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ORIGINAL ARTICLE

Prevalence and Risk Factors of Post-Traumatic Stress Disorders among the Survivors of 2015 Nepal Earthquake, in Dhading, Nepal

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ABSTRACT

Background: Nepal is considered to be the 11th most earthquake prone country in the world. On Saturday, 25 April2015 an earthquake of magnitude 7.9 on Richter scale struck in Barpak of central Nepal. It results over 8,790 casualties and 22,300 injuries. Mental health disturbances, especially post-traumatic stress disorders are major public health issues arising in the aftermath of such natural disasters of higher intensity. Aim of this study was to investigate the prevalence of posttraumatic stress disorders (PTSD) and perceived social support, their risk factors and relationship of PTSD to perceived social support among survivors of the Barpak earthquake in Dhading District, Nepal.

Methods: Cross sectional study was conducted among the five hundred and thirty-five survivors from the rural Dhading District. A conjoint study tool had been administered for evaluating Post traumatic stress disorders and perceived social support by using the PTSD Checklist-Civilian Version (PCL-C) questionnaire and Oslo Social Support Scale. Univariate analysis was done for the description of sample characteristics. Chi-square test was done to establish the association between predictors and outcome variable of interest. Further, binary regression model was used to adjust the confounders.

Results: The prevalence of PTSD among survivors was 18.5%. Significant risk factors of PTSD included gender (females 26.31%, males 11.80%), age (18–35 years 10.85%, 36–59 years 23.89%, ≥60 years 45.09), lost their job or income generating activities of the family(60%). Approximately 62 percent of PTSD was attributable for low social support. Multivariate logistic regression showed that females, older people, lost of job, difficulty in communication were significantly more likely to develop PTSD. Prevalence of the low social support was found to be 25.2%.

Conclusions: Posttraumatic stress symptoms remained relatively common among survivors nine month after Barpak earthquake. It is important to provide psychological aid and social support for survivors to decrease health burden from PTSD, especially for females, old age survivors and those who lost their job and income generation activities.

Keywords: Barpak Earthquake, Posttraumatic stress disorder, Social support

INTRODUCTION

Nepal is considered to be the 11th most earthquake-prone country in the world (Government of Nepal, 2015).

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On Saturday, 25 April 2015, a 7.9 magnitude on the Richter scale earthquake as recorded by Nepal's National Seismological Centre (NSC), struck Barpak in the historic district Gorkha, about 76 km northwest of capital city Kathmandu (United Nations,) Nepal had not faced a violent shock of comparable magnitude for over 80 years. There were over 8,790 casualties and 22,300 injuries, almost one-third of the population of Nepal, have been affected by these earthquake (United Nations,).

Mental health disorders are the key impairment after any distressing events. It is only in the last few decades that

the psychological consequences of earthquake boast external attention. Post traumatic stress disorder (PTSD) usually occurs one month after a disaster and could cause a series of psychological problems, including intrusive re-experiencing, avoidance, numbness and hyper-arousal (Kessler et al., 2005). Large scale disaster like earthquake, tsunami, major floods including man-made disasters like industrial accidents and major wars usually results in PTSD (Ni et al., 2013). Survivors who experienced infrequent disasters will have stress responses such as being at a loss, indolence, apprehension and melancholy (American Psychiatric Association, 2013). PTSD symptoms starts from a few weeks and can lasted for several years. However, some people may not recover due to excessive psychosomatic trauma, therefore repeatedly having symptoms of numbness, increased attentiveness, and loss of reminiscence and cognition, which is distinctive of post-traumatic stress disorder (Ni et al., 2013). The prevalence of PTSD differs according to the time frame, study in Japan after fourteen months of the earthquake shows PTSD prevalence of thirty three percent whereas five years aftermath of the earthquake in China shows 5.3 percent.

Several risk factors have been identified for the prediction of psychopathology principally posttraumatic stress disorders (PTSD) in post disaster setting (Galea et al., 2007). Predictors or risk factors are also one of the foremost concerns in public health after any disaster. These factors can be pigeonholed as pre-event such as prior personal or family history of a mental health disorders, history of exposure to distressing events and life stresses (Fu et al., 2013), peri-event such as loss of family members, loss of property, houses destroyed, loss of family members or close friends, difficulty in contacting loved ones, degree of injury, and witnessing of dead bodies (Sakuma et al., 2015; Norris, Friedman, & Watson, 2002; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008), and post traumatic-event such as loss of financial and perceived social support resources (Norris et al., 2008).

