symptoms of PTSD. Factors like education, occupation, felt risk to life, injury, witnessed death, death of close ones and stay at temporary settlement showed significant association with PTSD. Since more than one fifth of the respondents showed signs of PTSD even after a year of incident, effective program should be implemented to address such psychological need of the survivors by the government as well as private sectors.

**Key words:** PTSD, Nepal, Earthquake, Gorkha

**Introduction**

An earthquake of 7.8 struck Nepal on april 25, 2015. Barpak VDC of Gorkha district was the epicenter of Nepal earthquake. Along with many aftershocks, on May 12th 2015, another major earthquake of 7.3 Richter scale struck again, in Dolakha district of Nepal. The earthquakes severely impacted 14 out of the 75 districts in the country. As of June 2015, the Government of Nepal reported destruction of 505,745 house and 279,330 houses damaged by both major earthquakes. The earthquakes killed 8,702 people and injured thousands of people (1,2).

It is estimated that more than 70% of the earthquake survivors develops pervasive conditioned fear after exposure to unpredictable and uncontrollable earthquake and subsequent aftershocks. Some studies has shown that general distress syndrome that appeared after earthquake return to normal after 12 months but post traumatic stress reactions do not fade until 18 months after the earthquake. PTSD is an anxiety disorder triggered by terrifying or highly unsafe experiences like earthquake. With reference to many studies it can be said that the prevalence of PTSD varies widely among survivors of major earthquakes. For instance, prevalence of PTSD symptoms were found to be as high as 92% in adults, while in children, as many as 95% and as few as 4.5%(3, 4, 5, 6).

Not all people exposed to traumatic event develop PTSD. There are some other contributing factors like demographic variables, pre disaster factors, disaster related factors, post disaster factors and other factors such as elevated norepinephrine and chronically low levels of cortisol might play role for the onset of PTSD in a person. (7-17)

Physical damage of earthquake like death, collapsed buildings and crush injuries are obvious. The mental scars that arise from traumatic events are often invisible, especially in country like Nepal where issues like mental and psychosocial health has always been in shadow. Mental health of the people of Nepal can be more affected by certain pre existing social norms and culture of Nepal. Social stratification including caste discrimination, gender based discrimination may be a barrier to equitable delivery of services. A history of human rights abuses that may be exacerbated during the earthquake, such as human trafficking, may be challenged. The high burden of mental illness prior the earthquake may be challenged when providing post earthquake services. Mental health & psychosocial problems prior to traumatic exposure increase the risk of PTSD, substance abuse and other problems after trauma (1, 18).

**Methodology**

**Aim**

To assess the prevalence of PTSD among residents of Gorkha district after one year of the 2015 earthquake in Nepal.

**Study Design**

Cross sectional descriptive study was carried out from April to June 2016 to assess the prevalence of PTSD among earthquake survivors of Gorkha district. Barpark VDC (Village Development Committee) of Gorkha district was the epicenter of 25th April, 2015 Nepal earthquake. Government of Nepal reported 412 people killed and 1,034 injured in Gorkha district (19) making it one of the highly affected area by the earthquake. Hence Gorkha district was selected for the assessment of PTSD.

A sample of 249 earthquake survivors between 15 to 70 years of age from specified VDCs of Gorkha district were initially estimated for the study, but 3 respondents withdrew at the mid of the interview. Thus, ultimately 246 respondents was the total sample size of the study. Estimated prevalence of PTSD by WHO after any such disaster was 15-20%(20). Hence, our sample size was calculated on the basis of an assumed PTSD prevalence of 17.5%. People who were present in the house during survey and gave consent to participate in the survey were included in the study. Whereas, those who were involved in pilot study and those having hearing, speaking, cognitive or severe mental disability were excluded from the study.

Households were used as the primary sampling unit. Multistage sampling was adopted as the appropriate sampling technique. Due to geographical constraints and poor transportation facilities, only five VDCs from the Gorkha District; namely Takumajh Lakurikot, Srinathkot, Taple, Bungkot, Saurpani, were selected as per the convenience. In second stage systematic selection of 3 wards from each VDC was done (each VDC consist of 9 wards). From each wards 24/23 households were selected systematically in third stage. In stage four, random selection of one individual from each selected household was done as per the inclusion and exclusion criteria.

