BMJ Open

# Prevalence and associated factors of post-traumatic stress disorder among koshe landslide survivors, Addis Ababa Ethiopia: A cross sectional study



| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2018-028550 |
| Article Type: | Research |
| Date Submitted by the Author: | 17-Dec-2018 |
| Complete List of Authors: | Asnakew, Sintayehu ; Debretabor University, Psychiatry<br>shumet, shegaye; University of Gondar, psychiatry<br>Ginbare , Worknesh ; Amanuel mental specialized hospital, Psychiatry<br>Legas, Getasew ; Debretabor university, Psychiatry<br>Haile , Kalkidan ; Dbremarkos hospital, psychiatry |
| Keywords: | PSYCHIATRY, EPIDEMIOLOGY, Adult psychiatry < PSYCHIATRY, Anxiety disorders < PSYCHIATRY, Child & adolescent psychiatry < PSYCHIATRY |
| | |

# *Prevalence and associated factors of post-traumatic stress disorder among koshe landslide survivors, Addis Ababa Ethiopia: A cross sectional study*

*Sintayehu Asnakew[1*] Shegaye Shumet[2], Worknesh Ginbare [3], Getasew Legas [1]Kalkidan Haile [4]*

*[1] Department of Psychiatry, College Health Sciences, Debretabor University, Debretabor, Ethiopia*

*[2]Department of psychiatry, School of medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia*

*[3] Department of psychiatry, Amanuel mental specialized hospital, Addis Ababa, Ethiopia*

*[4] Department of psychiatry, Debre markos hospital, Debre markos, Ethiopia*

*SA1: sintie579@gmail.com*

*SS: shumetshegaye@yahoo.com*

*WG: workneshginbare@gmail.com*

*GL: getasewlegas@gmail.com*

*KH: kalkidan946@gmail.com*

*Corresponding Author. Shegaye shumet

Department of psychiatry, university of Gondar, Gondar, Ethiopia

. Tel.:+251918045505/+251967148362 Email: shumetshegaye@yahoo.com

## Abstract

**Objectives:** To assess the prevalence of post-traumatic stress disorder and associated factors among survivors of koshe landslide Addis Ababa, Ethiopia, 2018.

**Design:** Community based, cross-sectional design.

**Setting:** The study was conducted among survivors of koshe landslide, Addis Ababa, Ethiopia.

**Participants:** About 830 town residents were recruited for interview during the study period.

**Measurement:** Data were collected by face-to-face interview. Post-traumatic stress disorder was measured using post-traumatic stress disorder checklist-civilian version. Perceived Stress Scale (PSS) and Oslo-3 social support were an instruments used to assess the associated factors.

**Result:** Prevalence of post-traumatic stress disorder was 37.3 % with ( 95 % CI: 34.1, 40.8). In multivariate logistic regression; female sex(AOR=1.74, 95%CI; 1.21,2.50)**,** divorced (AOR=2.08,95%CI; 1.26,3.43), sustained physical injury(AOR=8.28,95%CI; 5.04,13.61) , history of mental illness ( AOR = 5.55 , 95% CI ; 2.30 , 13.36 ) , family history of mental illness ( AOR = 2.82 , 95 %CI ; 1.48 , 5.37 ) , poor social support ( AOR = 3.64 , 95 %CI ; 1.99 , 6.69 ) , and high perceived stress ( AOR = 3.08 , 95 CI , 1.43 , 6.64 ) were associated with post-traumatic stress disorder.

**Conclusion:** The result suggest that prevalence of post-traumatic stress disorder among survivors of koshe landslide was high. It is better to give emphasis for these populations in early screening particularly for individuals with family history of mental illness, female sex, history of mental illness and for those who experienced physical trauma during the disaster.


## Strengths and limitations of this study

- The study was including relatively large sample size and sampling methods
- Social and recall bias were the limitations
- Since study was cross sectional, did not show cause effect relationship

**Keywords**: Koshe landslides, post-traumatic stress disorder

## Introduction

Posttraumatic stress disorder is a mental disorder that follows a traumatic event in which the individual experienced, witnessed, or was confronted with either actual or threatened loss of life or serious injury resulting a response of fear, helplessness, or horror(1).In order to be diagnosed with PTSD, a person must have re-experiencing of the trauma, avoidance of trauma-related stimuli, excessive arousal, and negative alterations in cognition and mood and that must occur 1 month after the event(2). A disaster is a traumatic event that is experienced by many people and causes different mental and physical health consequences(3). A survey study conducted in US residents, 13% of the sample reported a lifetime exposure to natural or human-generated disaster(4). According to several studies undertaken among adults, there was an increased psychological distress after natural disasters(5). Although the consequences of disasters may include a wide range of psychopathology, a systematic review has acknowledged that PTSD is the most commonly studied and frequently occurred psychopathology following disasters(6).

About 8 million adults have PTSD during a given year worldwide(7). More than fifty-one million people are being forcibly displaced worldwide, of which 16.7 million are displaced outside their home countries which were found to have a stress-related disorder(8). According to the global burden of disease report, about 14% of the diseases burden has been attributed to neuropsychiatric disorders, mostly due to long term disabling nature of depression, and other common mental disorders including PTSD(9). Post-traumatic stress disorder (PTSD) was estimated to account for 0.4% of total YLD, around the same percentage as schizophrenia. According to the global burden of disease 2000 study, published in the World Health Report 2001, the estimated burden of PTSD has increased to 0.6% YLD globally (10). The lifetime prevalence of PTSD is estimated to be about 8 % in the general population in the USA and the lifetime prevalence rate was 10 % in women and 4 % in men(11) . Study among Israeli residents age 18 years and above who were exposed to terrorism, prevalence of current PTSD was 9.4%, with higher rates among women (16.2%) than men (2.4%)(12). The global economic burden of stress-related mental illness is expected to rise in the coming decade. The world health organization global disease of burden study estimates that mental illness, including stress-related disorder, will be the second leading cause of disability by the year 2020(13).

PTSD prevalence rate in developing countries is higher as compared with the more developed countries. A study conducted among a geographically diverse sample of Mexican adults, the prevalence of PTSD was estimated to be 19%(14). Different studies undertaken in Africa indicated that PTSD can still be a public health concern several years after the civil conflict and post-disaster setting. A recent community-based study in South Africa showed that trauma exposure is higher in lower-income countries compared with high-income countries which resulted in a high rate of PTSD(15). Study in Uganda during an active conflict period showed that PTSD prevalence varied between 18% and 54 % in the general population (16).

PTSD is a public health issue that contributes for poverty, lack of employment, unsecured living circumstances, change in social network and highly associated with lower quality of life (QOL) even after the end of the actual hostility and post-disaster setting (17, 18).

Factors that contribute for the development of post-traumatic stress disorder have been classified into pre-existing factors like family history of mental illness, and substance history, the traumatic event itself, post-trauma factors such as social support (19).

Even though PTSD are highly prevalent among post post-disaster setting, there is no studies which shows prevalence of PTSD among survivors of koshe landslide Addis Ababa, Ethiopia. So determining prevalence of PTSD and associated factors among survivors of koshe landslide Addis Ababa is important for early intervention and further decrease the burden of PTSD and contribute to have a plane for improving victims' quality of life.

## Objective

This study set out to assess the prevalence of post-traumatic stress disorder and associated factors among survivors of koshe landslide Addis Ababa, Ethiopia, 2018.

## Methods and materials

Study settings and populations

### Study design

The study employed a community based, cross-sectional study. It was conducted may to june 2018.

### Study setting

The study was conducted at koshe, a large open landfill which receives rubbish and waste from Addis Ababa, which is located in the southwestern part of Addis Ababa, Ethiopia within

boundaries of Nefas Silk-Lafto and Kolfie. It has served for about 50 years for solid waste disposal for a city. The landfill hosts hundreds of rubbish pickers who sell recovered materials from the waste to businessmen and farmers.

**Study participants/subjects**

The study includes all survivors of koshe landslide, who were living in the study areas, Addis Ababa. Ethiopia. It had a total population of 5316 and estimated number of households of the region were about 1035 and there was one health center serving the community. We exclude those participants who were seriously ill and unable to communicate.

**Sampling procedure**

A multistage sampling technique was used to select 830 participants. To reach the households simple random sampling technique was used (computer generated random number). The sample size was distributed to each area (Kilinto, Asko Addis Hiwot and Koshe garbage dump area**)** proportional to the household size of the area. Members of the selected household were further selected for an interview and only one individual was selected per HH.

## Data sources and measurement

Data were collected via a face to face interview structured questionnaire. Supervisors had a BSc Degree in Psychiatric Nursing, and they were trained to explain purpose of the study, orient subjects on the questionnaire as well as the ethical principles of confidentiality/ anonymity and data management prior to involvement in data collection, secure subjects' informed consent for participation.

*Post-traumatic stress disorder* Checklist-Civilian version (PCL-C) was used to assess post-traumatic stress disorder. PCL-C is measured with likert type scale ranging from ( 1) "Not at all" to (5) "Extremely" with a cut point of ≥50. It had shown high internal consistency and reliability and strong correlation with PTSD diagnosis using clinician-administered PTSD scale translated versions of the PCL-C into Oromo and Somali produced high reliability with Cronbach's α (.93)(52) and has 0.89 sensitivity and 0.75 specificity(53). In the current study, the inter-data reliability or internal consistency was found to be Cronbach's α (0.94).

*Social support* was measured using Oslo 3-items social support scale and with scores ranging between 3 and 14: 3–8=poor social support; 9–11=intermediate social support; and 12–14=strong social support (50).

*Individual stress levels* were measured using the Perceived Stress Scale (PSS). The questions in this scale ask about their feelings and thoughts during the last month. PSS is measured with likert type scale ranging from ( 0) "Never" to (4) "very often " and individuals with higher scores indicating higher perceived stress(48).

*Substance use history*: To examine substance use history, respondents were asked: "Have you ever use any substance in the last three months or in life time?" and the response were yes/no (51)

*Items on socio-demographic factors* (age, sex, ethnicity, religion, marital status, educational status and occupational status) were adopted from different literatures

**Data collection**

Data were collected by four trained data collectors (psychiatry nurses) using the Amharic version of the questionnaire for a month. The questionnaire was designed in English and was translated to Amharic and back to English, that is, forward and backward translation. The training was on introduction to PTSD, research methods, interviewing skills, sampling and recruitment and ethical aspects of research.

**Data processing and analysis**

All collected data were checked for completeness and consistency and entered in to Epi-data version 4.2 and then exported to SPSS for windows version 24 for analysis.

Descriptive and bivariate logistic regression analyses were computed to see frequency distribution and to test whether there were an association between the independent and dependent variables respectively. Factors associated with PTSD were selected during bivariate analysis with a value of $p \leq 0.05$ for further analysis in multivariable regression analysis. In multivariable regression analysis variables with P-value less than 0.05 at 95% confidence interval were considered as statistically significant.

## Ethical Consideration

Ethical clearance was obtained from joint ethical review committees of University of Gondar and Amanuel mental specialized hospital. Permission was obtained from Addis Ababa city

Administration health bureau ethical committee. Written consent was taken from study participants and assent from legally approved foster parents after explaining purpose of the study. Confidentiality was maintained by omitting their personal identification.

**Patient and public involvement**

In the current study our study participants are people who survive at koshe landslide, Addis, Ababa, Ethiopia, and patients were not included in this study. Our study participants were also not involved in the study design and recruitment. The results of this study will be disseminated to Federal ministry of health, Addis Ababa health bureau, and Kolfe sub city health department for timely management of those survivors through presentation and policy briefing.



## Result

A total of 830 respondents were participated in the study with the response rate of 98.2%. Majority of the respondents were female 491 (59.2%). The mean age of the respondents was 33 with SD ±12 years, of whom 675 (81.3%) were included in the age range of 15-40 years. Majority of the respondents were married 428(51.6%), orthodox followers 502 (60.5%) and Amhara by ethnicity 404 (48.7%). Regarding their occupation, most of them were employed 470(56.6%) (**table1**).

About 55(6.6%) of participants had history of mental illness. About 202 (24.3%) of them had childhood physical abuse and neglect experience, and seventy-nine (9.5%) of them had family history of mental illness.

Majority of 569 (68.6%) of the respondents had witnessed physical injury of families or friends, and about 166 (20%) of the respondents had experienced physical injury and majority of them (70 %) had a moderate perceived life threat (**table 2**) .

Table 1: Distribution of trauma factors of the respondents in koshe Addis Ababa, Ethiopia, August 2018 (n=830)

| Characteristics | Frequency | Percentage |
|---|---|---|
| Sustaining physical injury | 166 | 20 |
| Witnessing the death of families or friends | 526 | 63.4 |
| Witnessing physical injury of families or friends | 569 | 68.6 |
| Property destruction | 240 | 28.9 |
| Thinking that they may be died | 546 | 65.8 |
| Perceived life threat | | |
| Low perceived stress | 185 | 22.3% |
| Moderate perceived stress | 581 | 70% |
| High perceived stress | 64 | 7.7% |

Out of the total 830 participants, nearly half (48%) of the respondents had poor social support and majority 659(79.4%) of the participants had experienced at least one stress full life events (**table 3**).

Table 2: Distribution of psychosocial factors of study participants among residents of koshe Addis Ababa, Ethiopia, 2018(n= 83)

| Characteristics | **Category** | **Frequency** | **percent** |
|---|---|---|---|
| **Social support** | Poor | 398 | 48 |
| | Moderate | 324 | 39 |
| | Strong | 108 | 13 |
| **Stressful life events** | Yes | 659 | 79.4 |
| | No | 171 | 20.6 |

Nearly three fourth (**72.5**%) of the participants had ever use of alcohol and about (62.2%) of the respondents had current use of alcohol (Fig **1**).

**Prevalence of PTSD**

The prevalence of post-traumatic stress disorder (PTSD) in this population was 37.3% (95 % CI: 34.1, 40.8) (**Fig2**).

**Factors associated with posttraumatic stress disorder**

To determine the association of independent variables with PTSD, bivariate and multivariate binary logistic regression analysis were carried out.

In the bivariate analysis posttraumatic stress disorder in relation to each explanatory variables : female sex, age >60 years , divorced in marital status, history of mental illness, family history of mental illness, experiencing childhood physical trauma and neglect, sustained physical injury, witnessing the death and physical injury of families or friends, property destruction, thought that they may die, poor social support, and high perceived life threat were found to be significant at a P value less than 0.05. These factors were entered into multivariable logistic regression for further analysis. In multivariate analysis female sex, divorced, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD at a p-value less than 0.05 (**Table 4**).