However, there is an existence of individual differences in responses to the same event and many persons does well, even after intense experiences, communities have the potential to function effectively and acclimatize successfully in the aftermath of disasters (Xiong Ke, Liu, & Li, 2010) ; whereas certain population groups, such as those with a pre-disaster history of tough times, may be especially at risk for developing mental health problems after a disaster (Sakuma et al., 2015). The convergence of stresses and traumas, that's regarded as the pre-earthquake experience, peri-earthquake experience and -earthquake experience may lead to the development of post-traumatic stress disorders among the survivors in earthquake affected population. Previous study shows being female, uneducated, and married marital status has been allied with the development of post-traumatic stress disorder (Norris et al., 2008; Sakuma et al., 2015; Tian, Wong, Li, & Jiang, 2014).

Aftermath of an earthquake, it is a common practice to provide peripheral resources including social support to help people cope with the results of the quake. It is commonly believed that perceived social support can uphold the unenthusiastic impact of stressful events on people's wellbeing; social support is painstaking to be the major factor connected with PTSD (Xiong Ke et al., 2010).

Mental health is one of the precedence areas of the policies of the government of Nepal. Mental health policy, having been adopted in Nepal since 1997, but implementation of the policy is being practiced. In ordinary with other low middle income countries, the resources allocated for mental health is trifling. Mental health services are rigorous in the big cities, with 0.22 psychiatrists and 0.06 psychologists per 100,000 population compared to rural areas (Luitel et al., 2015).

PTSD impacts decisively upon the quality of life of an individual resulting in grave functional and emotional impairment. There is a detrimental cost to society with high financial and social consequences from the significantly elevated rates of hospitalization, suicide attempts and alcohol abuse (Davidson, 2000). There is no any published research looking at the post-traumatic stress disorder aftermath of an earthquake in general population of Nepal. Natural disaster leads to unique stresses and problems for general population that deserve them to be investigated and find the solution. Thus this study aimed to find out the prevalence and risk factors of post-traumatic stress disorders among the survivors of 2015 Nepal Earthquake.

METHODS

Participants

All the participants were recruited from Dhading district, which lies in the central part of the country. The people of the district are primarily Brahmin and Chhetri considered as upper caste in the south and Tamang and Gurung thereof lower caste in the north, with much of the centre is habitation for Newars (Central Bereau of Statistics, Nepal, 2012). The sample size was calculated using an Open Epi version three (Dean AG, Sullivan KM, Soe MM., n.d.) considering population size as infinite(N), anticipated prevalence of PTSD taken from Japan (p=33%) (Sakuma et al., 2015), using 5% absolute precision (d), applying design effects for complex sample survey(DEFF) of 1.5 at 95% confidence level. Considering cross sectional sample size formula as mentioned below.

$$n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]$$

The total sample size was 510. Five percent non response rate was added to the calculated sample. Therefore the total sample size was 535.

The survivors were the target population in this study, and were sampled from all household units in this community. A multi stage sampling technique was used for this study. It is known that 47 village development committees (VDCs) and one municipality (MP) are there in this district (District Development Committe, 2014). In the first stage of this study, 30% of the administrative unit were selected by using probability proportionate to size technique (PPS). On the second stage from each village development committee households were selected according to the proportionate to size, respondents were selected by house to house (consecutive) visits by the data enumerators and investigator to achieve the desired sample size from each cluster. One governmental health facility from each village development committees were taken as a reference point for data collection. Lottery method was done to identify one direction from four poles north, south, east and west in order to start the consecutive household visit. One individual as a unit of study was selected from each household. The individual was taken by asking the birth date closer to the data collection period for interview schedule.

Those respondents who were willing to participate, over 18 years old, without language disorders (a communication disorder such as deviant articulation, fluency, voice, and/or comprehension and/or expression of language, spoken or written) and clear conscious (state or quality of awareness, or, of being aware of an external object or something within oneself) and those who had experienced the Barpak earthquake in Nepal on April 25 2015 and residence of Dhading district were taken as the study sample. Those people who were already identified and recorded local in health facility as a mental retardation, dementia, or any other major psychosis (e.g., schizophrenia, major depressive disorders, and severe mental disorders) were excluded from our study. The response rated obtained is universal in this study.