**Data Collection Tools and Techniques**

Standard instrument, Post Traumatic Stress Disorder Checklist (PCL)- S (Specific Traumatic Event) was used to assess the prevalence of PTSD. The PCL-S is a 17 item self report checklist of PTSD symptoms developed by Weathers.F.W et.al for DSM-IV in National Center for PTSD-Behavioural Science Division in 1991 for evaluating experience of people who faced traumatic events like natural disaster. Individuals would rate each item from 1 (not at all) to 5 (extremely) to indicate the degree to which they have been bothered by that particular symptom over the past month. Total possible score range from 17 to 85. This checklist has an excellent internal consistency (0.82-0.97) and excellent test retest reliability (21). In this study a person with score between 35 to 50 were categorized as having moderate PTSD symptoms whereas those scoring more than 50 were classified as having severe PTSD symptoms. In addition to PCL-S checklist, other socio-economic variables, experience of the earthquake and external support received afterwards were also included in the research tool which was validated by professors and subject experts.

Pilot study was carried out in 10% of the estimated respondents in Gorkha Municipality, which was also highly affected by the earthquake. Kopila Nepal is a local Non Governmental Organizations that is working for the psychosocial wellbeing of the vulnerable people in Kaski district Nepal. Data collection was carried out by the trained psychological counselors of Kopila Nepal working in Gorkha district. Counselors were oriented about the purpose of the study and data collection technique before the actual collection of data. As the research tool was translated to Nepali language it was validated for its accuracy and feasibility by local bilingual mental health experts. Verbal informed consent was obtained from each respondent before conduction of survey as majority of the respondents was illiterate.

**Statistical Analysis**

Collected data were verified and coded daily after completing the field activities. Data entry and analysis were done in Statistical Package for Social Sciences (SPSS) version 21.0 Descriptive statistics such as frequency distribution, proportions and means were calculated to describe the demographic characteristics of the sample population. Cross tabulation of data, Odds Ratio and Chi-square were applied to test statistical significance between dependent and independent variables.

**Result**

In this study, 44% of the respondents were male; 77% were Hindu, 20% Buddhist and 2% Christian; 26% were illiterate and 9% had education above secondary level; 12% of the respondents were elderly group of 60 years and above. Agriculture was the main source of livelihood (67%) followed by service (10%), labour (8%) and remittance (5%).

As per the impact of the earthquake, 52% of the respondents felt their life was at risk during the earthquake, majority (52%) said that they received some physical or emotional support and about 37% reported they provided physical or emotional support to others immediately after earthquake; 5% of the respondents said they were injured by the quake. When asked about loss of life, 22% lost their close family members or friend and 12% reported to see someone's death or dead body. In our survey, 87% of the houses were either totally destroyed or partially damaged. Most of the houses damaged were made up of mud and stones with no strong foundation. Almost 61% of the respondents said they could not reconstruct their house and were staying at temporary settlement even after one year of the earthquake.

Figure 1 Prevalence of Post Traumatic Stress Disorder among Respondents

Analyzing the score received by the respondents on PCL-S (Figure 1), 46 respondents (19%) showed moderate symptoms of PTSD whereas, 4 (2%) of the respondents showed severe PTSD symptoms in our survey. The study revealed mean PTSD score of 29.337 + 8.36 with PTSD score ranging from 17 to 75 out of 85.

