Factors Associated with the Development of Post-Traumatic Stress Disorders after severe flooding and landslides in Nyarugenge District

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Abstract

Disasters lead to trauma that may affect both mental and physical health of those affected. Post-Traumatic Stress Disorders (PTSD) is among chronic traumatic events that affect people as a result of disasters. This study focused on flooding and landslides disasters which cover more than 80% of all natural disasters globally and Rwanda in particular. It aimed at determining factors associated with the development of PTSD in a population affected by floods and landslides. A descriptive cross-sectional design using quantitative method was used. Proportional sampling was used to select two hundred and nine participants where 209 responded from different sectors were selected. Data were analyzed using SPSS and results were presented in descriptivestatistics, where tables and pie charts were used to present the data. Bivariate and multiple logistic regression analysis were used to report on factors associated with the development of PTSDs. The results showed that participants below 25 years old were the majority of the participants, female participants dominated with 126(60%), themajority164 (78%) of the participants have secondary level of education and above, majority of the participants 137(66%) have family income below 50000 Rfr and80 (38%) which constitute the majority are in ubudehe category three. The multivariate analysis reported that the factors that the participants fall in low Ubudehe category leads to the development of PTSD among study population though its likelihood was less due to the Confidence Intervals close to 0; Ubudehe category 1 (AOR= 0.221; 95% CI=0.087-0.564; P= 0.002) and Ubudehe category 2 (AOR= 0.338; 95% CI=0.155-0.734; P= 0.006). The lack of support from the nearest health center was less likely to be associated with the development of PTSD (AOR= 0.188; 95% CI=0.052-0.687; P= 0.011) as well as lack of government support (AOR= 0.423; 95% CI=0.221-0.813; P= 0.010).

Key words

Trauma, Post-Traumatic Stress Disorders, severe flooding, landslides and Nyarugenge district

1. Introduction

Natural or human-made disasters are responsible for traumatic incidents that impact the affected populations' psychosocial conditions. PTSD is a psychological disease that is attributed to a stressful situation that happened such as a natural disaster among others (Lancaster *et al*., 2016), and it is the common mental disorder widely (Neria, Nandi, & Galea, 2008). There are relatively common traumatic events, and they pose a public health problem.

Disasters are among the most cause of trauma due to its adverse impacts which remain high. In 2014 only, at a global scale, 324 natural disasters were responsible for 7823 deaths(Ejeta, Ardalan, Paton, & Yaseri, 2016); where floods and landslides were reported to be the most common cause of fatalities worldwide(Doocy, Daniels, & Kirsch, 2013).

The estimates on the prevalence of PTSD vary in different populations and range between 20-40% in area where disasters is more prevalent but it is reported to be as low as between 3-5% Worldwide (Bromet *et al*., 2017). It is highlighted in the worldwide mental health surveys that a prevalence range from 0.0 to 3.8 among studied adults.

In Rwanda, efforts to address effects of flooding and landslides that affected the country ranged from distribution of basic needs to the affected families, relocation from the affected areas, and distribution of hygiene materials (washing soap and buckets) and sensitization of the communities on proper use of

mosquito nets (IFRCRCS, 2016), but psychosocial aspects are overlooked. In this regards, community health interventions to screen for possible cases of PTSD can strengthen the efforts by the government to mitigate the long-term impacts of floods and landslides in affected regions.

The screening of PTSD conducted in African countries, such as Kenya showed a prevalence of 10.6% of probable PTSD in a studied population(Jenkins, Othieno, Omollo, Ongeri, & Sifuna, 2015), in Ethiopia; the occurrence of PTSDS was 37.3% (Asnakew, Shumet, Ginbare, Legas, & Haile, 2019), in RDC; among 998 study participants, 50.1 of them had met symptom criteria for PTSD (Jenkins *et al.*, 2015). In Rwanda, studies had shown that the prevalence of PTSD was 26.1 % of the 962 among Rwandan 14 years after the genocide (Munyandamutsa *et al.*, 2012). Other studies in Rwanda shaded on probable factors likely to result into the development of PTSD in communities in post-conflict and genocide. (Fodor *et al.*, 2015; Rugema *et al.*, 2015). The existing evidence on the topic especially in Rwandan context is accumulating in population mostly post conflict while the literature shows that PTSD can occur as results of multitude of factors including natural calamities and human made factors.