Ethical Issues

Ethical considerations were covered by getting approval from Institutional Ethics Committee, K.S. Hegde Medical Academy and the District Public Health Office (DPHO), Dhading. Verbal and written informed consent was taken with the participants before each interview and objectives of the research were clarified to them. Participants were assured that their privacy and confidentiality would be highly respected and maintained. No other important ethical dilemmas requiring serious attention were observed in the study. An anonymous study tool with limited identifier was used. Data will be stored for five years to retain transparency. Participants were given ample opportunity to ask the queries and withdraw from interview at any point of time.

Study tool

First part of the questionnaire consists of socio demographic variables such as age, gender, education, marital status, and religion and wealth index.

Second part of the questionnaire includes the earthquake related variables such as difficulty in communication, house damaged, injury to self and family, loss of family members, close relative and intimate friends. The post-earthquake factor lost of job or income was included too.

Third part of the instrument consists of PTSD screening tool. Structured and self-rated questionnaire was administered for the interview schedule purpose. The Post-traumatic stress disorder checklist civilian version (PCL-C) is one of the most commonly used instruments to assess PTSD. Its 17 items measure the three clusters of symptoms that record onto diagnostic Criteria B (re-experiencing), C (avoidance/ numbing), and D (hyper-arousal) for PTSD in the Diagnostic statistical manual for mental health (DSM-IV) was adopted (Ni et al., 2013). This tool makes the participant to indicate the extent to which each symptom is correlated with the earthquake on a scale from 1 (not at all) to 5 (extremely). The Nepalese translated version of the PCL-C was administered for measuring PTSD. PTSD was determined by trained psychosocial counsellors using Nepalese version PCl-C.

Table 1: Participants Characteristics

Variables		n	%
Socio-demographic Variables			
Age group(in years)			
	18-35	304	56.8
	36-59	180	33.6
	60 and above	51	9.6
Gender			
	Male	288	53.8
	Female	247	46.2
Education			
	Illiterate	126	23.55
	Attended Literacy class	41	7.66
	Primary Level	122	22.80
	Secondary	90	16.82
	Higher Secondary	89	16.63
	Under graduate and above	67	12.53
Marital Status			
	Unmarried	110	20.6
	Married	384	71.8
	Divorced/Widowed	41	7.6
Religion			
	Hindu	395	70.1
	Christian	97	18.1
	Buddhist	63	11.8
Wealth Quartile			
	Poor	180	33.67
	Middle	166	31
	Rich	189	35.33
Family History of Mental Illness	Yes	57	10.7
Peri Earthquake Factors			
	Difficulty in communication	359	67.1
	Involve in Rescue	222	41.5
	House damaged		
	Partially	105	28.69
	Completely	261	71.31
	Loss of Property	192	35.9
	Self Injury	108	20.2
	Injury to family members	113	21.1
	Loss of family member	104	19.4
	Loss of close relative	431	80.6
	Loss of intimate friends	114	21.3
	Witnessed Death	176	32.9
Post-Earthquake Factors			
	Loss of Job	125	23.4
	Low Social Support	135	25.2
	Moderate Social Support	155	29
	High Social Support	245	45.8

Cronbach alpha has been calculated for the measures of an internal consistency of the tool. The value of Cronbach alpha in our study for PCL-C was found to be 0.95, which possesses excellent internal consistency. Receiver's operator's characteristics (ROC) curve was generated for each of the subgroups. All three clusters of symptoms were found acceptable in this study setting. Area under the curve for B, C and D groups of symptoms were 0.97, 0.98, and 0.96 respectively, which shows the tool is acceptable at this study setting. In this cross sectional study, score of 44 or above taken as diagnostic cut-off.

Fourth part of the questionnaire consists of the social support scale. The Oslo 3-items Social Support Scale provides a brief measure of social functioning and it is considered to be one of the best predictors of mental health. It covers different fields of social support by measuring the number of people the respondent feels close to, the interest and concern shown by others, and the ease of obtaining practical help from others. The Oslo Social Support scale scores ranged from 3-14 with a score of 3-8 = poor support; 9-11 = moderate support; and 12-14 = strong support (Bøen, Dalgard, & Bjertness, 2012). Internal consistency for the Oslo social support scale was found to be good with the Cronbach alpha of 0.82.