Table 3: Factors associated with PTSD among residents of Koshe, Addis Ababa, Ethiopia, 2018 (n= 830)

| Variables | Category | PTSD | | COR(95%CI) | AOR(95%CI) |
|---|---|---|---|---|---|
| | | Yes | No | | |
| Sex | Male | 106 | 233 | 1 | 1 |
| | Female | 204 | 287 | 1.56(1.17,2.09) | 1.74(1.21,2.50)** |
| Age | 15-40 | 241 | 434 | 1 | 1 |
| | >40 | 69 | 86 | 1.45(1.01,2.06) | 1.36(0.86,2.14) |
| Marital status | Married | 138 | 290 | 1 | 1 |
| | Single | 87 | 162 | 1.13(0.81,1.57) | 1.18(0.78,1.79) |
| | Divorced | 77 | 54 | 3.00(2.00,4.48) | 2.08(1.26,3.43)** |
| | Others | 8 | 14 | 1.20(0.49,2.93) | 1.43(0.49,4.18) |
| Hx. of mental illness | Yes | 46 | 9 | 9.89(4.77,20.52) | 5.55(2.30,13.36)** |
| | No | 264 | 511 | 1 | 1 |
| Family Hx of mental illness | Yes | 55 | 24 | 4.46(2.69,7.37) | 2.82(1.48,5.37)** |
| | No | 255 | 496 | 1 | 1 |
| Experiencing Childhood trauma | Yes | 109 | 93 | 2.49(1.80,3.44) | 1.17(0.74,1.85) |
| | No | 201 | 427 | 1 | 1 |
| Sustaining Physical trauma | Yes | 135 | 31 | 12.17(7.94,18.65) | 8.28(5.04,13.61)** |
| | No | 175 | 489 | 1 | 1 |
| Witnessing the death of Family or friend | yes | 223 | 303 | 1.89(1.36,2.49) | 0.84(0.50,1.40) |
| | No | 87 | 217 | 1 | 1 |
| Witnessing injury of family or friend | Yes | 238 | 331 | 1.89(1.37,2.59) | 0.82(0.49,1.37) |
| | No | 2 | 189 | 1 | 1 |
| Property destruction | Yes | 117 | 123 | 1.96(1.44,2.66) | 1.01(0.68,1.51) |
| | No | 193 | 397 | 1 | 1 |
| Thought of death | Yes | 242 | 304 | 2.53(1.84,3.48) | 1.31(0.86,1.99) |
| | No | 68 | 216 | 1 | 1 |
| Social support | poor | 209 | 189 | 4.87(2.88,8.23) | 3.64(1.99,6.69)** |
| | Moderate | 81 | 243 | 1.47(0.85,2.53) | 1.39(0.75,2.60) |
| | Strong | 20 | 88 | 1 | 1 |
| Perceived threat | Low | 56 | 129 | 1 | 1 |
| | Moderate | 209 | 372 | 2.94(1.89,4.56) | 1.02(0.66,1.58) |
| | High | 45 | 19 | 10.91(5.56,21.41) | 3.08(1.43,6.64)** |

key:**=p-value<0.05,Modelfitness=0.114 (hosmer and lemshow),=0.000(Omnibus test), no multicolinearity (tolerance>0.1 and VIF<2)

## Discussion

The prevalence of PTSD was found to be 37.3% (95% CI; 34.1, 40.8). This finding was in line with the studies conducted in Kerman earth quick 36.3%(34), Syrian refugees in Lebanon,35.4%(8), turkey 34.9%(28), P. Mur- rah federal building in Oklahoma city, USA 34.3% (25), and USA general population,39.5%(54). On the other hand this study finding was lower than the previous studies in South Sudan (48%)(41), Rana Plaza building collapse in Bangladesh (75.6%)(22), Saudi Arabia (57%)(23), former Yugoslavia living in Croatia, Serbia, Germany and U.K. (83.7%)(18), Fukushima nuclear disaster Japan(59.4%)(26). The possible reason for this high prevalence might be instrument difference (PCL-C cut off 45, CAPTSD scale), exposure to multiple trauma, sample size difference and study conducted during an active conflict.

This finding was higher than studies in Northern Uganda (11.8%)(37), Serbia(18.8%)(29), Southern Lebanon(29.3%)(33), Sothern Brazil(9.1%)(36), India(4.2%)(27), Kashmir Southern Asia India(7.3%)(31), Australia(1.33%)(32), Wenchuan earth quick in China (15.7%)(21), USA ( among world trade center disaster rescue and recovery worker 12.4%)(24), and USA(Alabama, Joplin, Missouri 6.7%)(30). The possible reason for this variation might be instrument difference ( GHQ-12, structured clinical interview, MINI, the modified version of a composite international diagnostic interview ), the method of data collection (structured telephone interview ) and delayed conduction of the study after the trauma.

In this study, being female were significantly associated with PTSD. It might be due to, females have experienced sexual assault and child sexual abuse than males, hence being exposed to such trauma is more risk than other trauma in causing PTSD(55). This finding was supported by the research conducted in Kenya(38), India(27), Bangladesh(22), Kerman in Iran(34), China(21), USA(30), Oklahoma city USA(25).

Participants who were divorced were more likely to develop PTSD as compared with married respondents. Those with younger children might have concerns often center on raising their family alone, financial worries tend to fill the minds of most people facing life without their partner, especially those with young children which leads to be stressed. This was supported by the research conducted in Serbia(45).

Having history of mental illness was also significantly associated with PTSD. Participants with history of mental illness might have neurochemical imbalance and neuronal damage

as compared to those who had no history of mental illness, as a result they might prone to develop PTSD after this phenomenon. This finding was supported by studies in, Kenya(38), Fukushima nuclear disaster(26), Brewin University College London(42), Southern Korea(44), and Alferd.P.Mur Rah federal building bombing in Oklahoman city USA(25).

The odds of developing PTSD was 2.8 times higher among respondents who had family history of mental illness than those who had no family history of mental illness. The possible explanation might be, the inheritance of the serotonin transporter gene, as well as genes associated with the hypothalamic–pituitary–adrenal axis. This finding was supported by the studies conducted in Brewin University College London(42), and South Korea(44).

Moreover, experiencing physical injury was the strongest predictors of PTSD as compared with those individuals who didn't experience physical injury during the phenomenon. The possible explanation could be, the presence of scars, having impaired part may remind the trauma and relive it and may believe that the traumatic event has been put behind them, the body could be clinging to unresolved issues. This result was explained similarly in researches conducted in Wenchuan earth quick in China(21), the Rana Plaza building collapse in Bangladesh(22), and Kerman Iran(34).

The odds of developing PTSD was 3.6 times higher among individuals who had poor social support than those had higher social support. Lack of help with physical exercise, emotional support and having someone to talk with about traumatic experience or to turn to for advice could increase the risk of PTSD(56). This finding was supported by the studies conducted in Southern Brazil(36), Mexico(46), and USA(20).

Participants who had high perceived stress were more likely to develop PTSD as compared with those respondents who hadn't low perceived stress. The negative belief towards the consequence of ongoing threat as damaging implications will precipitate the onset and persistence of PTSD(57). This finding was supported by the research done in Southern Israel(43), and Southern Korea(44). There were several limitations. The design of the study was cross sectional; therefore we were unable to conclude any causal direction of the association found and in this study participants did not consider whether they have PTSD or not before the onset of land slide due to other factors. Social desirability bias might also be the other limitation. Since data collection method was face

to face interview which make individuals to respond socially acceptable answer during the interview process especially in case of substance related questions.

Individuals without PTSD may have less motivation to recall earlier exposure as compared with individuals with PTSD. So recall bias could the limitation.

The strength of the study was including relatively large sample size and sampling methods.

## Conclusion

The prevalence of PTSD was found to be high. Female sex, divorced participants, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD. Therefore; It is better to give emphasis for these populations in early screening particularly for individuals with family history of mental illness, female sex, history of mental illness and for those who experienced physical trauma during the disaster.

## Lists of abbreviations:

AMSH: Amanuel Mental Specialized Hospital; AOR: Adjusted Odd Ratio, CI: Confidence Interval; COR: Crude Odd Ratio; DSM: Diagnostic and Statistical Manual; HH: House Hold; M.I.N.I: Mini International Neuropsychiatric Interview; OSS-3: Oslo 3 Items Social Support Scale; PCL-C: Post Traumatic Stress Disorder Civilian Version; PTSD: Post Traumatic Stress Disorder; QOL: Quality Of Life**;** SPSS: Statistical Package for Social Science; U.S: United States**;** UOG: University Of Gondar; WHO: World Health Organization

## Declarations

### Ethical approval and consent to participate:

Ethical clearance was obtained from joint ethical review committees of the University of Gondar and Amanuel mental specialized hospital. A formal letter of permission obtained and submitted to the respective town administration. Informed consent was obtained from participants and confidentiality was maintained by omitting their personal identification

**Consent to publication**: Not applicable

***Availability of data and materials***:

Data will be available upon request from the corresponding author.

***Competing interests***: The authors declare that they have no competing interests.

***Funding***

The funder has no role in collection, analysis and interpretation of data and in writing the manuscript.

**Authors' contribution*:*** SA developed the proposal, supervised the data collection, analyzed the data and wrote the draft manuscript. All the coauthors revised the proposal, checked the data analysis, and revised and approved the manuscript.

**Acknowledgment**

The authors acknowledge university of Gondar and Amanuel Mental Specialized Hospital for funding the study. We extend our gratitude to data collectors, supervisors and study participants for their time and effort.

## References

1. Heinrichs M, Wagner D, Schoch W, Soravia LM, Hellhammer DH, Ehlert U. Predicting posttraumatic stress symptoms from pretraumatic risk factors: a 2-year prospective follow-up study in firefighters. American Journal of Psychiatry. 2005;162(12):2276-86.
2. Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
3. 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: Interpersonal and biological processes. 2002;65(3):207-39.
4. Burkle Jr FM. Acute-phase mental health consequences of disasters: implications for triage and emergency medical services. Annals of emergency medicine. 1996;28(2):119-28.

5. Gates MA, Holowka DW, Vasterling JJ, Keane TM, Marx BP, Rosen RC. Posttraumatic stress disorder in veterans and military personnel: Epidemiology, screening, and case recognition. Psychological services. 2012;9(4):361.

6. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. Epidemiologic reviews. 2005;27(1):78-91.

7. L. HG. Heather Graham L. How Common is PTSD? National Center for PTSD. 2015.:1. National Center for PTSD 2015:1.

8. Kazour F, Zahreddine NR, Maragel MG, Almustafa MA, Soufia M, Haddad R, et al. Post-traumatic stress disorder in a sample of Syrian refugees in Lebanon. Comprehensive psychiatry. 2017;72:41-7.

9. Prince M, Patel V, Saxena S, Maj M, Maselko J, Phillips MR, et al. No health without mental health. The lancet. 2007;370(9590):859-77.

10. Ayuso-Mateos JL. Global Burden of post-traumatic stress disorder in the year 2000: version 1 estimates. World Health Organ. 2002.

11. Kaplan BJ. Kaplan and Sadock's Synopsis of Psychiatry. Behavioral Sciences/Clinical Psychiatry. Tijdschrift voor Psychiatrie. 2016;58(1):78-9.

12. Bleich A, Gelkopf M, Solomon Z. Exposure to terrorism, stress-related mental health symptoms, and coping behaviors among a nationally representative sample in Israel. Jama. 2003;290(5):612-20.

13. Kalia M. Assessing the economic impact of stress [mdash] The modern day hidden epidemic. Metabolism-Clinical and Experimental. 2002;51(6):49-53.

14. Norris FH, Murphy AD, Baker CK, Perilla JL, Rodriguez FG, Rodriguez JdJG. Epidemiology of trauma and posttraumatic stress disorder in Mexico. Journal of abnormal psychology. 2003;112(4):646.

15. Atwoli L, Stein DJ, Koenen KC, McLaughlin KA. Epidemiology of posttraumatic stress disorder: prevalence, correlates and consequences. Current opinion in psychiatry. 2015;28(4):307.

16. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. Psychological bulletin. 2003;129(1):52.

17. Akinyemi OO, Owoaje ET, Ige OK, Popoola OA. Comparative study of mental health and quality of life in long term refugees and host populations in Oru-Ijebu, Southwest Nigeria. BMC research notes. 2012;5(1):394.

18. Priebe S, Matanov A, Janković Gavrilović J, McCrone P, Ljubotina D, Knežević G, et al. Consequences of untreated posttraumatic stress disorder following war in former Yugoslavia: morbidity, subjective quality of life, and care costs. Croatian medical journal. 2009;50(5):465-75.

19. Keane TM, Marshall AD, Taft CT. Posttraumatic stress disorder: etiology, epidemiology, and treatment outcome. Annu Rev Clin Psychol. 2006;2:161-97.

20. CLa. M. The History, Prevalence, and Measurement of Posttraumatic Stress Disorder. . Behav Meas Lett. 2017;2(12):5.

21. Zhou X, Kang L, Sun X, Song H, Mao W, Huang X, et al. Prevalence and risk factors of post-traumatic stress disorder among adult survivors six months after the Wenchuan earthquake. Comprehensive psychiatry. 2013;54(5):493-9.

22. Fitch T, Villanueva G, Quadir M, Alamgir H. Prevalence and risk factors for PTSD in injured workers in Bangladesh: a study of surviving workers from the Rana Plaza building collapse. The Lancet Global Health. 2015;3:S33.

23. Alghamdi M, Hunt N, Thomas S. Prevalence rate of PTSD, Depression and Anxiety symptoms among Saudi Firefighters. Journal of Traumatic Stress Disorders and Treatment. 2016;6(1):1-6.

24. Perrin MA, DiGrande L, Wheeler K, Thorpe L, Farfel M, Brackbill R. Differences in PTSD prevalence and associated risk factors among World Trade Center disaster rescue and recovery workers. American Journal of Psychiatry. 2007;164(9):1385-94.

25. North C, Nixon S, Shariat S. Psychiatric Disorders Among Survivors of the Oklahoma City Bombing. Year Book of Psychiatry and Applied Mental Health. 2001;2001(1):226-7.

26. Tsujiuchi T, Yamaguchi M, Masuda K, Tsuchida M, Inomata T, Kumano H, et al. High prevalence of post-traumatic stress symptoms in relation to social factors in affected population one year after the Fukushima nuclear disaster. PloS one. 2016;11(3):e0151807.

27. Arnberg FK, Johannesson KB, Michel P-O. Prevalence and duration of PTSD in survivors 6 years after a natural disaster. Journal of anxiety disorders. 2013;27(3):347-52.

28. Ataman M. Prevalence of PTSD and related factors in communities living in conflictual area: Diyarbakir case. 2008.

29. Lecic-Tosevski D PB, Miladinovic T, Toskovic O, Priebe S. Posttraumatic stress disorder in a Serbian community: seven years after trauma exposure. . The Journal of nervous and mental disease. 2013(201):1040-4.

30. Zachary W. Adams JAS CKD, 1Jenna L. McCauley, 1Heidi S. Resnick, 1Kirstin Gr€os, 1, 2Lisa A. Paul, 3Kyleen E. Welsh 1andKenneth J. Ruggiero. . Prevalence and predictors of PTSD and depression among adolescent victims of the Spring 2011 tornado outbreak Adams Journal of Child Psychology and Psychiatry - Wiley Online Library. 2014:1047–55.

31. Margoob MA, Ahmad SA. Community prevalence of adult post traumatic stress disorder in south Asia: Experience from Kashmir. JK-Practitioner. 2006;13(Suppl 1):S18-S25.

32. Creamer M BP, McFarlane AC. . Post-traumatic stress disorder: findings from the Australian National Survey of Mental Health and Well-being. . Psychological medicine. 2001;7(31):1237-47.

33. Farhood L, Dimassi H, Lehtinen T. Exposure to war-related traumatic events, prevalence of PTSD, and general psychiatric morbidity in a civilian population from Southern Lebanon. Journal of transcultural nursing. 2006;17(4):333-40.

34. N. P. Post-Traumatic Stress Disorder in Bam-Survived Students Who Immigrated to Kerman, Four Months after the Earthquake. Arch Iran Med. 2009;12((3):244-9.

35. Smigelsky MA, Aten JD, Gerberich S, Sanders M, Post R, Hook K, et al. Trauma in sub-Saharan Africa: Review of cost, estimation methods, and interventions. International journal of emergency mental health. 2013;16(2):354-65.

36. Brunnet AE BL, Weber JL, Kristensen CH. . Prevalence and factors associated with PTSD, anxiety and depression symptoms in Haitian migrants in southern Brazil. . International Journal of Social Psychiatry. 2018(0020764017737802).