Table 1 Symptoms of PTSD Felt by Respondents

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.N** | **Symptoms** | **Not at all**  **n(%)** | **Little bit**  **n(%)** | **Moderately**  **n(%)** | **Quite a bit n(%)** | **Extremely n(%)** |
| **1** | **Repeated, disturbing memories, thoughts or images of earthquake.** | 93 (37.8) | 72 (29.3) | 34 (13.8) | 27 (11) | 20 (8.1) |
| **2** | **Repeated disturbing dreams of earthquake.** | 87 (35.4) | 104 (42.3) | 30 (12.2) | 19 (7.7) | 6 (2.4) |
| **3** | **Suddenly acting or feeling as if earthquake is happening again.** | 78 (31.7) | 98 (39.8) | 52 (21.1) | 11 (4.5) | 7 (2.8) |
| **4** | **Feeling upset when reminded of earthquake?** | 109 (44.3) | 66 (26.8) | 48 (19.5) | 15 (6.1) | 8 (3.3) |
| **5** | **Physical reaction (e.g. heart pounding, trouble breathing etc.) when reminded of earthquake.** | 87 (35.4) | 71 (28.9) | 44 (17.9) | 26 (10.6) | 18 (7.3) |
| **6** | **Avoid thinking or talking about earthquake.** | 176 (71.5) | 54 (22) | 12 (4.9) | 2 (0.8) | 2 (0.8) |
| **7** | **Avoid situation that remind you of earthquake.** | 182 (74) | 43 (17.5) | 14 (5.7) | 2 (0.8) | 5 (2.0) |
| **8** | **Trouble remembering important parts of earthquake** | 137 (55.7) | 74 (30.1) | 26 (10.6) | 3 (1.2) | 6 (2.4) |
| **9** | **Loss of interest in things that you used to enjoy.** | 203 (82.5) | 31 (12.6) | 6 (2.4) | 4 (1.6) | 2 (0.8) |
| **10** | **Feeling distant or cut off from other people.** | 196 (79.7) | 37 (15) | 8 (3.3) | 4 (1.6) | 1 (0.4) |
| **11** | **Feeling emotionally numb** | 212 (86.2) | 26 (10.6) | 8 (3.3) | - | - |
| **12** | **Feeling as if future will somehow be cut short.** | 150 (61) | 59 (24.0) | 15 (6.1) | 15 (6.1) | 7 (2.8) |
| **13** | **Trouble falling or staying asleep** | 116 (47.2) | 65 (26.4) | 38 (15.4) | 17 (6.9) | 10 (4.1) |
| **14** | **Feeling irritable or having angry outburst.** | 123 (50) | 50 (20.3) | 36 (14.6) | 29 (11.8) | 8 (3.3) |
| **15** | **Difficulty concentrating** | 164 (66.7) | 60 (24.4) | 12 (4.9) | 7 (2.8) | 3 (1.2) |
| **16** | **Being "Super alert" or watch on guard?** | 109 (44.3) | 68 (27.6) | 28 (11.4) | 35 (14.2) | 6 (2.4) |
| **17** | **Feeling jumpy or startled.** | 158 (64.2) | 47 (19.1) | 23 (9.3) | 14 (5.7) | 4 (1.6) |

Among different symptoms shown by the respondents (Table 1) as per PCL-S checklist, most of the extremely felt symptoms were repeated disturbing memories, thoughts or image of earthquake and physical reaction (e.g. heart pounding, trouble breathing etc.) when reminded of earthquake. Feelings like being super alert, feeling irritable, repeated disturbing memories of earthquake and physical reactions were most common symptoms felt quite a bit. Suddenly acting or feeling as if earthquake is happening again, feeling upset when reminded of earthquake, physical reactions when reminded of earthquake, trouble falling or staying asleep, feeling irritable, being super alert were most of the moderately felt symptoms by the respondents.

Education (Table 2) showed negative significant relation with PTSD (p<0.05, OR 2.444) in our study i.e. those who had higher education showed symptoms of PTSD in comparison to people with lower educational status. Occupation was another variable that showed significant relation with PTSD (p<0.05, OR 2.457) showing higher prevalence of PTSD among those involved in other occupation than agriculture. All other socio-demographic characteristics like sex, age and religion didn't show any association with PTSD. In table number 2, PTSD category I refers to those who showed mild symptoms of PTSD (score<35), PTSD category II refers to cases who showed moderate and severe symptoms of PTSD (score 35 and more) and OR refers to Unadjusted Odds Ratio.