Statistical Analysis

Data were entered into Microsoft excel spreadsheet. After a meticulous data cleaning and accuracy checks, questionnaire responses were coded and data were exported to SPSS 16.0 version for analysis. The mean, standard deviation (SD), median and interquartile ranges were computed for all continuous variables. Frequencies and percentages were computed for categorical variables. Statistically significant associations between independent variables and the outcome variables were calculated using first bivariate and then binary logistic regression analysis using chi-square tests as at significant $p<0.05$ to 95% CI.

RESULTS

Table 1 shows the main characteristics of the socio-demographic variables and earthquake related variables. Mean age of the respondents was 36.26 years (SD = 13.24 years) (age range 18 - 75 years). More than half of the respondents (56.8%) were in 18 to 35 years age group. Male comprised of more than half (53.8%) of the sample. Literacy rate was found to be 76.2%. Bulks of the participants were married (71.8%), and follow Hindu religion (70.1%). Approximately, one-third of the respondents were in middle and poor category (64.67%). Just about one out of ten 57/535 (10.7%) participants were exposed to mental illness within family.

Out of the 535 participants in this study approximately two out of three participants (67.1%) felt difficulty in communication, (41.5%) involved in the rescue and relief to the earthquake victims. Two third of the participants (68.4%) house were damaged. Of 535 survivors (35.9%) lost their property due to earthquake. Approximately two out of the five (20.2%), survivors got injured due to this event. In addition 113/535 (21.1%) respondent's family members were injured. About one in five (19.4%), (23.2%), (21.3%) of the survivors had lost their family members, close relative and intimate friends respectively. Two third of the respondents, (32.9%) approximately half of the participants proportion (48%) witnessed building collapsed and dead bodies respectively. One in five (23.4%) survivors were either unemployed or cut short the income generation activities (23.4%) due to earthquake.

Table 2 shows the frequencies of different PTSD symptoms. Among all 535 participants, the positive rates were 35.1% for "intrusive re-experiencing" group (B group), 22.1% for "avoidance and numbing" group (C group), and 32.9% for "hyper-arousal" group (D group), respectively. In subgroups, for items "acting or felling at least events recurring", "avoidance of reminder", "Recurrent and intrusive distressing recollections", "Intense psychological distress to cues" and "physiological reactivity to cues" PTSD symptoms appeared relatively frequently (28.04%, 29.72%, 25.42%, 25.61% and 26.92% respectively), while for items "detachment or estrangement feelings" and "irritability or outburst of anger" the symptoms occurred relatively infrequently (18.69% and 18.88% respectively).

Among the 99 PTSD participants, the percentages of positive symptoms for "intrusive re-experiencing", "avoidance and numbing" and "hyper-arousal" groups

Table 2: Frequency of PTSD symptoms among the survivors and PTSD Case

Cluster of Symptoms	Symptomatic n	Symptomatic %	PTSD n	PTSD %
B-group Intrusive re-experiencing (at least one required)	188	35.1	98	98.98
• Recurrent and intrusive distressing recollection	136	25.42	84	84.85
• Recurrent distressing dreams	124	23.18	84	84.85
• Acting or felling at least events recurring	150	28.04	85	85.86
• Intense psychological distress to cues	137	25.61	81	81.82
• Physiological reactivity to cues	144	26.92	83	83.84
C-group Avoidance and Numbing (at least three required)	118	22.1	92	92.92
• Avoidance of thoughts, feelings and conversations	127	23.74	75	75.76
• Avoidance of reminder	159	29.72	84	84.85
• Psychogenic Amnesia	127	23.74	78	78.89
• Markedly diminished interest in significant activities	119	22.24	75	75.76
• Detachment or estrangement feelings	100	18.69	71	71.72
• Restricted range of affect	108	20.19	75	75.76
• Sense of foreshortened future	113	21.12	82	82.83
D- group Hyper arousal (at least two required)	176	32.9	97	97.97
• Sleep difficulty	115	21.50	69	69.70
• Irritability or outburst of anger	101	18.88	73	73.74
• Difficulty concentrating	104	19.44	75	75.76
• Hyper-vigilance	124	23.18	77	77.78
• Exaggerated startle response	123	22.99	72	72.73