37. Mugisha J, Muyinda H, Wandiembe P, Kinyanda E. Prevalence and factors associated with posttraumatic stress disorder seven years after the conflict in three districts in northern Uganda (The Wayo-Nero Study). BMC psychiatry. 2015;15(1):170.

38. Jenkins R, Othieno C, Omollo R, Ongeri L, Sifuna P, Mboroki JK, et al. Probable post traumatic stress disorder in Kenya and its associated risk factors: A cross-sectional household survey. International journal of environmental research and public health. 2015;12(10):13494-509.

39. Atwoli L, Stein DJ, Williams DR, Mclaughlin KA, Petukhova M, Kessler RC, et al. Trauma and posttraumatic stress disorder in South Africa: analysis from the South African Stress and Health Study. BMC psychiatry. 2013;13(1):182.

40. Pham PN WH, Longman T. . Trauma and PTSD Symptoms in Rwanda. Jama 2004;292(5):602.

41. Karunakara UK, Neuner F, Schauer M, Singh K, Hill K, Elbert T, et al. Traumatic events and symptoms of post-traumatic stress disorder amongst Sudanese nationals, refugees and Ugandans in the West Nile. African health sciences. 2004;4(2):83-93.

42. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. Journal of consulting and clinical psychology. 2000;68(5):748.

43. Besser A, Neria Y, Haynes M. Adult attachment, perceived stress, and PTSD among civilians exposed to ongoing terrorist attacks in Southern Israel. Personality and Individual Differences. 2009;47(8):851-7.

44. Song JY, Jeong K-S, Choi K-s, Kim M-g, Ahn Y-S. Psychological risk factors for posttraumatic stress disorder in workers after toxic chemical spill in Gumi, South Korea. Workplace health & safety. 2018:2165079917750168.

45. Lecic-Tosevski D, Pejuskovic B, Miladinovic T, Toskovic O, Priebe S. Posttraumatic stress disorder in a Serbian community: seven years after trauma exposure. The Journal of nervous and mental disease. 2013;201(12):1040-4.

46. Kaniasty K, Norris FH. Longitudinal linkages between perceived social support and posttraumatic stress symptoms: Sequential roles of social causation and social selection. Journal of Traumatic Stress. 2008;21(3):274-81.

47. M. G. The Posttraumatic Stress Disorder Checklist ( PCL ) PTSD CheckList – Civilian Version ( PCL-C J Appl Clin Psychol. 1993;2(8):323-55.

48. COHEN. Perceived Stress Scale. . 1983:7–8.

49. Motrico E, Moreno-Küstner B, de Dios Luna J, Torres-González F, King M, Nazareth I, et al. Psychometric properties of the List of Threatening Experiences—LTE and its association with psychosocial factors and mental disorders according to different scoring methods. Journal of affective disorders. 2013;150(3):931-40.

50. Dalgard OS. The Oslo 3-items social support scale. 20002.

51. Humeniuk R, Ali R, Babor TF, Farrell M, Formigoni ML, Jittiwutikarn J, et al. Validation of the alcohol, smoking and substance involvement screening test (ASSIST). Addiction. 2008;103(6):1039-47.

52. Jaranson JM, Butcher J, Halcon L, Johnson DR, Robertson C, Savik K, et al. Somali and Oromo refugees: correlates of torture and trauma history. American journal of public health. 2004;94(4):591-8.

53. Foa EB, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. Psychological assessment. 1997;9(4):445.

54. CLa. M. The History, Prevalence, and Measurement of Posttraumatic Stress Disorder. . Behav Meas Lett. 2017;12(2):5.

55. Heim C, Newport DJ, Heit S, Graham YP, Wilcox M, Bonsall R, et al. Pituitary-adrenal and autonomic responses to stress in women after sexual and physical abuse in childhood. Jama. 2000;284(5):592-7.

56. Guay S, Billette V, Marchand A. Exploring the links between posttraumatic stress disorder and social support: Processes and potential research avenues. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2006;19(3):327-38.

57. Taylor S. Clinician's guide to PTSD: A cognitive-behavioral approach: Guilford Publications; 2017.

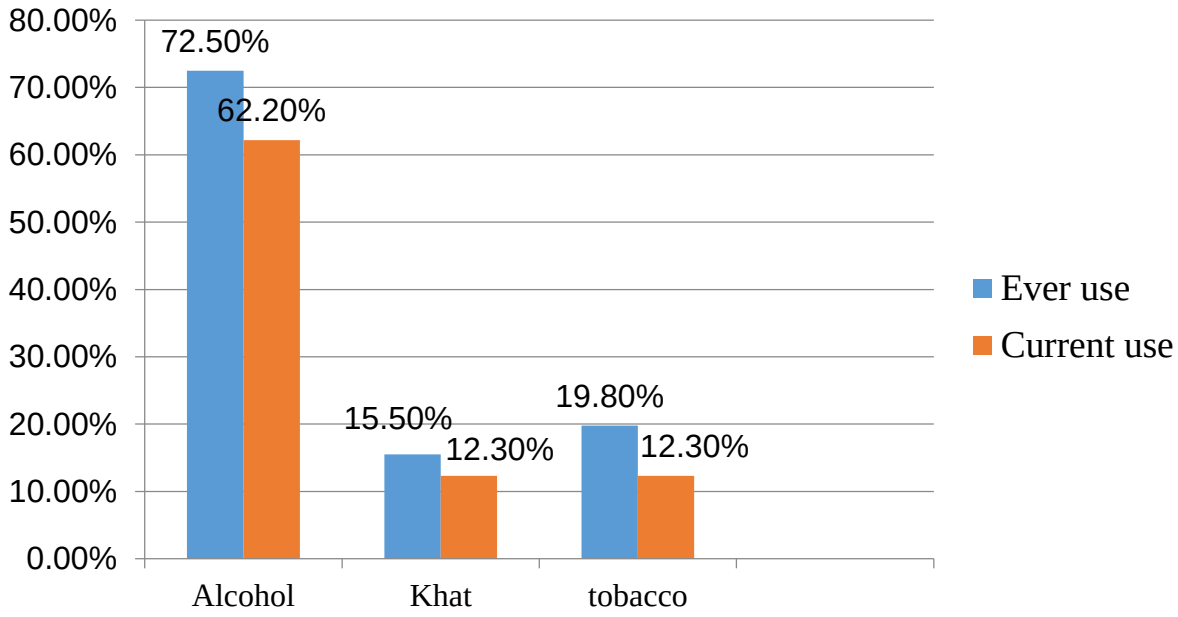
Table 4: Sociodemographic characteristics of study participants among residents of koshe area, Addis Ababa, Ethiopia, 2018 (n=830).

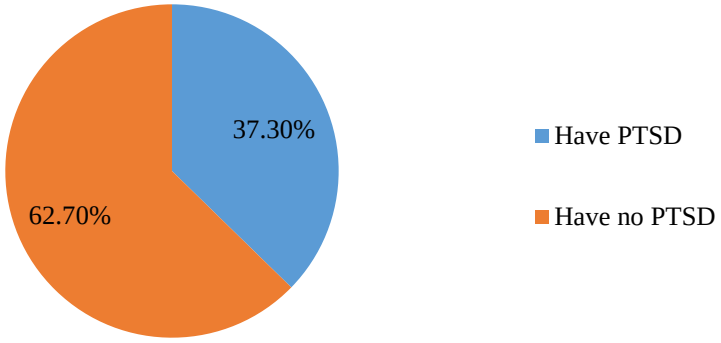
| Characteristics | Frequency | Percentage |
|---|---|---|
| Age | | |
| 15-40 | 675 | 81.3 |
| >40 | 155 | 18.7 |
| Sex | | |
| Female | 491 | 59.2 |
| Male | 339 | 40.8 |
| Marital status | | |
| Married | 428 | 51.6 |
| Single | 249 | 30% |
| Divorced | 131 | 15.8 |
| Others * | 22 | 2.7 |
| Ethnicity | | |
| Amhara | 404 | 48.7 |
| Tigray | 138 | 16.6 |
| Gurage | 135 | 16.3 |
| Oromo | 123 | 14.8 |
| Others ** | 30 | 3.6 |
| Religion | | |
| Orthodox | 502 | 60.5 |
| Muslim | 195 | 23.5 |
| Protestant | 94 | 11.3 |
| Catholic | 39 | 4.7 |
| Educational status | | |
| Cannot read and write | 153 | 18.4 |
| Primary school | 366 | 44.1 |
| Secondary school | 185 | 22.3 |
| Diploma and above | 126 | 15.2 |
| Occupational status | | |
| House wife | 131 | 15.8 |
| Employed | 472 | 56.9 |
| Student | 110 | 13.3 |
| Jobless | 117 | 14 |

NB: others * separated, widowed

Others** Silte, Hadya

List of figures





BMJ Open

# Prevalence and associated factors of post-traumatic stress disorder among Koshe landslide survivors, Addis Ababa Ethiopia: community-based, cross-sectional study

| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2018-028550.R1 |
| Article Type: | Research |
| Date Submitted by the Author: | 30-Mar-2019 |
| Complete List of Authors: | Asnakew, Sintayehu ; Debretabor University, Psychiatry<br>shumet, shegaye; University of Gondar, psychiatry<br>Ginbare , Worknesh ; Amanuel mental specialized hospital, Psychiatry<br>Legas, Getasew ; Debretabor university, Psychiatry<br>Haile , Kalkidan ; Dbremarkos hospital, psychiatry |
| Primary Subject Heading: | Mental health |
| Secondary Subject Heading: | Public health |
| Keywords: | Koshe landslides, post-traumatic stress disorder, Ethiopia, Addis Ababa |
| | |

# Prevalence and associated factors of post-traumatic stress disorder among Koshe landslide survivors, Addis Ababa Ethiopia: community-based, cross-sectional study

Sintayehu Asnakew[1*] Shegaye Shumet[2], Worknesh Ginbare [3], Getasew Legas [1]Kalkidan Haile [4]

[1] Department of Psychiatry, College Health Sciences, Debretabor University, Debretabor, Ethiopia

[2]Department of psychiatry, School of medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

[3] Department of psychiatry, Amanuel mental specialized hospital, Addis Ababa, Ethiopia

[4] Department of psychiatry, Debre markos hospital, Debre markos, Ethiopia

SA1: sintie579@gmail.com

SS: shumetshegaye@yahoo.com

WG: workneshginbare@gmail.com

GL: getasewlegas@gmail.com

KH: kalkidan946@gmail.com

*Corresponding Author. Shegaye shumet

Department of psychiatry, university of Gondar, Gondar, Ethiopia

. Tel.:+251918045505/+251967148362 Email: shumetshegaye@yahoo.com

## Abstract

**Objectives:** To assess the prevalence of post-traumatic stress disorder and associated factors among survivors of Koshe landslide, Addis Ababa, Ethiopia, 2018.

**Design:** Community based, cross-sectional study design.

**Setting:** Koshe landslide, Addis Ababa, Ethiopia.

**Participants:** We recruited about 830 participants using simple random sampling method for an interview during the study period.

**Measurement:** Data were collected by face-to-face interview. Post-traumatic stress disorder was measured using post-traumatic stress disorder checklist-civilian version. Perceived Stress Scale (PSS) and Oslo-3 social support were instruments used to assess the associated factors. Coded variables were entered into Epi data version 4.2 then exported to SPSS version 24 for analysis. Bivariate and multivariate binary logistic regressions with odds ratio and 95% confidence interval were employed.

**Result:** A total of 830 participants were interviewed, resulting in a response rate of 98.2% for the study. The prevalence of post-traumatic stress disorder was 37.3 % with ( 95 % CI: 34.1, 40.8). In the multivariate logistic regression; being female (AOR=1.74, 95%CI; 1.21,2.50)**,** divorced (AOR=2.08,95%CI; 1.26,3.43), sustained physical injury(AOR=8.28,95%CI; 5.04,13.61) , history of mental illness ( AOR = 5.55 , 95% CI ; 2.30 , 13.36 ) , family history of mental illness ( AOR = 2.82 , 95 %CI ; 1.48 , 5.37 ) , poor social support ( AOR = 3.64 , 95 %CI ; 1.99 , 6.69 ) , and high perceived stress ( AOR = 3.08 , 95 CI , 1.43 , 6.64 ) were associated with post-traumatic stress disorder.

**Conclusion and recommendation:** The prevalence of post-traumatic stress disorder among survivors of Koshe landslide was high. We recommend a PTSD-focused early regular screening by trained health professionals and considering linkage with mental health service providers is beneficial.


## Strengths and limitations of the study

- The limitation of the study emanates from its cross-sectional design, which may have only partially accounted for durable temporal relationships.
- Social and recall biases might have occurred among subjects while completing the questionnaire.
- PTSD Checklist–Civilian Version scale in the current study can be used as a reference in subsequent studies since it has good internal consistency.

**Keywords**: Koshe landslides, post-traumatic stress disorder

## Introduction

Posttraumatic stress disorder is a mental disorder that follows a traumatic event in which the individual experienced, witnessed, or was confronted with either actual or threatened loss of life or serious injury resulting a response of fear, helplessness, or horror(1).In order to be diagnosed with PTSD, a person must have re-experiencing of the trauma, avoidance of trauma-related stimuli, excessive arousal, and negative alterations in cognition and mood and that must occur 1 month after the event(2). A disaster is a traumatic event that is experienced by many people and causes different mental and physical health consequences(3). A survey study conducted in US residents, 13% of the sample reported a lifetime exposure to natural or human-generated disaster(4). According to several studies undertaken among adults, there was an increased psychological distress after natural disasters(5). Although the consequences of disasters may include a wide range of psychopathology, a systematic review has acknowledged that PTSD is the most commonly studied and frequently occurred psychopathology following disasters(6).

About 8 million adults have PTSD during a given year worldwide(7). Over fifty-one million people are being forcibly displaced worldwide, of whom 16.7 million are displaced outside their home countries and this may lead to a stress-related disorder(8). According to the global burden of disease report, about 14% of the disease burden has been attributed to neuropsychiatric disorders, mostly due to long term disabling nature of depression, and other common mental disorders including PTSD(9). Post-traumatic stress disorder (PTSD) was estimated to account for 0.4% of total YLD, around the same percentage as schizophrenia. According to World Health Report 2001, the estimated burden of PTSD has increased to 0.6% YLD globally (10). Data in USA showed the lifetime prevalence of PTSD was 8 % in the general population. The lifetime prevalence rate was 10 % in women and 4 % in men(11) . Study among Israeli residents age 18 years and above who were exposed to terrorism, the prevalence of PTSD was 9.4%, with higher rates among women (16.2%) than men (2.4%)(12). The global economic burden of stress-related mental illness is expected to rise in the coming decade. The world health organization global disease of burden study estimates that mental illness, including stress-related disorder, will be the second leading cause of disability by the year 2020(13).

The prevalence rate of PTSD in developing countries is higher as compared with in the developed countries. A study conducted among a geographically diverse sample of Mexican adults, the prevalence of PTSD was estimated to be 19%(14). Different studies in Africa showed that PTSD can still be a public health concern several years after the civil conflict and post-disaster setting. Reviews of community-based study in South Africa showed that trauma exposure is higher in low-income countries compared with high-income countries(15). Another study in Uganda during an active conflict period showed that PTSD prevalence varied between 18% and 54 % in the general population (16).

PTSD is a public health issue that contributes for poverty, lack of employment, unsecured living circumstance, change in the social network and highly associated with lower quality of life (QOL) even after the end of the actual hostility and post-disaster setting (17, 18). Factors that contribute for the development of post-traumatic stress disorder have been classified into pre-existing factors like a family history of mental illness, and substance history, the traumatic event itself, post-trauma factors such as social support (19).