Table 2 Association of PTSD with Different Socio-demographic Characteristics

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.N** | **Socio-demographic Variables** | **PTSD cat I**  **n(%)** | **PTSD cat II**  **n(%)** | **Chi-square** | **p-value** | **OR** | **95% CI** |
| **1.** | **Age** |  |  |  |  |  |  |
|  | **<60 years** | 169 (78) | 47 (22) | - | - | - | - |
|  | **60 years or above** | 27 (90) | 3 (10) |  |  |  |  |
| **2.** | **Sex** |  |  |  |  |  |  |
|  | **Male** | 85 (78) | 24 (22) | 0.346 | 0.556 | 0.830 | 0.445-1.546 |
|  | **Female** | 111 (81) | 26 (19) |  |  |  |  |
| **3.** | **Education** |  |  |  |  |  |  |
|  | **Primary or low** | 154 (84) | 30 (16) | 7.289 | 0.007\* | 2.444 | 1.226-4.733 |
|  | **Secondary or above** | 42 (68) | 20 (32) |  |  |  |  |
| **4.** | **Religion** |  |  |  |  |  |  |
|  | **Hindu** | 157 (82) | 34 (18) | 3.361 | 0.067 | 1.894 | 0.950-3.777 |
|  | **Non-Hindu** | 39 (71) | 16 (29) |  |  |  |  |
| **5.** | **Occupation** |  |  |  |  |  |  |
|  | **Agriculture** | 143 (85) | 26 (15) | 7.25 | 0.007\* | 2.457 | 1.267-4.768 |
|  | **Other** | 47 (69) | 21 (31) |  |  |  |  |

Experiences like perceived risk to life felt by the respondents during earthquake showed significant association with PTSD (p<0.001, OR 4.176) (Table 4). Injury during earthquake (p<0.001, OR 7.276), death of family member/friend/relatives (p<0.001, OR< 7.348), witnessed someone's death or dead body (p<0.05, OR 2.329) and stay at temporary settlement (p<0.001, OR 4.408) until the study time period are other experiences of earthquake that showed significant relationship with PTSD (Table 3).

Table 3Association of PTSD with Experiences of Earthquake

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.N** | **Experiences of Earthquake & Work Done Afterward** | **PTSD cat I n(%)** | **PTSD cat II n(%)** | **Chi-square** | **p-value** | **OR** | **95% CI** |
| **1.** | **Felt Risk to Life** |  |  | **16.440** | **<0.001\*\*** | **4.176** | **2.021-8.628** |
|  | **No** | 106 (91) 11 | 11 (8) |
|  | **Yes** | 90 (70) | 39 (30) |
| **2.** | **Received Help Immediately** |  |  | 0.396 | 0.529 | - | - |
|  | **No** | 96 (81) | 22 (19) |
|  | **Yes** | 100 (78) | 28 (22) |
| **3.** | **Helped Others** |  |  | 9.728 | 0.002\* | 2.687 | 1.426-5.064 |
|  | **No** | 133 (86) | 22 (14) |
|  | **Yes** | 63 (69) | 28 (41) |
| **4.** | **Got Injured** |  |  |  | <0.001\*\* | 7.276 | 2.26-23.35 |
|  | **No** | 191 (82) | 42 (18) | 14.396 |
|  | **Yes** | 5 (38) | 8 (62) |  |
| **5.** | **Death of Close Ones** |  |  |  | <0.001\*\* | 7.348 | 3.69-14.63 |
|  | **No** | 169 (88) | 23 (12) | 37.622 |
|  | **Yes** | 27 (50) | 27 (50) |  |
| **6.** | **Injury to Family or Friends** |  |  |  | 0.064 | - | - |
|  | **No** | 180 (81) | 41 (19) | 3.419 |
|  | **Yes** | 15 (65) | 8 (35) |  |
| **7.** | **Witness Someone's Death or Dead body** |  |  |  | 0.044\* | 2.329 | 1.006-5.390 |
|  | **No** | 177 (82) | 40 (18) | 4.069 |
|  | **Yes** | 19 (66) | 10 (34) |  |
| **8.** | **House Damaged or Destroyed** |  |  |  | - | - | - |
|  | **No** | 29 (94) | 2 (6) | - |
|  | **Yes** | 167 (78) | 48 (22) |  |
| **9.** | **Stay at Temporary Settlement** |  |  | 14.619 | <0.001\*\* | 4.408 | 1.967-9.878 |
|  | **No** | 89 (92) | 8 (8) |
|  | **Yes** | 106 (72) | 42 (28 |

In our survey, respondent's perception of suffering from mental disorder after earthquake showed high significant association (p<0.001, OR 3.894) with PTSD. Experience of traumatic event (p<0.007) before the earthquake also showed significant relation with symptoms of PTSD.(Table 4). It shows that those who faced any traumatic events during their life are more vulnerable to conditions like PTSD after disasters like earthquake.