Table 3: Proportion of PTSD by participant's characteristics, bivariate and multivariate analysis

Variables	n	PTSD Cases	Rate %	p-value	OR	AOR
Overall	535	99	18.5			
Gender				<0.001**		
Male	288	34	11.80		Ref	Ref
Female	247	65	26.31		2.66,95%CI (1.69-4.21)	3.012,95%CI (1.003-9.041)
Marital Status				<0.001		
Unmarried	110	9	8.18		Ref	
Married	384	65	16.92		2.28,95%CI (1.10-4.75)	NS
Divorced/Separated/Widowed/Widower	41	25	60.98		17.53, 95%CI (6.94-44.29)	NS
Age in yrs				<0.001**		
18-35	304	33	10.85		Ref	Ref
36-59	180	43	23.89		2.57,95%CI(1.56-4.24)	NS
60 and above	51	23	45.09		6.74,95%CI (3.48-13.04)	6.78,95%CI(1.60-28.66)
Educational Status						
Illiterate	126	50	39.68	<0.001**	4.83, 95%CI (3.03-7.69)	NS
Literate	409	49	11.98		Ref	
Educational Level						
Primary and below	163	31	19.01	<0.001**	2.97,95%CI (1.60-5.52)	NS
Secondary and above	246	18	7.31		Ref	
Religion						
Hindu	375	47	12.53	<0.001**	Ref	
Christian	97	38	39.17		4.49,95%CI (2.70-7.48)	NS
Buddhist	63	14	22.22		1.99,95%CI(1.02-3.88)	NS
Wealth Quartile				<0.001**		
Poor	180	14	7.77		Ref	
Middle	166	16	9.63		NS	
Rich	189	69	36.50		6.81,95%CI (3.66-12.68)	NS
Previous History of Mental Illness				<0.05*		
Yes	57	20	35.08		2.73,95%CI (1.50-4.95)	NS
No	478	79	16.52		Ref	

were 98.98%, 92.92% and 97.97% respectively. The positive rates for the 17 items concerning PTSD symptoms varied from 69.70% to 84.85%. The highest items included "acting or feeling as if events recurring" (85.86%), "Recurrent and intrusive distressing recollection" (84.85%), "recurrent distressing dreams" (84.85%), "Intense psychological distress to cues" (81.82%) and "physiological reactivity to cues" (83.84%). The lowest item was "sleep difficulty" (69.70%). The overall prevalence of PTSD was 18.5%.

In bivariate analysis (Table 3), Female, (OR=2.66), widowed or separated or divorced (OR=17.53), Older age group 60 and above (OR=6.74), illiterate (OR= 2.98), being Christian (OR=4.49), rich economic status (OR=6.88) and exposure of family history of mental illness (POR=2.73) were the significant demographic predictors for PTSD. But, in multivariate analysis (Table 3) only gender (AOR=3.012) and older age groups 60 years and above (AOR=6.78) was found to be the significant predictors for PTSD.

Table 4: Proportion of PTSD by peri and post traumatic factors, bivariate and multivariate analysis