There was the occurrence of garbage landslide in Addis Ababa, Ethiopia, at the area of Koshe. It is a vast rubbish dump on the outskirts of Addis Ababa, capital city of Ethiopia. Even though landslide is sometimes happened in Ethiopia but garbage land slide is rare incident. The landslide had a major impact on these community in terms of housing, financial, work and family problems resulting from the event(20). Many people were dead and dozens injured after the disaster. Hundreds of people attempt to make a living at the landfill site by collecting items for sell. Some people even lived around at the rubbish dump permanently. Natural disasters including land slide have a negative impact on mental health of affected individuals(21). Post-traumatic stress disorder is the most common psychopathology and important public health matter after experiencing trauma/disaster.

Even though PTSD is highly prevalent among post-disaster setting, there are no studies which shows the prevalence of PTSD among survivors of Koshe landslide Addis Ababa, Ethiopia. So determining prevalence of PTSD and associated factors among survivors of Koshe landslide Addis Ababa is important for early intervention and further decrease the burden of PTSD and contribute to have a plane for improving victims' quality of life.

**Objective**

This study set out to assess the prevalence of post-traumatic stress disorder and associated factors among survivors of Koshe landslide Addis Ababa, Ethiopia, 2018.

## Methods and materials

### Study settings and period

A community based, cross-sectional study was conducted between May to June 2018.The study was conducted at Koshe, a large open landfill which receives rubbish and waste from Addis Ababa, capital city of Ethiopia. This landfill is located in the southwestern part of Addis Ababa within boundaries of Nefas Silk-Lafto and Kolfie (Sub cities of Addis Ababa).The area has been a dumping ground for Addis Ababa's rubbish for more than five decades. The landfill hosts hundreds of rubbish pickers who sell recovered materials from the waste. Some people even live around at the rubbish dumping permanently.

### Study participants and sampling

We used multistage sampling technique to select 830 participants. To reach the households simple random sampling technique was used (computer-generated random number). We proportionally allocated the sample size to Kilinto, Asko, Addis Hiwot and Koshe garbage dump area**,** where victims' temporary settle. Members of the selected household were further selected for an interview. In case of more than one eligible participant in the household, lottery method was used to select only one.

The study included all participants whose age 15 years and above during data collection period at the study area. In total, there were 5316 population. Nearly, 1035 were households. We excluded those participants who were seriously ill and unable to communicate.

### Sample size determination

In this study, we determined the sample size by using a single population proportion formula with the following assumptions: by taking 48% prevalence of post-traumatic stress disorder from results conducted in South Sudan(22), which was P=0.48. Z (standard normal distribution: 1.96) was assumed and CI was set at 95% (and $\alpha$=0.05); and a non-response rate of 10%. Accordingly, a representative/probabilistic sample size of the study was calculated to be 423. After considering design effect, the total sample size was decided to be 846.

**Study variables**

The dependent variable PTSD was measured as a dichotomous variable (yes/no) on 17 items of PTSD checklist-Civilian version, with the cut-off point set at greater than or equal to 50, that is, garbage slide victims who scored ≥50 had PTSD.

Independent variables include sociodemographic factors (age, sex, marital status, ethnicity, religion, educational status and occupational status), clinical variables (family history of mental illness, previous history of mental illness and experiencing childhood trauma), traumatic related factors (trauma exposure, perceived life threat ),substance related factors(alcohol consumption, cigarette smoking, Khat chewing) and psychosocial factors (social support, stressful life events).

**Data sources and measurement**

Data were collected via a face-to-face interview using semi structured questionnaire. Data were collected by four trained data collectors (psychiatry nurses) using the Amharic version of the questionnaire for a month. The questionnaire was designed in English and was translated to Amharic, national language of Ethiopia and back to English for its consistency. The training was given for data collectors regarding to the questionnaire such as how to interview and explain unclear questions, purpose of the study for participants. Furthermore, they have given awareness about ethical principles including confidentiality/ anonymity/ and data management, secure subjects' informed consent for participation.

***Post-traumatic stress disorder*** **Checklist-Civilian version (PCL-C)** was used to assess post-traumatic stress disorder. PCL-C is measured with likert type scale ranging from ( 1) "Not at all" to (5) "Extremely" with a cut point of ≥50. It had shown high internal consistency and reliability and strong correlation with PTSD diagnosis using clinician-administered PTSD scale translated versions of the PCL-C into Oromo and Somali produced high reliability with cronbach's α (.93)(23) and has 0.89 sensitivity and 0.75 specificity(24). In the current study, the inter-data reliability or internal consistency was found to be Cronbach's α (0.94).

***Social support*** was measured using Oslo 3-items, social support scale and with scores ranging between 3 and 14: 3–8=poor social support; 9–11=intermediate social support; and 12–14=strong social support (25).

***Individual stress levels*** were measured using the Perceived Stress Scale (PSS). The questions in this scale ask about their feelings and thoughts during the last month. PSS is measured with likert type scale ranging from ( 0) "Never" to (4) "very often " and individuals with higher scores indicating higher perceived stress(26).

*Substance use history*: To examine substance use history, respondents were asked: "Have you ever use any substance in the last three months or in lifetime?" and the responses were yes/no (27).

***History of mental illness***: To examine history of mental illness, respondents were asked: "Have you ever been diagnose with mental illness and treated previously" and responses were yes/no.

**Family history of mental illness**: To examine family history of mental illness, respondents were asked: "Do you know a family member who had experienced a mental illness?"

**Experiencing childhood trauma**: To examine child hood trauma, respondents were asked: "Have you been experienced childhood physical and sexual abuse and neglect" and responses were yes/no.

*Items on socio-demographic factors* (age, sex, ethnicity, religion, marital status, educational status and occupational status) were adopted from different literatures.

**Data processing and analysis**

All collected data were checked for completeness and consistency and entered in to Epi-data version 4.2 and then exported to SPSS for windows version 24 for analysis.

We computed descriptive and bivariate and multivariate logistic regression analyses to see frequency distribution and to test whether there were an association between the independent and dependent variables, respectively. Factors associated with PTSD were selected during bivariate analysis with a value of $p \leq 0.05$ for further analysis in multivariable regression analysis. In multivariable regression analysis variables with P-value less than 0.05 at 95% confidence interval with its adjusted odds ratio were considered as statistically significant.

**Ethical Consideration**

Ethical approval was obtained ethical review board of the University of Gondar. Ethical clearance was obtained from joint ethical review committees of the University of Gondar and Amanuel mental specialized hospital. Permission was obtained from Addis Ababa city Administration health bureau ethical committee. We took written consent from study participants and assent from legally approved foster parents after explaining purpose of the study. Confidentiality was maintained by omitting their personal identification.

**Patient and public involvement**

In the current study our study participants are people who survive at Koshe landslide, Addis, Ababa, Ethiopia, and patients were not included in this study. Our study participants were also not involved in the study design and recruitment. The results of this study will be disseminated to Federal Ministry of Health, Addis Ababa health bureau, and Kolfe sub city health department for timely management of those survivors through presentation and policy briefing.

## Result

A total of 830 respondents were participated in the study with the response rate of 98.2%. Majority of the respondents, 491 (59.2%) were female. The mean age of the respondents was 33(SD ±12 ) years, of whom 675 (81.3%) were in the age range of 15-40 years. Approximately, 428(51.6%) respondents were married, 502 (60.5%) Orthodox Christian followers and 404 (48.7%) Amhara by ethnicity. Regarding to their occupation, more than half (56.6%) were employed (**table1**).

Table 1: Sociodemographic characteristics of study participants among residents of Koshe area, Addis Ababa, Ethiopia, 2018 (n=830).

| Characteristics | Frequency | Percentage |
|---|---|---|
| Age | | |
| 15-40 | 675 | 81.3 |
| >40 | 155 | 18.7 |
| Sex | | |
| Female | 491 | 59.2 |
| Male | 339 | 40.8 |
| Marital status | | |
| Married | 428 | 51.6 |
| Single | 249 | 30.0 |
| Divorced | 131 | 15.8 |
| Others * | 22 | 2.7 |
| Ethnicity | | |
| Amhara | 404 | 48.7 |
| Tigray | 138 | 16.6 |
| Gurage | 135 | 16.3 |
| Oromo | 123 | 14.8 |
| Others ** | 30 | 3.6 |

| | | |
|---|---|---|
| Religion | | |
| Orthodox | 502 | 60.5 |
| Muslim | 195 | 23.5 |
| Protestant | 94 | 11.3 |
| Catholic | 39 | 4.7 |
| Educational status | | |
| Cannot read and write | 153 | 18.4 |
| Primary school | 366 | 44.1 |
| Secondary school | 185 | 22.3 |
| Diploma and above | 126 | 15.2 |
| Occupational status | | |
| House wife | 131 | 15.8 |
| Employed | 472 | 56.9 |
| Student | 110 | 13.3 |
| Jobless | 117 | 14.0 |

NB: others * separated, widowed, others** Silte, Hadya

About 55(6.6%) of participants had a history of mental illness. Around 202 (24.3%) of them had childhood physical abuse and neglect experience, and seventy-nine (9.5%) of them had family history of mental illness.

Nearly, 569 (68.6%) of the respondents had witnessed physical injury of their families or friends, and about 166 (20%) had experienced physical injury and 581 (70 %) of the participants had moderate perceived life threat (**table 2**).

**Table 2**: Distribution of trauma-related factors of the respondents in Koshe, Addis Ababa, Ethiopia, 2018 (n=830)

| Characteristics | Frequency | Percentage |
|---|---|---|
| Sustaining physical injury | 166 | 20.0 |
| Witnessing the death of families or friends | 526 | 63.4 |
| Witnessing physical injury of families or friends | 569 | 68.6 |
| Property destruction | 240 | 28.9 |
| Thinking, they may die | 546 | 65.8 |
| Perceived life threat | | |
| Low perceived stress | 185 | 22.3 |

| | | |
|---|---|---|
| Moderate perceived stress | 581 | 70.0 |
| High perceived stress | 64 | 7.7 |

Out of the total 830 participants, nearly half (48%) of the respondents had poor social support and majority 659(79.4%) of the participants had experienced at least one stressful life events (**table 3**).

**Table 3:** Distribution of psychosocial factors of the study participants among residents of Koshe Addis Ababa, Ethiopia, 2018(n= 83)

| Characteristics | **Category** | **Frequency** | **percent** |
|---|---|---|---|
| **Social support** | Poor | 398 | 48.0 |
| | Moderate | 324 | 39.0 |
| | Strong | 108 | 13.0 |
| **Stressful life events** | Yes | 659 | 79.4 |
| | No | 171 | 20.6 |

On substance-related factors, nearly three fourth, 602(**72.5**%) of the participants had ever use of alcohol, and 516(62.20%) current use of alcohol. Regarding to tobacco smoking, 164(19.80%) of the participants had ever used, and 102(12.30%) current use of tobacco. Concerning khat chewing (leaves of khat), about 129(15.5%) ever use and 102(12.30%) current use of khat.

**Prevalence of PTSD**

In our finding the prevalence of post-traumatic stress disorder (PTSD) among study participants was 37.3% (95 % CI: 34.1, 40.8) (**Fig1**).

**Factors associated with posttraumatic stress disorder**

To determine the association of independent variables with PTSD, bivariate and multivariate binary logistic regression analysis were carried out.

In the bivariate analysis factors including being female, age >60 years , divorced in marital status, history of mental illness, family history of mental illness, experiencing childhood physical trauma and neglect, sustained physical injury, witnessing the death and physical injury of families or friends, property destruction, thought, they may die, poor social support, and high perceived life threat were significantly associated with post-

traumatic stress disorder at a P value less than 0.05. These factors were then entered into multivariable logistic regression model to control for its confounding effects.

The result of the multivariate analysis showed that being female, being divorced, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD at a p-value less than 0.05. Being female was 1.7 times more likely to develop PTSD as compared with male respondents (AOR=1.7,95 %CI; 1.2,2.5).The odds of developing PTSD were 2.1 times higher among respondents who were divorced as compared with those respondents who were married (AOR=2.1,95%CI;1.3,3.4). On history of mental illness, the odds of developing PTSD were 5.6 times higher among participants who had history of mental illness as compared with those who had no history of mental illness (AOR=5.6,95% CI,2.3,13.4). The likelihood of developing PTSD was 2.8 times higher among respondents who had family history of mental illness as compared with those who had no family history of mental illness (AOR=2.8, 95% CI, 1.5, 5.4).The odds of developing PTSD were 8.3 times higher among respondents who had experienced physical injury than those who hadn't experienced physical injury (AOR=8.3, 95% CI, 5.0, 13.6). Respondents who had poor social support were 3.6 times more likely to develop PTSD as compared with those participants who had strong social support( AOR= 3.6,95% CI,2.0,6.7).The odds of developing PTSD were 3.1 times higher among those respondents who had high perceived stress than those who had low perceived stress (AOR= 3.1, 95% CI;1.4,6.6) (**Table 4**).

**Table 4**: Factors associated with PTSD among residents of Koshe, Addis Ababa, Ethiopia, 2018 (n= 830)

| Variables | Category | PTSD | | COR(95%CI) | AOR(95%CI) |
|---|---|---|---|---|---|
| | | Yes | No | | |
| Sex | Male | 106 | 233 | 1 | 1 |
| | Female | 204 | 287 | 1.6(1.2,2.1) | 1.7(1.2,2.5)** |
| Age | 15-40 | 241 | 434 | 1 | 1 |
| | >40 | 69 | 86 | 1.5(1.0,2.1) | 1.4(0.9,2.1) |
| Marital status | Married | 138 | 290 | 1 | 1 |
| | Single | 87 | 162 | 1.1(0.8,1.6) | 1.2(0.8,1.8) |
| | Divorced | 77 | 54 | 3.0(2.0,4.5) | 2.1(1.3,3.4)** |
| | Others | 8 | 14 | 1.2(0.5,2.9) | 1.4(0.5,4.2) |

| | | | | | |
|---|---|---|---|---|---|
| History(Hx) of mental illness | Yes<br>No | 46<br>264 | 9<br>511 | 9.9(4.8,20.5)<br>1 | 5.6(2.3,13.4)**<br>1 |
| Family Hx of mental illness | Yes<br>No | 55<br>255 | 24<br>496 | 4.5(2.7,7.4)<br>1 | 2.8(1.5,5.4)**<br>1 |
| Experiencing childhood trauma | Yes<br>No | 109<br>201 | 93<br>427 | 2.5(1.8,3.4)<br>1 | 1.2(0.7,1.9)<br>1 |
| Sustaining Physical trauma | Yes<br>No | 135<br>175 | 31<br>489 | 12.2(7.9,18.7)<br>1 | 8.3(5.0,13.6)**<br>1 |
| Witnessing the death of family or friend | yes<br>No | 223<br>87 | 303<br>217 | 1.9(1.4,2.5)<br>1 | 0.8(0.5,1.4)<br>1 |
| Witnessing injury of family or friend | Yes<br>No | 238<br>2 | 331<br>189 | 1.9(1.4,2.6)<br>1 | 0.8(0.5,1.4)<br>1 |
| Property destruction | Yes<br>No | 117<br>193 | 123<br>397 | 2.0(1.4,2.7)<br>1 | 1.0(0.7,1.5)<br>1 |
| Thought of death | Yes<br>No | 242<br>68 | 304<br>216 | 2.5(1.8,3.5)<br>1 | 1.3(0.7,2.0)<br>1 |
| Social support | poor<br>Moderate | 209<br>81 | 189<br>243 | 4.9(2.9,8.2)<br>1.5(0.9,2.5) | 3.6(2.0,6.7)**<br>1.4(0.8,2.6) |
| | Strong | 20 | 88 | 1 | 1 |
| Perceived threat | Low | 56 | 129 | 1 | 1 |
| | Moderate | 209 | 372 | 2.9(1.9,4.6) | 1.0(0.7,1.6) |
| | High | 45 | 19 | 10.9(5.6,21.4) | 3.1(1.4,6.6)** |

key:**=p-value<0.05,Modelfitness=0.114 (hosmer and lemshow),=0.000(Omnibus test), no multicolinearity (tolerance>0.1 and VIF<2)

## Discussion

Post-traumatic stress disorder is the most common psychopathology and important public health matter after experiencing trauma/disaster. We found that, for the entire sample, a garbage landslide has a negative impact on exposed individuals' mental health and in terms of housing, financial, work and family problems resulting from the event. This study found a number of people met the criteria for post trauma stress symptomatology. Approximately, 37.3% of people who experienced the incident have presented with posttraumatic stress disorder symptoms based on post-traumatic stress disorder checklist-civilian version. Our finding was consistent with reports in other studies on populations exposed to natural disasters, which were 36.3% among earth quick victims in Kerman, 35.4% among Syrian refugees in Lebanon, 34.9% in turkey, 34.3% among bombing victims of the Oklahoma city, USA (8, 28-30). Conversely, this finding was lower than 48% found

in South Sudan, 75.6% among Rana Plaza building collapse victims in Bangladesh, 57% in Saudi Arabia, 83.7%, former Yugoslavia living in Croatia, Serbia, Germany and U.K, 59.4% in Fukushima nuclear disaster Japan (18, 22, 31-33). The possible reason for this difference might be due to use of different instruments and cutoff points to measure PTSD, exposure to multiple trauma, study design and the nature and magnitude of the accidents covered in the study.