Table 4 Association of PTSD with Different Psychological Experiences

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.N** | **Psychological Experiences** | **PTSD cat I n(%)** | **PTSD cat II n(%)** | **Chi-square** | **p-value** | **OR** | **95% CI** |
| **1.** | **Perceived mental health problem after earthquake** |  |  |  |  |  |  |
|  | **No** | 160 (86) | 27 (14) | 17.330 | <0.001\*\* | 3.894 | 2.00-7.57 |
|  | **Yes** | 35 (60) | 23 (40) |  |  |  |  |
| **2.** | **Any accident or mishap before earthquake** |  |  |  |  |  |  |
|  | **No** | 184 (82) | 41 (18) | 7.198 | 0.007\* | 3.366 | 1.33-8.51 |
|  | **Yes** | 12 (57) | 9 (43) |  |  |  |  |

**Discussion**

The cross-sectional descriptive study designed to assess the prevalence of PTSD among 246 earthquake survivors of Gorkha district found 21% PTSD after one year of earthquake with 19% moderate symptoms and 2% severe symptoms of PTSD. Prevalence rate of PTSD symptoms in our survey is similar to the study of Turkey earthquake (23%)(22) after 13 months of incident but it is lower than the study of 2004 Indian Ocean tsunami(23) which is reported 37% after 15-19 months. However in similar study after 3 months of the Bam earthquake(24) the prevalence rate was reported to be (higher than this study) 89.2%, where 34% had severe, 38% moderate and 28% mild symptoms of PTSD. Similarly prevalence rate of symptoms of PTSD among survivors of earthquake in China(25) after 3 years was 5% PTSD and 11% of partial PTSD. It can be inferred that the prevalence of PTSD among survivors of Nepal might decline with passage of time as per the trend in studies in different time period after earthquake, we have discussed above.

In a study of Taiwan earthquake(26) and Peru earthquake(27) female had significantly higher prevalence rate of PTSD than men. Similarly in study after 3 months of Sichuan earthquake in China(14), PTSD was found significantly associated with female gender, sub-nationality and lower educational level. In contrast to these studies, neither of the sex showed significant relation with PTSD in our study. Instead, people with higher education level showed symptoms of PTSD than those with lower or no education which contradict with study findings of Sichuan China. More tendencies of educated people to consult Medias and newspaper and discuss about the severity of the situation than those with less education might be reason behind higher prevalence of PTSD among educate people of Nepal. Most of the Nepalese people in rural areas are involved in agricultural farming for their livelihood. The earthquake destroyed their houses, still they had means of livelihood through agriculture hence this might be the reason that for higher prevalence of PTSD symptoms among those involved in other occupation than agriculture.

Experience and activities after earthquake like perceived risk to life, helped others immediately after earthquake, injury, death of family member/friend/relative, witnessed someone's death or dead body and stayed at temporary settlement showed highly significant relationship with PTSD. These findings get support from other similar studies, Whenchaun earthquake(7), Peru earthquake(27) and 2008 earthquake in China(25) where loss of houses and property, being injured, deaths of family members, and witness of death or those confronted with dead bodies and joblessness were found to be significantly associated with symptoms of PTSD.

Perceived mental health problem after earthquake and traumatic events like death of family member or accident before the earthquake were significantly associated with PTSD. In study carried out among destitute women earthquake survivors in Pakistan(28), factors like history of previous trauma and previous history of psychiatric illness were significantly associated with psychiatric morbidity of the respondents, which supports our study although in the former study population was only destitute women survivors.

**Conclusion**

Psychological effect of the Nepal earthquake on survivors was evident even after one year of the incident. About one fifth of the respondents showed either moderate or severe symptoms of PTSD. Along with physical needs, thorough assessment of mental health condition of survivors is also important after such incidences. Moreover, people were living in temporary settlements even after one year of earthquake and there is no certainty when these people will get financial assistance from the government to rebuilt and renovate their houses, which can impact the mental well being of people even in coming days as well. Government need to conduct extensive research to diagnose potential mental health problem among survivors and effective intervention need to be designed to address people suffering from such problem.

**Declaration**

**Ethics approval and consent to participate:** Ethical Consideration for the study was obtained from the Research Degree Committee of Akal College of Health and Allied Sciences, Eternal University, Himanchal Pradesh, India. Furthermore, approval for the study was obtained from District Public Health Office, Gorkha and Village Development Committee in case of need.

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**Competing interests:** There is no any competing interest for the publication of this manuscript.

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