Variables	n	PTSD Cases	Rate %	p-value	OR	AOR
Overall	535	99	18.5			
House Damaged				<0.001**		
Yes	366	96	26.22		19.67,95% CI(6.13-63.09)	NS
No	169	3	1.77		Ref	
Level of House Damaged				<0.001		
Partially Damaged	105	12	11.42		Ref	NS
Completely Damaged	261	84	32.18		3.67,95% CI(1.91-7.08)	
Loss of Property				<0.001		
Yes	192	75	39.06		8.52,95% CI(5.13-14.13)	NS
No	343	24	6.99		Ref	
Involved in Rescue				<0.001		
Yes	222	57	25.67		2.22,95% CI(1.43-3.47)	NS
No	313	42	13.41		Ref	
Injury to yourself		ss		<0.001		
Yes	108	51	47.22		7.06,95% CI(4.36-11.44)	NS
No	427	48	11.24		Ref	
Difficulty in communication				<0.001		
Yes	359	90	25.06		6.20,95%CI(3.04-12.65)	5.326,95%CI (1.006-28.20)
No	176	9	5.11		Ref	Ref
Injury to family members				<0.001		
Yes	113	63	55.75		13.51,95% CI(8.15-22.37)	NS
No	422	36	8.53		Ref	
Family members died				<0.001		
Yes	104	60	57.69		13.70,95% CI(8.23-22.81)	NS
No	431	39	9.04		Ref	
Close relative died				<0.001		
Yes	124	59	47.58		8.41,95% CI(5.20-13.60)	NS
No	411	40	9.73		Ref	
Intimate Friends died				<0.001		
Yes	114	45	39.47		4.43,95% CI(2.76-7.10)	NS
No	421	54	12.82		Ref	
Witnessing death				<0.001		
Yes	176	79	44.88		13.80,95% CI(8.04-23.69)	5.41,95%CI(1.44-20.26)
No	359	20	5.57		Ref	Ref
Witnessing building collapsed				<0.001		
Yes	257	85	33.07		9.20,95% CI(5.06-16.73)	NS
No	278	14	5.03		Ref	
Loss of job/income generation				<0.001		
Yes	125	75	60		24.12,95% CI(13.97-41.64)	22.72, 95%CI(7.01-73.60)
No	410	24	5.85		Ref	
Perceived Social Support				<0.001		
Low Social Support	135	83	61.48		76.61,95% CI(29.60-198.30)	71.34,95%CI(13.85-367.46)
Moderate Social Support	155	11	7.09		3.66,95% CI(1.24-10.76)	NS
High Social Support	245	5	2.04		Ref	Ref

Table 4 shows the bivariate and multivariate analysis regarding earthquake related peri and post traumatic factors and PTSD. House completely damaged (POR=3.67). Loss of property (POR=8.52), involved in rescue (OR=2.22), difficulty in communication (OR=6.20) were found to increase the odds of PTSD. Humanitarian loss such as family member died (OR=13.70), close relative died (OR=8.41) lost their intimate friends (OR=4.43) were risk factors for developing PTSD. Loss of Job or income generation activities (OR=24.12), and low social support (76.61) were the significant post-earthquake factors associated with PTSD. Witnessing death (OR=13.51) and witnessing building collapsed (OR=9.20) were also the predictors for PTSD.

In adjusted model, difficulty in communication (AOR= 5.32), witnessing death (5.41), lost of job or income generation activities (AOR=22.72), and low social support (AOR=71.34) were the significant factors for elevated PTSD rates.

DISCUSSION

Natural disaster, such as earthquakes causes distressing stress and affects the large number of people in the world. The 2015 Barpak earthquake in Nepal was cataclysmic disaster and had a heart-rending impact on many survivors. Nine months after the disaster, the affected peoples were yet to be recovered. This cross sectional study emerged with four central observations. First, the prevalence of PTSD assessed by DSM-IV criteria was very high nine months after the event. Second, there was an astonishing burden of traumatic events and stressors experienced by the Nepalese population after the earthquake. Third, the impact of selected peri and post-earthquake factors on PTSD was stronger for survivors. Fourth, those who perceive low social support faced significantly increased risk of PTSD.

Consistent with previous studies on mental health problems among extremely affected survivors in the initial stages of an earthquake, the present study found that approximately one out of five participants suffered from PTSD (18.5%). This prevalence is also higher than most other post-earthquake population-based studies, which reported prevalence's ranging from 3.3 to 19.2% for PTSD (Cerdá et al., 2013; Lai, Chang, Connor, Lee, & Davidson, 2004). Among all 99 PTSD sufferers, the items "acting or feeling as if events recurring" (85.86%), "avoidance of reminders" (84.85%) and "recurrent and intrusive distressing recollection" (84.85%) occurred most frequently, suggesting more mental interventions concerning these symptoms would be warranted. These results were slightly different as compared with the study conducted in China (Y. C. Zhang & Ho, 2011). This implies PTSD symptoms might differ to the cultural context and coping strategy adopted by individual after any traumatic events.