On the other hand, our estimations are higher than findings in other countries, which were 11.8% in Northern Uganda, 18.8% in Serbia, 29.3% in Southern Lebanon, 9.1% in Sothern Brazil (34-37). The possible reason for this variation might be instrument difference. They were using GHQ-12, structured clinical interview, MINI, the modified version of a composite international diagnostic interview but we used post-traumatic stress disorder checklist civilian version. The other variation might be due to the methods they used for data collection (structured telephone interview) and delayed conduction of the study after the trauma.

On the independent predictors of PTSD, being female, being divorced, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD. Specifically, the greater likelihood of PTSD occurrence among female gender as compared with male respondents, which is similar with other studies (28, 30, 31, 38-40),which is possibly due to females have experienced sexual assault and child sexual abuse than males, hence being exposed to such trauma is more risk than other trauma in causing PTSD(41).

Participants who were divorced were more likely to develop PTSD as compared with married respondents. Those with younger children might have concerns often center on raising their family alone, financial worries tend to fill the minds of most people facing life without their partner, especially those with young children which leads to be stressed. This was supported by study in Serbia(35).

Having the history of mental illness was also significantly associated with PTSD. Participants with the history of mental illness might have neurochemical imbalance and neuronal damage as compared to those who had no history of mental illness. As a result they might prone to develop PTSD after this phenomenon. This finding was supported by results of studies conducted in various country (30, 33, 38, 42, 43).

The odds of developing PTSD was 2.8 times higher among respondents who had a family history of mental illness than those who had no family history of mental illness. The possible explanation might be the inheritance of the serotonin transporter gene as well as genes associated with the hypothalamic–pituitary–adrenal axis and psychological factors which made participants more highly predispose to PTSD (41, 44). This finding was consistent with results of studies conducted in South Korea(42, 43).

Moreover, experiencing physical injury was the strongest predictor of PTSD as compared with those individuals who didn't experience physical injury during the catastrophe which is similar with results from other studies (28, 31, 40). The possible explanation for the similarity could be the presence of scars, having impaired part may remind the trauma and relive it and may believe that the traumatic event has been put behind them, the body could be clinging to unresolved issues. The odds of developing PTSD was 3.6 times higher among individuals who had poor social support than strong social support which is similar with results of studies conducted in Southern Brazil and Mexico (37, 45). Lack of help with physical exercise, emotional support and having someone to talk with about traumatic experience or to turn to for advice could increase the risk of PTSD(46).

Participants who had high perceived stress were more likely to develop PTSD as compared with those respondents who had low perceived stress which is similar with findings from Southern Israel and Southern Korea(42, 47). The negative belief towards the consequence of ongoing threat as damaging implications will precipitate the onset and persistence of PTSD(48).

**Limitation of the study**

The design of the study was cross-sectional; therefore, we were unable to conclude the observed/reported associations may not necessarily any causal direction.

In addition, participants did not consider whether or not they have post-traumatic stress disorder before the onset of landslide due to other factors. The presence of post-traumatic stress disorder symptoms before this catastrophe may influence prevalence of post-traumatic stress disorder due garbage land slide.

Furthermore, social desirability and recall bias might also be the other limitations. Since data collection method was face-to-face interview which might lead individuals to respond socially acceptable answer during the interview process especially in case of substance-related questions.

Individuals without PTSD symptoms may have less motivation to recall earlier exposure as compared with individuals with PTSD symptoms.

In addition to this, we did not consider other mental health problems that can confound study outcomes. For instance, the presence and effects of anxiety and depression symptoms, which are commonly associated with PTSD symptoms and severity of PTSD, duration of mental illness, or exposure to other diseases were not covered in the study.

The strength of the study was including a relatively large sample size and sampling methods. Since it was face-to-face interview, we were addressing individuals who had PTSD for further investigation and intervention.

## Conclusion

The prevalence of PTSD was found to be high. This study confirms the negative impact of a garbage landslide on the mental health of affected individuals. Being female, divorced participants, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD. Therefore; we recommend a PTSD-focused early regular screening by trained health professionals and considering linkage with mental health service providers is beneficial. It is also better to give emphasis for individuals with a family history of mental illness, female gender, and a history of mental illness and for those who experienced physical trauma during the disaster.

**Lists of abbreviations**

AMSH: Amanuel Mental Specialized Hospital; AOR: Adjusted Odd Ratio, CI: Confidence Interval; COR: Crude Odd Ratio; DSM: Diagnostic and Statistical Manual; HH: House Hold; M.I.N.I: Mini-International Neuropsychiatric Interview ; OSS-3: Oslo 3 Items Social Support Scale; PCL-C: Post Traumatic Stress Disorder Civilian Version; PTSD: Post Traumatic Stress Disorder; QOL: Quality Of Life**;** SPSS: Statistical Package for Social Science; U.S: United States**;** UOG: University Of Gondar; WHO: World Health Organization

**Acknowledgment**

The authors acknowledge the University of Gondar and Amanuel Mental Specialized Hospital for funding the study. We extend our gratitude to data collectors, supervisors and study participants for their time and effort.

**Authors' contribution:** SA developed the proposal, supervised the data collection, analyzed the data and wrote the draft manuscript. WG,GL,KH revised the proposal, checked the data analysis. SS, revised the proposal, check data analysis, revised and approved the manuscript.

***Funding:*** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors. The funder has no role in collection, analysis and interpretation of data and in writing the manuscript

***Competing interests***: None declared

Patient consent: Informed consent was obtained from participants

**Ethical approval and consent to participate**: Ethical approval was obtained from Ethical review board of the University of Gondar. Ethical clearance was obtained from joint ethical review committees of the University of Gondar and Amanuel mental specialized hospital. A formal letter of permission obtained and submitted to the respective town administration.

**Provenance and peer review**: Not commissioned; externally peer reviewed.

**Data sharing statement**: The data set is available on request by emailing the corresponding author at shumetshegaye@yahoo.com

**Consent to publication**: Not applicable

## References

1. Heinrichs M, Wagner D, Schoch W, Soravia LM, Hellhammer DH, Ehlert U. Predicting posttraumatic stress symptoms from pretraumatic risk factors: a 2-year prospective follow-up study in firefighters. American Journal of Psychiatry. 2005;162(12):2276-86.
2. Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
3. 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: Interpersonal and biological processes. 2002;65(3):207-39.
4. Burkle Jr FM. Acute-phase mental health consequences of disasters: implications for triage and emergency medical services. Annals of emergency medicine. 1996;28(2):119-28.
5. Gates MA, Holowka DW, Vasterling JJ, Keane TM, Marx BP, Rosen RC. Posttraumatic stress disorder in veterans and military personnel: Epidemiology, screening, and case recognition. Psychological services. 2012;9(4):361.

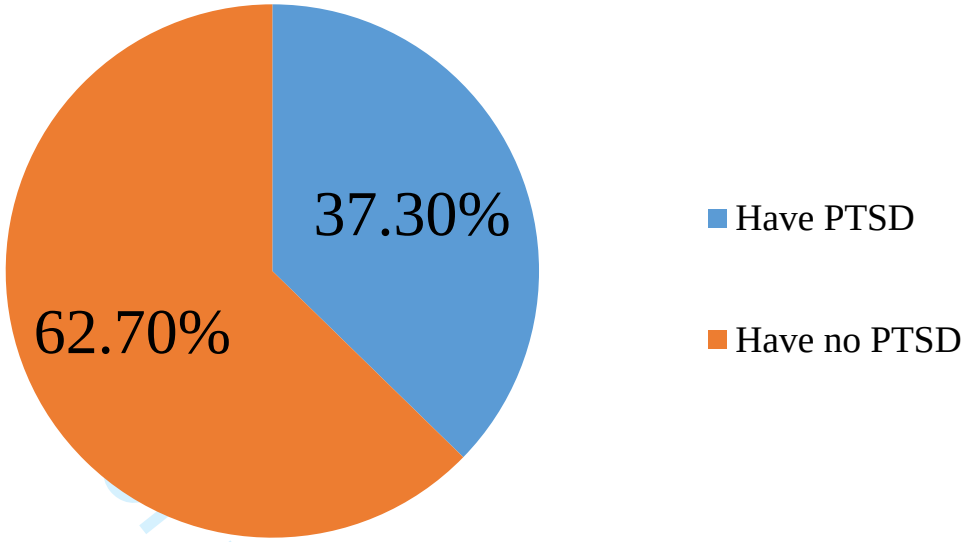
6. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. Epidemiologic reviews. 2005;27(1):78-91.
7. L. HG. Heather Graham L. How Common is PTSD? National Center for PTSD. 2015.:1. National Center for PTSD 2015:1.
8. Kazour F, Zahreddine NR, Maragel MG, Almustafa MA, Soufia M, Haddad R, et al. Post-traumatic stress disorder in a sample of Syrian refugees in Lebanon. Comprehensive psychiatry. 2017;72:41-7.
9. Prince M, Patel V, Saxena S, Maj M, Maselko J, Phillips MR, et al. No health without mental health. The lancet. 2007;370(9590):859-77.
10. Ayuso-Mateos JL. Global Burden of post-traumatic stress disorder in the year 2000: version 1 estimates. World Health Organ. 2002.
11. Kaplan BJ. Kaplan and Sadock's Synopsis of Psychiatry. Behavioral Sciences/Clinical Psychiatry. Tijdschrift voor Psychiatrie. 2016;58(1):78-9.
12. Bleich A, Gelkopf M, Solomon Z. Exposure to terrorism, stress-related mental health symptoms, and coping behaviors among a nationally representative sample in Israel. Jama. 2003;290(5):612-20.
13. Kalia M. Assessing the economic impact of stress [mdash] The modern day hidden epidemic. Metabolism-Clinical and Experimental. 2002;51(6):49-53.
14. Norris FH, Murphy AD, Baker CK, Perilla JL, Rodriguez FG, Rodriguez JdJG. Epidemiology of trauma and posttraumatic stress disorder in Mexico. Journal of abnormal psychology. 2003;112(4):646.
15. Atwoli L, Stein DJ, Koenen KC, McLaughlin KA. Epidemiology of posttraumatic stress disorder: prevalence, correlates and consequences. Current opinion in psychiatry. 2015;28(4):307.
16. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. Psychological bulletin. 2003;129(1):52.
17. Akinyemi OO, Owoaje ET, Ige OK, Popoola OA. Comparative study of mental health and quality of life in long term refugees and host populations in Oru-Ijebu, Southwest Nigeria. BMC research notes. 2012;5(1):394.
18. Priebe S, Matanov A, Janković Gavrilović J, McCrone P, Ljubotina D, Knežević G, et al. Consequences of untreated posttraumatic stress disorder following war in former Yugoslavia: morbidity, subjective quality of life, and care costs. Croatian medical journal. 2009;50(5):465-75.
19. Keane TM, Marshall AD, Taft CT. Posttraumatic stress disorder: etiology, epidemiology, and treatment outcome. Annu Rev Clin Psychol. 2006;2:161-97.
20. Kennedy IT, Petley DN, Williams R, Murray V. A systematic review of the health impacts of mass Earth movements (landslides). PLoS currents. 2015;7.
21. Catapano F, Malafronte R, Lepre F, Cozzolino P, Arnone R, Lorenzo E, et al. Psychological consequences of the 1998 landslide in Sarno, Italy: a community study. Acta Psychiatrica Scandinavica. 2001;104(6):438-42.
22. Karunakara UK, Neuner F, Schauer M, Singh K, Hill K, Elbert T, et al. Traumatic events and symptoms of post-traumatic stress disorder amongst Sudanese nationals, refugees and Ugandans in the West Nile. African health sciences. 2004;4(2):83-93.
23. Jaranson JM, Butcher J, Halcon L, Johnson DR, Robertson C, Savik K, et al. Somali and Oromo refugees: correlates of torture and trauma history. American journal of public health. 2004;94(4):591-8.
24. Foa EB, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder: the Posttraumatic Diagnostic Scale. Psychological assessment. 1997;9(4):445.
25. Dalgard OS. The Oslo 3-items social support scale. 20002.
26. COHEN. Perceived Stress Scale. . 1983:7–8.
27. Humeniuk R, Ali R, Babor TF, Farrell M, Formigoni ML, Jittiwutikarn J, et al. Validation of the alcohol, smoking and substance involvement screening test (ASSIST). Addiction. 2008;103(6):1039-47.
28. Parvaresh N, Bahramnezhad A. Post-traumatic stress disorder in bam-survived students who immigrated to Kerman, four months after the earthquake. 2009.

29. Ataman M. Prevalence of PTSD and related factors in communities living in conflictual area: Diyarbakir case. 2008.
30. North CS, Nixon SJ, Shariat S, Mallonee S, McMillen JC, Spitznagel EL, et al. Psychiatric disorders among survivors of the Oklahoma City bombing. Jama. 1999;282(8):755-62.
31. Fitch T, Villanueva G, Quadir M, Alamgir H. Prevalence and risk factors for PTSD in injured workers in Bangladesh: a study of surviving workers from the Rana Plaza building collapse. The Lancet Global Health. 2015;3:S33.
32. Alghamdi M, Hunt N, Thomas S. Prevalence rate of PTSD, depression and anxiety symptoms among Saudi firefighters. Journal of Traumatic Stress Disorders and Treatment. 2016;6(1):1-6.
33. Tsujiuchi T, Yamaguchi M, Masuda K, Tsuchida M, Inomata T, Kumano H, et al. High prevalence of post-traumatic stress symptoms in relation to social factors in affected population one year after the Fukushima nuclear disaster. PloS one. 2016;11(3):e0151807.
34. Mugisha J, Muyinda H, Wandiembe P, Kinyanda E. Prevalence and factors associated with posttraumatic stress disorder seven years after the conflict in three districts in northern Uganda (The Wayo-Nero Study). BMC psychiatry. 2015;15(1):170.
35. Lecic-Tosevski D, Pejuskovic B, Miladinovic T, Toskovic O, Priebe S. Posttraumatic stress disorder in a Serbian community: seven years after trauma exposure. The Journal of nervous and mental disease. 2013;201(12):1040-4.
36. Farhood L, Dimassi H, Lehtinen T. Exposure to war-related traumatic events, prevalence of PTSD, and general psychiatric morbidity in a civilian population from Southern Lebanon. Journal of transcultural nursing. 2006;17(4):333-40.
37. Brunnet AE, Bolaséll LT, Weber JL, Kristensen CH. Prevalence and factors associated with PTSD, anxiety and depression symptoms in Haitian migrants in southern Brazil. International Journal of Social Psychiatry. 2018;64(1):17-25.
38. Jenkins R, Othieno C, Omollo R, Ongeri L, Sifuna P, Mboroki J, et al. Probable post traumatic stress disorder in kenya and its associated risk factors: a cross-sectional household survey. International journal of environmental research and public health. 2015;12(10):13494-509.
39. Arnberg FK, Johannesson KB, Michel P-O. Prevalence and duration of PTSD in survivors 6 years after a natural disaster. Journal of anxiety disorders. 2013;27(3):347-52.
40. Zhou X, Kang L, Sun X, Song H, Mao W, Huang X, et al. Prevalence and risk factors of post-traumatic stress disorder among adult survivors six months after the Wenchuan earthquake. Comprehensive psychiatry. 2013;54(5):493-9.
41. Heim C, Newport DJ, Heit S, Graham YP, Wilcox M, Bonsall R, et al. Pituitary-adrenal and autonomic responses to stress in women after sexual and physical abuse in childhood. Jama. 2000;284(5):592-7.
42. Song JY, Jeong K-S, Choi K-s, Kim M-g, Ahn Y-S. Psychological risk factors for posttraumatic stress disorder in workers after toxic chemical spill in Gumi, South Korea. Workplace health & safety. 2018;66(8):393-402.
43. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. Journal of consulting and clinical psychology. 2000;68(5):748.
44. Keane T, Fisher L, Krinsley K. Posttraumatic stress disorder, Handbook of prescriptive treatments for adults. Springer; 1994.
45. Kaniasty K, Norris FH. Longitudinal linkages between perceived social support and posttraumatic stress symptoms: Sequential roles of social causation and social selection. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2008;21(3):274-81.
46. Guay S, Billette V, Marchand A. Exploring the links between posttraumatic stress disorder and social support: Processes and potential research avenues. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2006;19(3):327-38.

47. Besser A, Neria Y, Haynes M. Adult attachment, perceived stress, and PTSD among civilians exposed to ongoing terrorist attacks in Southern Israel. Personality and Individual Differences. 2009;47(8):851-7.
48. Taylor S. Clinician's guide to PTSD: A cognitive-behavioral approach: Guilford Publications; 2017.

List of figure

Fig 1: Showing prevalence of PTSD among residents of Koshe, Addis Ababa, Ethiopia, 2018 (n=830)



STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | 1 | (a) Indicated in page-I,red color highlighted |
| | | (b) Indicated in page II and changes are highlighted |
| **Introduction** | | |
| Background/rationale | 2 | Explained page -1 of the introduction section |
| Objectives | 3 | Stated in page-2 |
| **Methods** | | |
| Study design | 4 | page 2 |
| Setting | 5 | page-2 |
| Participants | 6 | (*a*) page-3 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. (Page-3) |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). ( Page-4) |
| Bias | 9 | Describe any efforts to address potential sources of bias |
| Study size | 10 | Explain how the study size was arrived at (page-3) |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analysis. (No qualitative data) |
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding (page-5) |
| | | (b) Describe any methods used to examine subgroups and interactions(no sub group ) |
| | | (c) Explain how missing data were addressed (page-5 in data processing section) |
| | | (d) If applicable, describe analytical methods taking account of sampling strategy(page-3) |
| | | (e) Describe any sensitivity analyses (page-4) |
| **Results** | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (page-6) |
| | | (b) Give reasons for non-participation at each stage( some is not voluntary, some is not present during data collection ) |
| Descriptive data | 14* | (c) Consider use of a flow diagram(we were not using since it is not relevant here) |
| | | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders(page 6-7) |
| | | (b) Indicate number of participants with missing data for each variable of interest (page-6) |
| Outcome data | 15* | Report numbers of outcome events or summary measure (page-7) |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included( page 7-8) |
| | | (b) Report category boundaries when continuous variables (no continuous variable used) |
| | | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period(no relevancy here) |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses(no) |

| | | |
|---|---|---|
| **Discussion** | | |
| Key results | 18 | Summarise key results with reference to study objectives (page 9-11) |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or Imprecision. Discuss both direction and magnitude of any p(page11-12) |
| (Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant (page- |
| 12) Generalisability | 21 | Discuss the generalisability (external validity) of the study results(page -12) |
| **Other information** | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based(page 12) |

*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

# The prevalence of post-traumatic stress disorder and associated factors among Koshe landslide survivors, Addis Ababa Ethiopia: A community-based, cross-sectional study



| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2018-028550.R2 |
| Article Type: | Research |
| Date Submitted by the Author: | 31-May-2019 |
| Complete List of Authors: | Asnakew, Sintayehu ; Debretabor University, Psychiatry<br>shumet, shegaye; University of Gondar, psychiatry<br>Ginbare , Worknesh ; Amanuel mental specialized hospital, Psychiatry<br>Legas, Getasew ; Debretabor university, Psychiatry<br>Haile , Kalkidan ; Dbremarkos hospital, psychiatry |
| Primary Subject Heading: | Mental health |
| Secondary Subject Heading: | Public health |
| Keywords: | Ethiopia, Addis Ababa, Koshe landslides, post-traumatic stress disorder |
| | |

# The prevalence of post-traumatic stress disorder and associated factors among Koshe landslide survivors, Addis Ababa Ethiopia: A community-based, cross-sectional study

Sintayehu Asnakew[1*] Shegaye Shumet[2], Worknesh Ginbare [3], Getasew Legas [1]Kalkidan Haile [4]

[1] Department of Psychiatry, College Health Sciences, Debretabor University, Debretabor, Ethiopia

[2]Department of psychiatry, School of medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

[3] Department of psychiatry, Amanuel mental specialized hospital, Addis Ababa, Ethiopia

[4] Department of psychiatry, Debre markos hospital, Debre markos, Ethiopia

SA1: sintie579@gmail.com

SS: shumetshegaye@yahoo.com

WG: workneshginbare@gmail.com

GL: getasewlegas@gmail.com

KH: kalkidan946@gmail.com

*Corresponding Author. Shegaye shumet

Department of psychiatry, university of Gondar, Gondar, Ethiopia

. Tel.:+251918045505/+251967148362 Email: shumetshegaye@yahoo.com

## Abstract

**Objectives:** To assess the prevalence of post-traumatic stress disorder and associated factors among the survivors of Koshe landslide, Addis Ababa, Ethiopia, 2018

**Design:** Community-based cross-sectional design.

**Setting:** Koshe landslide, Addis Ababa, Ethiopia

**Participants:** We recruited 830 participants for interviews using the simple random sampling technique.

**Measurement:** We collected data by face-to-face interviews. The civilian version of the post-traumatic stress disorder checklist was used to measure the symptoms of the disorder. The perceived Stress Scale (PSS) and the Oslo-3 social support instruments were used to assess the factors. Coded variables were entered into Epi data version 4.2 and exported to SPSS version 24 for analysis. Bivariate and multivariate logistic regressions with odds ratio and 95% confidence interval were employed.

**Result:** A total of 830 participants were interviewed, with a response rate of 98.2%. The prevalence of post-traumatic stress disorder was 37.3 % with ( 95 % CI: 34.1, 40.8). In the multivariate logistic regression, female sex (AOR=1.74, 95%CI; 1.21,2.50)**,** divorce (AOR=2.08,95%CI; 1.26,3.43), sustained physical injury(AOR=8.28,95%CI; 5.04,13.61) , history of mental illness ( AOR = 5.55 , 95% CI ; 2.30 , 13.36 ) , family history of mental illness ( AOR = 2.82 , 95 %CI ; 1.48 , 5.37 ) , poor social support ( AOR = 3.64 , 95 %CI ; 1.99 , 6.69 ) , and high perceived stress ( AOR = 3.08 , 95 CI , 1.43 , 6.64 ) were associated with post-traumatic stress disorder.

**Conclusion and recommendations:** The prevalence of post-traumatic stress disorder among the survivors of Koshe landslide was high. We recommend that an early PTSD-focused regular screening be carried out by trained health professionals; linkage with mental health service providers also needs to be considered.


### Strengths and limitations of the study

- The nature of cross-sectional design, which might have only partially accounted for durable temporal relationships.
- Social and recall biases might have interfered with decisions respondents made when completing the questionnaire.
- The PTSD Checklist–Civilian Version scale used in the current study can serve as a reference in subsequent studies since it has good internal consistency.

**Keywords**: Koshe landslides, post-traumatic stress disorder

## Introduction

Posttraumatic stress disorder is a mental health problem that occurs following a traumatic event in which the individual experience, witnesses, is confronted with either actual or imagined loss of life or serious injury which results in a response of fear, helplessness, or horror(1).In order to be diagnosed with post-traumatic stress disorder (PTSD), a person must re-experience the trauma, avoidance of trauma-related stimuli, excessive arousal, and negative alterations in cognition and mood which occur within a month after the event(2). A disaster is a traumatic event that might have been experienced by many people and causes different mental and physical health consequences(3). A survey study conducted on USA residents, 13% of the participants reported a lifetime exposure to natural or human-generated disasters(4). Several studies conducted among adults showed that there was an increasing psychological distress after natural disasters(5). Although the consequences of a disaster included a wide range of psychopathology, a review study indicated that PTSD is the most commonly investigated and frequently occurring psychopathology following disaster(6).

About eight million adults had PTSD during a given year worldwide(7). Over fifty-one million people are being forcibly displaced worldwide, of whom 16.7 million were displaced outside their home countries, and this may lead to a stress-related disorders(8). The global disease burden report attributed about 14% of the burden to neuropsychiatric disorders, mostly because of the long term disabling nature of depression and other common mental disorders like PTSD(9). According to World Health Report 2001, approximately 0.4% of the total YLD followed post-traumatic stress disorder, and the estimated burden increased to 0.6% YLD globally (10). Data in USA showed the lifetime prevalence of PTSD was 8 % in the general population. The lifetime prevalence rate was 10 % in women and 4 % in men(11) . A study on Israelis aged 18 years and above and exposed to terrorism showed that the average prevalence of PTSD was 9.4%, 16.2% for women and 2.4% for men (12). The global economic burden of stress-related mental illness is expected to rise in the coming decade. The global disease burden study of WHO estimates that mental illness, including stress-related disorders, will be the second leading cause of disability by the year 2020(13).

The prevalence rate of PTSD in developing countries is higher compared with the developed ones. A study conducted among a geographically diverse sample of Mexican adults estimated the prevalence of PTSD at 19%(14). Different studies in Africa showed that PTSD could still be a

public health concern for several years after the civil conflict and natural disaster. Reviews of community-based studies in South Africa showed that trauma exposure was higher in low-income countries than in their counterparts (15). Another study in Uganda during an active conflict showed that PTSD prevalence varied between 18% and 54 % in the general population (16).

PTSD is a public health issue that contributes to poverty, lack of employment, insecure living circumstances, change in the social network and is highly associated with low quality of life (17, 18). Factors that contribute to the development of post-traumatic stress disorder have been classified into pre-existing factors like family history of mental illness, substance history as well as the traumatic event itself, and post-trauma factors, such as lack of social support (19).

There was a devastating garbage landslide in Addis Ababa, Ethiopia, in the area of Koshe garbage land fill on 11th March, 2017. The catastrophic slope collapse killed more than 113 people who were living around the landfill and injured several others. The debris stood from a height of 20 m beyond the actual toe line of the landfill, destroying a minimum of fifty houses (20, 21). The phenomenon occurred in the early morning hours of March 11 and buried a number of makeshift homes under tons of refuse as reported by Eddie Haywood (March 2017). Koshe landfill is a large man-made mount formed from vast rubbish dump on the outskirts of Addis Ababa, the capital of Ethiopia. Hundreds of people used to attempt to make a living by collecting refuse at the landfill site and selling it. Some people even lived around the rubbish dump permanently. Even though landslides sometimes happened in Ethiopia, a man–made garbage hill slide like this was quite. The landslide left a negative sequel on the victims' socioeconomic and psychological conditions, for example, in terms of housing, job and loss of family members.

Disasters including man-made mishaps have negative impacts on the mental health of affected individuals(22). Post-traumatic stress disorder is the most common psychopathology and notable public health matter that follows trauma/disaster. Although PTSD is highly prevalent among post-disaster settings, no studies have been done on the prevalence of PTSD among Koshe landslide survivors, Addis Ababa, Ethiopia. So, determining the prevalence of PTSD and associated factors among the survivors is important for early intervention and the reduction of the burden of PTSD and to improve the victims' quality of life.

**Objective**

This study set out to assess the prevalence of post-traumatic stress disorder and associated factors among the survivors of Koshe landslide, Addis Ababa, Ethiopia, 2018.

## Methods and materials

### Study settings and period

A community-based, cross-sectional study was conducted in May and June 2018.The study was conducted at Koshe(dirt), a large open landfill with a surface area of 25 hectares which used to receive 300,000 tons of solid waste from Addis Ababa, the capital of Ethiopia, annually as reported by Clague 2017. It was the only dumping site available for the entire capital city with more than three million inhabitants. It has been located in the southwestern part of Addis Ababa bounded by Nefas Silk-Lafto and Kolfie sub-cities. The area was a dumping ground for Addis Ababa's rubbish for more than five decades, hosting hundreds of rubbish pickers who sell materials recovered from the waste. Some people even live around the site permanently.

### Study participants and sampling

We used the multistage sampling technique to select 830 participants. To reach households, the simple random sampling technique (computer-generated random number) was employed. In each of the areas, household lists were obtained from the kebeles/wards/ offices and health extension workers. We proportionally allocated the sample size to Kilinto, Asko, Addis Hiwot and Koshe garbage dumping area**,** where victims temporarily settled. Members of the selected households were further sorted for interviews. In case of more than one eligible participant in a household, the lottery method was used to choose one.

The study included participants aged 15 years and above during data collection in the area. There were a total of 5316 people in nearly1035 households. Individuals seriously ill and unable to communicate were excluded.

### Sample size determination

We determined the sample size by using the single population proportion formula with the assumptions of 48% prevalence of post-traumatic stress disorder from studies conducted in South Sudan(23), 0.48 P, 1.96 Z (standard normal distribution), 95% CI, $\alpha$=0.05, and a 10% non-response

rate . Accordingly, a representative/probabilistic sample was calculated to be 423. After considering design effect, the total sample was 846.

**Study variables**

The dependent variable was posttraumatic stress disorder measured by the 17 items of the PTSD checklist-Civilian version. We measured PTSD as a dichotomous variable (yes/no). Independent variables included sociodemographic factors (age, sex, marital status, ethnicity, religion, educational and occupational status), clinical variables (family history of mental illness, previous history of mental illness and childhood trauma), trauma related factors (trauma exposure, perceived life threat ), substance related factors(alcohol consumption, cigarette smoking, khat chewing), awhile psychosocial factors embraced social support and stressful life events.

**Data sources and measurement**

Data were collected by face-to-face interviews using a semi-structured questionnaire by four trained data psychiatry nurses by means of the Amharic version of the tool for a month. The questionnaire was designed in English and translated to Amharic and back to English to maintain consistency. Data collectors were trained on how to interview participants and explain unclear questions and the purpose of the study. Furthermore, they were made aware about ethical principles, such as confidentiality/ anonymity/ data management, and securing respondents' informed consent for participation.