In this post disaster scenario female gender experienced greater level of psychological problems for PTSD and gender was a risk factor of PTSD. A previous study of the Haiti earthquake also inveterate that being female as the risk factor for PTSD (Fawzi et al., 2009). This result was also steady with the previous earthquake surveys which found that being female as the predictor of PTSD (Kun et al., 2009; L.-P. Zhang et al., 2015). Gender differences in exposure to terror may be attributable to a number of factors; among these are women's higher senses of risk and poorer self-efficacy, as well as their inclination to use less useful coping strategies than men and tended to construe disasters more negatively (Solomon, Gelkopf, & Bleich, 2005). In addition, it is possible that women are more susceptible to negative events and more have a tendency to express emotion. When faced with this appalling disaster, men were most likely just as terrified as women, but in this cross-sectional study, they may be significantly under-reporting their fear and misery, but generally women lean to be more willing to reveal their pessimistic emotions. Study findings from Dhading do not mean this gender difference is universal, but they certainly do mean this difference is wide spread, it extend across cultures, economies, and sources of strain. This topic deserves a higher priority in future research.

Age group was found to be significant factors for the prediction of PTSD. Study conducted in China replicates the findings that older people were more likely to have PTSD and general psychiatric morbidity compared to adult survivor (Wu, Xu, & He, 2014). Elder survivors have

a propensity for lower quality of life in terms of physical capability and psychosomatic well-being after the earthquake (Lin et al., 2002). One study argued that due to the piece of evidence that an elder often already feels weak because of loathsome health conditions, impaired cognitive abilities and decreased sensory alertness, the crash of an unexpected disaster may be devastating (Pekovic, Seff, & Rothman, 2007). Though there is no current attestation that changes seen in these systems with aging meet the causality criteria for the progress of post-disaster PTSD in older individuals. Further basic researches are indispensable to focus on the mechanisms why post-disaster vulnerability to psychological problems is likely to be age-dependent, and provide robust indication for interventions.

Barpak earthquake one of the most awful disaster faced by Nepal, the level of damage produced by it was significantly more in terms of deaths, injuries, and infrastructure damage than disasters previously occurred in the country. In this sample, (68.4%) of the house were damaged, 20.2% were injured, approximately 67% faced difficultly in communication with beloved ones, 32.9% witnessed the death, 19.4% lost their family members which was the extraordinary traumatic burden faced by the general population of Dhading district. This in due course acts as the stressors for resulting PTSD in individuals. Previous literature reported that experiencing the death of a close family member was the major risk factor for PTSD (Kun et al., 2009; L. Wang, Zhang, Shi, & Wang, 2009). However, in this study, having a close relative died contribute to PTSD prevalence in general population, but was not an autonomous risk factor for PTSD. Further, existing pre-disaster stress level, and exposure to violence probably led to a predisaster burden of psychological disabilities in the general population, which considerably negatively influenced the potential for healing in the general population subsequent to this disaster. But this study does not find the family history of mental illness as a risk factor for PTSD. Due to unavailability of earthquake related population-based studies of psychiatric disorders, in Nepali setting, comparison was not possible.

This cross sectional study identified peri- and post-earthquake traumatic events, including difficulty in communication during the earthquake and witnessing of deaths, increased the odds of PTSD among the survivors. Note that some of the variables that predicted mental health problems from earthquake-specific trauma exposure in bivariate analysis (e.g., loss of property, loss of intimate friend and witnessing building collapsed) were not significant in the multivariate analyses. These results are incoherent with the conclusions of many empirical studies examining the extent of disaster exposure; specifically, high-level losses are one of the most important risk factors for developing mental disorders (David et al., 1996; Galea, Nandi, & Vlahov, 2005). Nevertheless, these findings do not mean that loss of family/relatives and property losses are of no importance.

Lack of communication was associated with increased PTSD risk in earthquake survivors. This replicates the finding of the research conducted in Japan after Great East Japan Earthquake.(Sakuma et al., 2015) Communication results to unremitting attachment to one's social group during recovery from harrowing experiences has been repeatedly shown in previous studies (X. Ke, Liu, & Li, 2010; Wen, Shi, Li, Yuan, & Wang, 2012). Another study eminent that feeling connected might be important for recovery from mass trauma and post-traumatic intensification in local relief workers (X. L. Wang, Chan, Shi, & Wang, 2013). Therefore, measures to promote communication ultimately increase sharing of worst insight traumatic feelings and fear of disaster at the community level, this might smooth the progress of psychological recovery in general population.