Post-traumatic stress disorder was measured using the post-traumatic stress disorder Checklist-Civilian version (PCL-C)**.** The PCL is a standardized self-report rating scale for PTSD comprising 17 items that correspond to the key Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV symptoms of PTSD. A total symptom severity score (range=17–85) was obtained by summing the scores from each of the 17 items. It had a likert response options ranging from (1) "Not at all" to (5) "Extremely" and a cut-off ≥50,that is, garbage landslide victims had PTSD symptoms (24).We adapted this instrument from a study conducted on Somali and Oromo Ethiopians in Minnesota (25). It showed a high internal consistency, reliability and a strong correlation with PTSD diagnosis. We conducted a reliability analysis for the PCL-C questionnaire (Amharic version) and that it a had high score (Cronbach's α =0.94).

***Social support*** was measured using the Oslo 3-items social support scale with scores ranging from 3 to 14: 3–8=poor social support; 9–11=intermediate social support; and 12–14=strong social support (26).

***Individual stress levels*** were measured using the Perceived Stress Scale (PSS). The questions in this scale asked about feelings and thoughts last month. PSS was measured with likert type scale ranging from ( 0) "Never" to (4) "Very often " and individuals with higher scores indicating higher perceived stress(27).

*Substance use history*: To examine substance use history, respondents were asked: "Have you ever used any substance in the last three months or in your lifetime?" and the responses were Yes/No (28).

***History of mental illness***: To examine history of mental illness, respondents were asked: "Have you ever been diagnosed with mental illness and treated" and responses were Yes/No.

**Family history of mental illness**: To examine family history of mental illness, respondents were asked: "Do you know a family member who had experienced a mental illness?"

**Experiencing childhood trauma**: To examine childhood trauma, respondents were asked: "Have you experienced childhood physical and sexual abuse and neglect" and responses were Yes/No.

*Items on socio-demographic factors* (age, sex, ethnicity, religion, marital status, educational status and occupational status) were adopted from a variety literature.

**Data processing and analysis**

All collected data were checked for completeness and consistency and entered into Epi-data version 4.2 and then exported to SPSS for windows version 24 for analysis.

We computed descriptive, bivariate and multivariate logistic regression analyses to see the frequency distribution and to test the association between independent and dependent variables, respectively. Factors associated with PTSD were selected during the bivariate analysis with a p-value <0.05 for further analysis in the multivariable logistic regression analysis. In the multivariable logistic regression analysis, variables with P-value less than 0.05 at 95% confidence interval with adjusted odds ratio were considered as statistically significant.

**Ethical consideration**

Approval was obtained from the Ethical Review Board and ethical clearance from the joint Ethical Review Committees of the University of Gondar and Amanuel mental specialized hospital. Permission was obtained from the Addis Ababa Administration Health Bureau Ethical Committee. We received written informed consent from study participants and assent from officially

authorized foster parents after explaining the purpose of the study. Confidentiality was maintained by omitting personal identifiers.

**Patient and public involvement**

In the current study, participants were people who survived the Koshe landfill, Addis, Ababa, Ethiopia; patients were excluded; participants were not involved in the study design and recruitment. The results of this study will be disseminated to the Federal Ministry of Health, Addis Ababa Health Bureau, and Kolfe sub-city Health Department for timely management of survivors.

## Result

A total of 830 respondents took part with a response rate of 98.2%. The majority of the respondents, 491 (59.2%), were female. The mean age of the respondents was 33(SD ±12) years; 675 (81.3%) were in the age range of 15-40 years; 428(51.6%) were married; 502 (60.5%) were Orthodox Christian, and 404 (48.7%) Amhara by ethnicity. Regarding occupation, more than half (56.6%) were employed (**table1**).

Table 1: Sociodemographic characteristics of study participants among residents of Koshe area, Addis Ababa, Ethiopia, 2018 (n=830).

| Characteristics | Frequency | Percentage |
|---|---|---|
| Age | | |
| 15-40 | 675 | 81.3 |
| >40 | 155 | 18.7 |
| Sex | | |
| Female | 491 | 59.2 |
| Male | 339 | 40.8 |
| Marital status | | |
| Married | 428 | 51.6 |
| Single | 249 | 30.0 |
| Divorced | 131 | 15.8 |
| Others * | 22 | 2.7 |
| Ethnicity | | |
| Amhara | 404 | 48.7 |
| Tigray | 138 | 16.6 |
| Gurage | 135 | 16.3 |
| Oromo | 123 | 14.8 |
| Others ** | 30 | 3.6 |

| | | |
|---|---|---|
| Religion | | |
| Orthodox | 502 | 60.5 |
| Muslim | 195 | 23.5 |
| Protestant | 94 | 11.3 |
| Catholic | 39 | 4.7 |
| Educational status | | |
| Cannot read and write | 153 | 18.4 |
| Primary school | 366 | 44.1 |
| Secondary school | 185 | 22.3 |
| Diploma and above | 126 | 15.2 |
| Occupational status | | |
| House wife | 131 | 15.8 |
| Employed | 472 | 56.9 |
| Student | 110 | 13.3 |
| Jobless | 117 | 14.0 |

NB: others * separated, widowed, others** Silte, Hadya

A small number, 55(6.6%) of the participants had history of mental illness, 202 (24.3%) childhood physical abuse and neglect experience, and 79 (9.5%) family history of mental illness.

Of the respondents, 569 (68.6%) witnessed physical injury of families or friends, and about 166 (20%) sustained physical injury and 581 (70 %) moderate perceived life threat (**table 2**).

**Table 2**: Distribution of trauma-related factors of the respondents in Koshe, Addis Ababa, Ethiopia, 2018 (n=830)

| Characteristics | Frequency | Percentage |
|---|---|---|
| Sustaining physical injury | 166 | 20.0 |
| Witnessing the death of families or friends | 526 | 63.4 |
| Witnessing physical injury of families or friends | 569 | 68.6 |
| Property destruction | 240 | 28.9 |
| Thinking, they may die | 546 | 65.8 |
| Perceived life threat | | |
| Low perceived stress | 185 | 22.3 |
| Moderate perceived stress | 581 | 70.0 |
| High perceived stress | 64 | 7.7 |

Out of the total 830 participants, nearly half (48%) had poor social support and the majority, 659(79.4%), experienced at least one stressful life event (**table 3**).

**Table 3:** Distribution of psychosocial factors of the study participants among residents of Koshe Addis Ababa, Ethiopia, 2018(n= 83)

| Characteristics | **Category** | **Frequency** | **percent** |
|---|---|---|---|
| **Social support** | Poor | 398 | 48.0 |
| | Moderate | 324 | 39.0 |
| | Strong | 108 | 13.0 |
| **Stressful life events** | Yes | 659 | 79.4 |
| | No | 171 | 20.6 |

Regarding substance-related factors, nearly three fourths, 602(**72.5**%) consumed alcohol, and 516(62.20%) were ding that at the moment; 164 (19.80%) smoked, and 102(12.30%) were smoking; 129(15.5%) used khat (leaves) and 102(12.30%) were using it during the study.

**Prevalence of PTSD**

The prevalence of post-traumatic stress disorder (PTSD) among participants was 37.3% (95 % CI: 34.1, 40.8).

**Factors associated with posttraumatic stress disorder**

To determine the association of independent variables with PTSD, bivariate and multivariate binary logistic regression analyses were carried out. In the bivariate analysis, factors including female sex, >60 years of age, divorce, history of mental illness, family history of mental illness, childhood physical trauma and neglect, physical injury, witnessing the death and physical injury of families or friends, property destruction, fear of death, poor social support, and high perceived life threat were significantly associated with post-traumatic stress disorder at a P-value less than 0.05. These factors were entered into the multivariable logistic regression model to control confounding effects.

The result of the multivariate analysis showed that female sex, divorce, history of mental illness, family history of mental illness, physical injury, poor social support, and high perceived life threat were significantly associated with PTSD at a p-value less than 0.05.

Female sex was 1.7 times more likely to develop PTSD compared with male sex (AOR=1.7,95 %CI; 1.2,2.5).The odds of developing PTSD were 2.1 times higher among divorcees compared with the married ones (AOR=2.1,95%CI;1.3,3.4). The odds of developing PTSD were 5.6 times higher among participants who had history of mental illness compared with those who had no such history (AOR=5.6,95% CI,2.3,13.4). The likelihood of developing PTSD was 2.8 times higher among respondents who had family history of mental illness compared with those who had no family history of mental illness (AOR=2.8, 95% CI, 1.5, 5.4).The odds of developing PTSD were 8.3 times higher among respondents who sustained physical injury than those who hadn't (AOR=8.3, 95% CI, 5.0, 13.6). Respondents who had poor social support were 3.6 times more likely to develop PTSD compared with those who had strong social support( AOR= 3.6,95% CI,2.0,6.7).The odds of developing PTSD were 3.1 times higher among respondents who had high perceived stress than those who had low perceived stress (AOR= 3.1, 95% CI;1.4,6.6) (**Table 4**).

**Table 4**: Factors associated with PTSD among residents of Koshe, Addis Ababa, Ethiopia, 2018 (n= 830)

| Variables | Category | PTSD | | COR(95%CI) | AOR(95%CI) |
|---|---|---|---|---|---|
| | | Yes | No | | |
| Sex | Male | 106(31.3%) | 233(68.7%) | 1 | 1 |
| | Female | 204(41.5%) | 287(58.5 %) | 1.6(1.2,2.1)** | 1.7(1.2,2.5)** |
| Age | 15-40 | 241(35.7%) | 434(64.3%) | 1 | 1 |
| | >40 | 69(44.5%) | 86(55.5%) | 1.5(1.0,2.1) | 1.4(0.9,2.1) |
| Marital status | Married | 138(32.2%) | 290(67.7%) | 1 | 1 |
| | Single | 87(34.9%) | 162(65.1%) | 1.1(0.8,1.6) | 1.2(0.8,1.8) |
| | Divorced | 77(58.8%) | 54(41.2%) | 3.0(2.0,4.5)** | 2.1(1.3,3.4)** |
| | Others | 8(36.4%) | 14(63.6%) | 1.2(0.5,2.9) | 1.4(0.5,4.2) |
| History(Hx) of mental illness | Yes | 46(83.6%) | 9(16.4%) | 9.9(4.8,20.5)** | 5.6(2.3,13.4)** |
| | No | 264(34.1%) | 511(65.9%) | 1 | 1 |
| Family Hx of mental illness | Yes | 55(69.6%) | 24(30.4%) | 4.5(2.7,7.4)** | 2.8(1.5,5.4)** |

| | | | | | |
|---|---|---|---|---|---|
| | No | 255(34.0%) | 496(66.0%) | 1 | 1 |
| Experiencing childhood trauma | Yes | 109(54.0%) | 93(46.6%) | 2.5(1.8,3.4) | 1.2(0.7,1.9) |
| | No | 201(32.0%) | 427(68.0%) | 1 | 1 |
| Sustaining Physical trauma | Yes | 135(81.3%) | 31(18.7%) | 12.2(7.9,18.7)** | 8.3(5.0,13.6)** |
| | No | 175(26.4%) | 489(73.6%) | 1 | 1 |
| Witnessing the death of family or friend | yes | 223(42.4%) | 303(57.6%) | 1.9(1.4,2.5) | 0.8(0.5,1.4) |
| | No | 87(28.6%) | 217(71.4%) | 1 | 1 |
| Witnessing injury of family or friend | Yes | 238(41.8%) | 331(58.2%) | 1.9(1.4,2.6) | 0.8(0.5,1.4) |
| | No | 2(1.1%) | 189(98.9%) | 1 | 1 |
| Property destruction | Yes | 117(48.8%) | 123(51.2%) | 2.0(1.4,2.7) | 1.0(0.7,1.5) |
| | No | 193(32.7%) | 397(67.3%) | 1 | 1 |
| Thought of death | Yes | 242(44.3%) | 304(55.7%) | 2.5(1.8,3.5) | 1.3(0.7,2.0) |
| | No | 68(23.9% | 216(76.1%) | 1 | 1 |
| Social support | poor | 209(52.5%) | 189(47.5%) | 4.9(2.9,8.2)** | 3.6(2.0,6.7)** |
| | Moderate | 81(25.0%) | 243(75.0%) | 1.5(0.9,2.5) | 1.4(0.8,2.6) |
| | Strong | 20(18.5%) | 88(81.5%) | 1 | 1 |
| Perceived threat | Low | 56(30.3%) | 129(69.7%) | 1 | 1 |
| | Moderate | 209(36.0%) | 372(64.0%) | 2.9(1.9,4.6) | 1.0(0.7,1.6) |
| | High | 45(70.3%) | 19(29.7%) | 10.9(5.6,21.4)** | 3.1(1.4,6.6)** |

Key: **=p-value<0.05,Modelfitness=0.114 (hosmer and lemshow),=0.000(Omnibus test), no multicolinearity (tolerance>0.1 and VIF<2)

## Discussion

Post-traumatic stress disorder is the most common psychopathology and important public health matter after experiencing trauma/disaster. We found that, for the entire sample, the garbage landslide had a negative impact on exposed individuals' mental health in terms of housing, income, jobs and family problems resulting from the event. This study found that a number of people met the criteria for post trauma stress symptomatology. Some 37.3% of people who experienced the incident presented with posttraumatic stress disorder symptoms according to the post-traumatic stress disorder checklist-civilian version. Our finding was consistent with reports of studies on

people exposed to natural disasters, such as 36.3% among earth quack victims in Kerman, 35.4% Syrian refugees in Lebanon, 34.9% in Turkey, and 34.3% among the bombing victims of Oklahoma city, USA (8, 29-31). Conversely, this finding was lower than the 48% noted in South Sudan, 75.6% among the Rana Plaza building collapse victims in Bangladesh, 57% in Saudi Arabia, 83.7% in Croatia and Serbia former Yugoslavia, Germany and U.K, 59.4% in Fukushima nuclear disaster, Japan (18, 23, 32-34). The possible reason for this difference might be the use of different instruments and cutoff points to measure PTSD, exposure to multiple trauma, study design and the nature and magnitude of the accidents covered in the study.

On the other hand, our estimations are higher than findings in other countries, for example, 11.8% in northern Uganda, 18.8% in Serbia, 29.3% in Southern Lebanon, and 9.1% in sothern Brazil (35-38). The possible reason for this variation might be difference in instruments. That is, the other study used GHQ-12, structured clinical interview, MINI, the modified version of the composite international diagnostic interview, while we utilized the post-traumatic stress disorder checklist civilian version. The other variation might be due to the methods they used for data collection (structured telephone interview) and conducting of studies late after the trauma.

Female sexs, being divorce, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD. The greater likelihood of PTSD among women than men in our work was similar to the reports of other studies (29, 31, 32, 39-41), possibly because females experience sexual assaults and child sexual abuse more than males. Hence, being exposed to such trauma involves more risk than other trauma in causing PTSD(42).

Divorcees were more likely to develop PTSD than married respondents. Participants who lost their partners and needed to support families, especially small children, single handed were more stressed. Our finding was supported by that of a study in Serbia(36).

History of mental illness was also significantly associated with PTSD. Participants with history of mental illness might have more neurochemical imbalance and neuronal damage compared to those who had no history of mental illness. As a result, they might be prone to develop PTSD after the event. This finding was supported by results of studies conducted in various countries (31, 34, 39, 43, 44).