Loss of job or income generating activities caused by the earthquake was found as risk factors of PTSD. This is understandable and similar with most previous studies about adolescents after earthquakes (Cerdá et al., 2013). One in four participants in this study has lost their income generation which is comparably higher than other studies (Cerdá et al., 2013; L. P. Zhang, Wang, Li, & Hu, 2012). One latest study manifest that, lost of income is considered to be the ongoing post-disaster stressor which are likely to sway the mental health status of an individual (Kane et al., 2016) Study sample characteristics possess a

high number of married individuals, which they have a greater responsibility for managing the household, educational, health expenditure for children, etc. this might have the collective effect of being lost of income as a self-sufficient predictor for PTSD. This finding articulates that, high risk approach of economic aid program as an intervention will be fruitful to resolve the mental health problem.

Social supports appear to safeguard the negative impacts of traumatic events. In our sample low level of social support were found to be associated with higher number of PTSD symptoms. This result is in line with prior studies (Wu et al., 2014). Higher social support has been significantly associated with higher positive emotions (Feder et al., 2013). Structural social support shows a linear relation to quality of life; the functional aspects of support reveal stress-buffering proposition (X. Ke et al., 2010) Strong social support can not only protect individuals from suffering from psychological disorders, but also facilitate the psychological recovery from disasters (Dai et al., 2016). Thus our study marked the importance of social support to protect disaster victims from mental health disturbance, alternatively social support is considered to be the foremost factor allied with PTSD.

This study has its limitation such as cut-off score of 44 or above has taken as a PTSD positive without clinical diagnostic interview. Co morbidity of PTSD along with anxiety and depression has not been addressed in this study.

CONCLUSIONS

This study distinct a high prevalence of earthquake-related stressors and PTSD in a representative population-based study of Dhading district, exposed to the April 25, 2015 Barpak earthquake. In addition it identified particularly vulnerable factors associated with PTSD. As Nepal prepares to invest in post-earthquake renovation this year, these results can provide insight guidance for the influential planning and implementation of community based mental health interventions. Due to the availability of inadequate number of expert, mental health resources should focus first on those at utmost risk. Investment in formal and informal sources of social support for women may help to reduce the scrupulous vulnerability of women to PTSD. Post-earthquake capacity-building efforts such as home rebuilding, economic aid and employment support programs will provide benefit in parallel by addressing ongoing disaster-related adverse circumstances shown here to be associated with PTSD.

At last but not the least, evidence shown in this study strengthens the call for research on the impact of exposure to natural disaster on general population especially in resource poor-settings, considering the factor such as gender, loss of job and income generation activities, and social support. This evidence is crucial for the policy makers directed towards achieving gender equality, reducing the burden of mental health and improving the neighbourhood organization.

Abbreviations

AOR	Adjusted Odds Ratio
CI	Confidence Interval
DEFF	Design Effect
DPHO	District Public Health Office
DSM	Diagnostic and Statistical Manual of Mental Disorder
MP	Municipality
NDHS	Nepal Demographic Health Survey
NSC	Nepal National Seismological Centre
OR	Odds Ratio
PCA	Principle Component Analysis
PCL-C	Post-Traumatic Stress Disorder Checklist Civilian Version
PPS	Probability Proportionate to Size
PTSD	Post-Traumatic Stress Disorder
ROC	Receivers Operating Characteristics
SD	Standard Deviation
SE	Standard Error
SPSS	Statistical Package for the Social Sciences
VDCs	Village Development Committees

Ethical approval and consent to participate

Research has been performed according to the norms and conditions granted from Declaration of

Helsinki. Ethical approval has been taken from Institutional Ethics Committee, K.S. Hegde Medical Academy, Managalore. The reference no is INST.EC/EC/114/2015-16. Written consent has been taken from the research participants.

Consent for Publication

This research does not contain case reports any videos and pictures.

Availability of the data and material

SPSS data sheet can be made freely available to scientist wishing to use them without breaching. The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

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Authors Contribution

All authors contributed to conceive this study and refine its theoretic framework. Dr SK provide technical guidance for this study, Mr, DKT provide statistical guidance during analysis. All authors read and approval for the final manuscript.

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Competing Interest

The authors declare that they have no competing interests.

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