The odds of developing PTSD was 2.8 times higher among respondents who had family history of mental illness than those who had no such illness. The possible explanation might be the inheritance of the serotonin transporter gene as well as genes associated with the hypothalamic–pituitary–adrenal axis and psychological factors which make participants more highly predisposed to PTSD (42, 45). This finding was consistent with the results of studies conducted in South Korea(43, 44).

Moreover, experiencing physical injury was a stronger predictor of PTSD compared with those who experienced no such injuries during the catastrophe. The finding was similar to the results of other studies (29, 32, 41). The possible explanation for the similarity could be the presence of scars, the impaired part may remind the trauma and cause reliving it and victims may believe that the traumatic event has left its marks behind, and the body could keep clinging to unresolved issues. The odds of developing PTSD was 3.6 times higher among individuals who had poor social support than strong social support. The finding is similar to results of studies conducted in Southern Brazil and Mexico (38, 46). Lack of help to compensate for physical incapacity, emotional support, and someone to talk with about the traumatic experience or to turn to for advice could increase the risk of PTSD(47).

Participants who had high perceived stress were more likely to develop PTSD compared with respondents who had low perceived stress. The result is similar with findings from Southern Israel and South Korea(43, 48). Negative beliefs about the consequence of the ongoing threat as damaging implications will precipitate the onset and persistence of PTSD(49).

**Limitation of the study**

The cross-sectional design of the study prevented us from concluding the casual relationships of the associations we found.

In addition, participants might not tell whether or not they had other post-traumatic stress disorder symptoms before the onset of the landslide. The presence of earlier catastrophic experience might have influenced the disorder due to the landslide.

Furthermore, social desirability and recall bias might also be the other limitations. Since the data collection method was a face-to-face interview which might led individuals to respond in socially acceptable ways during the process, especially in cases of substance-related questions.

Individuals without PTSD symptoms may have less motivation to recall earlier exposure than individuals with the symptoms.

In addition, we did not consider other mental health problems that can confound outcomes. For instance, the presence and effects of anxiety and depression symptoms, which are commonly associated with PTSD symptoms and the severity of PTSD, duration of mental illness, or exposure to other diseases were not covered.

The strength of the study was it used a relatively large sample and sampling methods.

Since we have employed face-to-face interviews, we addressed individuals who had PTSD symptoms for further investigation and intervention.

## Conclusion

The prevalence of PTSD was found to be high. This study confirmed that the garbage landslide had a negative impact on the mental health of affected individuals. Female sex, divorce, history of mental illness, family history of mental illness, sustained physical injury, poor social support and high perceived life threat were significantly associated with PTSD. Therefore; we recommend a PTSD-focused early regular screening by trained health professionals and linkage with mental health service providers. It is necessary to give emphasis to individuals with family history of mental illness, women, and history of mental illness of those who experienced physical trauma during the disaster.

**Lists of abbreviation**

AMSH: Amanuel Mental Specialized Hospital; AOR: Adjusted Odd Ratio, CI: Confidence Interval; COR: Crude Odd Ratio; DSM: Diagnostic and Statistical Manual; M.I.N.I: Mini-International Neuropsychiatric Interview ; OSS-3: Oslo 3 Items Social Support Scale; PCL-C: Post Traumatic Stress Disorder Civilian Version; PTSD: Post Traumatic Stress Disorder; QOL: Quality Of Life**;** SPSS: Statistical Package for Social Science; U.S: United States**;** UOG: University Of Gondar; WHO: World Health Organization

**Acknowledgment**

The authors acknowledge the University of Gondar and Amanuel Mental Specialized Hospital for funding the study. We extend our gratitude to data collectors, supervisors and study participants for their time and effort. We also thank Mr. Demeke Dessu for his great contribution in language editing of the manuscript.

**Authors' contribution:** SA developed the proposal, supervised the data collection, analyzed the data and wrote the draft manuscript. WG, GL, KH revised the proposal, checked the data analysis. SS, revised the proposal, check data analysis, revised and approved the manuscript.

***Funding:*** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors. The funder has no role in collection, analysis and interpretation of data and in writing the manuscript

***Competing interests***: None declared

Patient consent: Informed consent was obtained from participants

**Ethical approval and consent to participate**: Ethical approval was obtained from Ethical Review Board of the University of Gondar. Ethical clearance was obtained from joint ethical review committees of the University of Gondar and Amanuel mental specialized hospital. A formal letter of permission obtained and submitted to the respective town administration.

**Provenance and peer review**: Not commissioned; externally peer reviewed.

**Data sharing statement**: The data set is available on request by emailing the corresponding author at shumetshegaye@yahoo.com

**Consent to publication**: Not applicable

## References

1. Heinrichs M, Wagner D, Schoch W, Soravia LM, Hellhammer DH, Ehlert U. Predicting posttraumatic stress symptoms from pretraumatic risk factors: a 2-year prospective follow-up study in firefighters. American Journal of Psychiatry. 2005;162(12):2276-86.
2. Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
3. 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: Interpersonal and biological processes. 2002;65(3):207-39.
4. Burkle Jr FM. Acute-phase mental health consequences of disasters: implications for triage and emergency medical services. Annals of emergency medicine. 1996;28(2):119-28.
5. Gates MA, Holowka DW, Vasterling JJ, Keane TM, Marx BP, Rosen RC. Posttraumatic stress disorder in veterans and military personnel: Epidemiology, screening, and case recognition. Psychological services. 2012;9(4):361.

6. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. Epidemiologic reviews. 2005;27(1):78-91.
7. L. HG. Heather Graham L. How Common is PTSD? National Center for PTSD. 2015.:1. National Center for PTSD 2015:1.
8. Kazour F, Zahreddine NR, Maragel MG, Almustafa MA, Soufia M, Haddad R, et al. Post-traumatic stress disorder in a sample of Syrian refugees in Lebanon. Comprehensive psychiatry. 2017;72:41-7.
9. Prince M, Patel V, Saxena S, Maj M, Maselko J, Phillips MR, et al. No health without mental health. The lancet. 2007;370(9590):859-77.
10. Ayuso-Mateos JL. Global Burden of post-traumatic stress disorder in the year 2000: version 1 estimates. World Health Organ. 2002.
11. Kaplan BJ. Kaplan and Sadock's Synopsis of Psychiatry. Behavioral Sciences/Clinical Psychiatry. Tijdschrift voor Psychiatrie. 2016;58(1):78-9.
12. Bleich A, Gelkopf M, Solomon Z. Exposure to terrorism, stress-related mental health symptoms, and coping behaviors among a nationally representative sample in Israel. Jama. 2003;290(5):612-20.
13. Kalia M. Assessing the economic impact of stress [mdash] The modern day hidden epidemic. Metabolism-Clinical and Experimental. 2002;51(6):49-53.
14. Norris FH, Murphy AD, Baker CK, Perilla JL, Rodriguez FG, Rodriguez JdJG. Epidemiology of trauma and posttraumatic stress disorder in Mexico. Journal of abnormal psychology. 2003;112(4):646.
15. Atwoli L, Stein DJ, Koenen KC, McLaughlin KA. Epidemiology of posttraumatic stress disorder: prevalence, correlates and consequences. Current opinion in psychiatry. 2015;28(4):307.
16. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. Psychological bulletin. 2003;129(1):52.
17. Akinyemi OO, Owoaje ET, Ige OK, Popoola OA. Comparative study of mental health and quality of life in long term refugees and host populations in Oru-Ijebu, Southwest Nigeria. BMC research notes. 2012;5(1):394.
18. Priebe S, Matanov A, Janković Gavrilović J, McCrone P, Ljubotina D, Knežević G, et al. Consequences of untreated posttraumatic stress disorder following war in former Yugoslavia: morbidity, subjective quality of life, and care costs. Croatian medical journal. 2009;50(5):465-75.
19. Keane TM, Marshall AD, Taft CT. Posttraumatic stress disorder: etiology, epidemiology, and treatment outcome. Annu Rev Clin Psychol. 2006;2:161-97.
20. Raviteja K, MunwarBasha B, editors. Probabilistic back analysis of Koshe landfill slope failure. Indian geotechnical conference; 2017.
21. Organization WH. Weekly Update on Outbreaks and other Emergencies: Week 11: 11-17 March 2017. Weekly Update on Outbreaks and other Emergencies. 2017.
22. Catapano F, Malafronte R, Lepre F, Cozzolino P, Arnone R, Lorenzo E, et al. Psychological consequences of the 1998 landslide in Sarno, Italy: a community study. Acta Psychiatrica Scandinavica. 2001;104(6):438-42.
23. Karunakara UK, Neuner F, Schauer M, Singh K, Hill K, Elbert T, et al. Traumatic events and symptoms of post-traumatic stress disorder amongst Sudanese nationals, refugees and Ugandans in the West Nile. African health sciences. 2004;4(2):83-93.
24. Ruggiero KJ, Del Ben K, Scotti JR, Rabalais AE. Psychometric properties of the PTSD Checklist—Civilian version. Journal of traumatic stress. 2003;16(5):495-502.
25. Jaranson JM, Butcher J, Halcon L, Johnson DR, Robertson C, Savik K, et al. Somali and Oromo refugees: correlates of torture and trauma history. American journal of public health. 2004;94(4):591-8.
26. Dalgard OS. The Oslo 3-items social support scale. 20002.
27. COHEN. Perceived Stress Scale. . 1983:7–8.
28. Humeniuk R, Ali R, Babor TF, Farrell M, Formigoni ML, Jittiwutikarn J, et al. Validation of the alcohol, smoking and substance involvement screening test (ASSIST). Addiction. 2008;103(6):1039-47.

29. Parvaresh N, Bahramnezhad A. Post-traumatic stress disorder in bam-survived students who immigrated to Kerman, four months after the earthquake. 2009.
30. Ataman M. Prevalence of PTSD and related factors in communities living in conflictual area: Diyarbakir case. 2008.
31. North CS, Nixon SJ, Shariat S, Mallonee S, McMillen JC, Spitznagel EL, et al. Psychiatric disorders among survivors of the Oklahoma City bombing. Jama. 1999;282(8):755-62.
32. Fitch T, Villanueva G, Quadir M, Alamgir H. Prevalence and risk factors for PTSD in injured workers in Bangladesh: a study of surviving workers from the Rana Plaza building collapse. The Lancet Global Health. 2015;3:S33.
33. Alghamdi M, Hunt N, Thomas S. Prevalence rate of PTSD, depression and anxiety symptoms among Saudi firefighters. Journal of Traumatic Stress Disorders and Treatment. 2016;6(1):1-6.
34. Tsujiuchi T, Yamaguchi M, Masuda K, Tsuchida M, Inomata T, Kumano H, et al. High prevalence of post-traumatic stress symptoms in relation to social factors in affected population one year after the Fukushima nuclear disaster. PloS one. 2016;11(3):e0151807.
35. Mugisha J, Muyinda H, Wandiembe P, Kinyanda E. Prevalence and factors associated with posttraumatic stress disorder seven years after the conflict in three districts in northern Uganda (The Wayo-Nero Study). BMC psychiatry. 2015;15(1):170.
36. Lecic-Tosevski D, Pejuskovic B, Miladinovic T, Toskovic O, Priebe S. Posttraumatic stress disorder in a Serbian community: seven years after trauma exposure. The Journal of nervous and mental disease. 2013;201(12):1040-4.
37. Farhood L, Dimassi H, Lehtinen T. Exposure to war-related traumatic events, prevalence of PTSD, and general psychiatric morbidity in a civilian population from Southern Lebanon. Journal of transcultural nursing. 2006;17(4):333-40.
38. Brunnet AE, Bolaséll LT, Weber JL, Kristensen CH. Prevalence and factors associated with PTSD, anxiety and depression symptoms in Haitian migrants in southern Brazil. International Journal of Social Psychiatry. 2018;64(1):17-25.
39. Jenkins R, Othieno C, Omollo R, Ongeri L, Sifuna P, Mboroki J, et al. Probable post traumatic stress disorder in kenya and its associated risk factors: a cross-sectional household survey. International journal of environmental research and public health. 2015;12(10):13494-509.
40. Arnberg FK, Johannesson KB, Michel P-O. Prevalence and duration of PTSD in survivors 6 years after a natural disaster. Journal of anxiety disorders. 2013;27(3):347-52.
41. Zhou X, Kang L, Sun X, Song H, Mao W, Huang X, et al. Prevalence and risk factors of post-traumatic stress disorder among adult survivors six months after the Wenchuan earthquake. Comprehensive psychiatry. 2013;54(5):493-9.
42. Heim C, Newport DJ, Heit S, Graham YP, Wilcox M, Bonsall R, et al. Pituitary-adrenal and autonomic responses to stress in women after sexual and physical abuse in childhood. Jama. 2000;284(5):592-7.
43. Song JY, Jeong K-S, Choi K-s, Kim M-g, Ahn Y-S. Psychological risk factors for posttraumatic stress disorder in workers after toxic chemical spill in Gumi, South Korea. Workplace health & safety. 2018;66(8):393-402.
44. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. Journal of consulting and clinical psychology. 2000;68(5):748.
45. Keane T, Fisher L, Krinsley K. Posttraumatic stress disorder, Handbook of prescriptive treatments for adults. Springer; 1994.
46. Kaniasty K, Norris FH. Longitudinal linkages between perceived social support and posttraumatic stress symptoms: Sequential roles of social causation and social selection. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2008;21(3):274-81.

47. Guay S, Billette V, Marchand A. Exploring the links between posttraumatic stress disorder and social support: Processes and potential research avenues. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2006;19(3):327-38.
48. Besser A, Neria Y, Haynes M. Adult attachment, perceived stress, and PTSD among civilians exposed to ongoing terrorist attacks in Southern Israel. Personality and Individual Differences. 2009;47(8):851-7.
49. Taylor S. Clinician's guide to PTSD: A cognitive-behavioral approach: Guilford Publications; 2017.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | 1 | (a) Indicated in page-I,red color highlighted |
| | | (b) Indicated in page II and changes are highlighted |
| **Introduction** | | |
| Background/rationale | 2 | Explained page -1 of the introduction section |
| Objectives | 3 | Stated in page-2 |
| **Methods** | | |
| Study design | 4 | page 2 |
| Setting | 5 | page-2 |
| Participants | 6 | (*a*) page-3 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. (Page-3) |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). ( Page-4) |
| Bias | 9 | Describe any efforts to address potential sources of bias |
| Study size | 10 | Explain how the study size was arrived at (page-3) |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analysis. (No qualitative data) |
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding (page-5) |
| | | (b) Describe any methods used to examine subgroups and interactions(no sub group ) |
| | | (c) Explain how missing data were addressed (page-5 in data processing section) |
| | | (d) If applicable, describe analytical methods taking account of sampling strategy(page-3) |
| | | (e) Describe any sensitivity analyses (page-4) |
| **Results** | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (page-6) |
| | | (b) Give reasons for non-participation at each stage( some is not voluntary, some is not present during data collection ) |
| Descriptive data | 14* | (c) Consider use of a flow diagram(we were not using since it is not relevant here) |
| | | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders(page 6-7) |
| | | (b) Indicate number of participants with missing data for each variable of interest (page-6) |
| Outcome data | 15* | Report numbers of outcome events or summary measure (page-7) |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included( page 7-8) |
| | | (b) Report category boundaries when continuous variables (no continuous variable used) |
| | | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period(no relevancy here) |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses(no) |

| | | |
|---|---|---|
| **Discussion** | | |
| Key results | 18 | Summarise key results with reference to study objectives (page 9-11) |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or Imprecision. Discuss both direction and magnitude of any p(page11-12) |
| (Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant (page- |
| 12) Generalisability | 21 | Discuss the generalisability (external validity) of the study results(page -12) |
| **Other information** | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based(page 12) |

*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.