The heavy rains of 114.2 and 154.2 mm between March and the beginning of May 2020 in Kigali caused natural disasters including floods and landslides; consequently caused population displacement (Weather Atlas, 2020). The recent data by the Ministry of Emergency Management in Rwanda reports showed a significant material damages caused by heavy rains, loss of 13 lives, where in 3 districts of Kigali city 3 people died, twelve houses were destroyed in Nyarugenge District in one month.

2. Review of Literature

2.1. Occurrence of PTSD

The estimates on the prevalence of PTSD vary in different populations. The reviewed literature reported the prevalence ranging from 20 to 40% in geographical areas where disasters are more prevalent while in less disaster focused areas, the prevalence was reported to be low between 3 and 5% in the general population (Bromet *et al.*, 2017). The survey that was conducted at the global scale with the aim to report the prevalence and other factors which might be associated with natural and human made disasters reported a prevalence range from 0.0 to 3.8 among studied adults. PTSDs are the much more frequent conditions in mental wellbeing that affect people after natural disasters in the United States. This was reported in a twelve months

prevalence morbidities that are the results of the risk of anxiety and mood disorders conducted which revealed that among the screened individual, PTSD accounted for 3.7 % (Kessler *et al.*, 2012).

Posttraumatic stress disorders epidemiological studies in Africa are accumulated in other diseases like HIV AIDS population and post conflict areas rather than after natural disasters(Olley*et al*., 2005).

A systematic review conducted in sub-Saharan Africa has shown that a prevalence of probable PTSD was 22% and current prevalence of 25% (Id et al., 2020) . In Kenya, among the studied population experiencing severe trauma, the reported prevalence of PTSD was 48 percent, and the prevalence of 10.6% of probable PTSD, with reference to the measuring scores on trauma screening questionnaire (TSQ)(Jenkins *et al*., 2015). In Democratic Republic of Congo(DRC), prevalence and associations with sexual abuse, human rights violation of citizens of particular Eastern DRC territories, including information on basic needs, access to health care, and physical and mental health, which also measured exposure-related PTSD, revealed that 50.1 of the 998 study participants met PTSD symptom criteria (Jenkins *et al*., 2015). The interview conducted in Ethiopia on 830 participants to report on prevalence and associated factors to develop PTSD among survivors of Koshe landslide highlighted that 37.3% of the sample had symptoms of PTSD (Asnakew *et al*., 2019).

Studies that were conducted in Rwanda are mainly focusing on PTSD post genocide and war. This was reported in a study conducted to examine mental health and related factors associated to the exposure to traumatic events related to the 1994 genocide against Tutsi in Rwandan men and women aged 20–35years. The study came to a conclusion that depression, posttraumatic stress disorders, related anxiety and suicidal episodes were prevalent in Rwanda among those affected (Rugema et al., 2015). Another research conducted in Rwanda highlighted some previously studied variables and documented a very Significant PTSD occurrence among individuals subjected to genocide. It was calculated that the occurrence of PTSD was 26.1 percent of the 962 population studied, A confirmatory factor analytic study conducted in Rwanda to compare results found in western communities with those in Rwandan context revealed that the prevalence and characteristics of PTSD found in Rwanda are comparable to those in Western communities(Fodor *et al*., 2015).

2.2. Factors associated with the development of PTSDs

The reported factors are mainly linked to the causes; whereby natural disasters are among them. To name a few, in a study conducted in a study conducted at a global scale with the aim to report the prevalence and other factors which might be associated with natural and human made disasters , the main predisposing factors were schooling, the death of someone close to the victim, severe injury or forced relocation from home, and pre-existing vulnerabilities(Bromet*et al*., 2017).

Conflicts were also added to be among the factors behind the development of PTSD among people prone to disasters where regions without conflicts reported a lower prevalence of 8% compared to regions in conflicts 30% (Id et al., 2020).

The interview conducted in Ethiopia on 830 participants to report on factors associated with the development of PTSD highlighted that being female, family separation, serious physical trauma, drug addiction background, familial history of depression, negative affect and perceived higher tension were found to be among the factors associated with PTSD (Asnakew *et al*., 2019).

The factors associated to the development of PTSD in Rwanda post genocide was studied and revealed that compared with men of the same age group, women were at greater risk, person vulnerability to rape and abuse were related to all of these conditions with high risks in women relative to men in the same age group (Rugema et al., 2015). Another study by (Munyandamutsa et al., 2012) revealed that having to live in severe poverty, witnessing the assassination of a family member in 1994, being divorced or wedded, missing both family and residing in the South Province in between ages of 25 and 34. Depression and alcohol dependency were most common in participants who met the diagnostic criteria for PTSD than respondents without PTSD in the same study population (Munyandamutsa *et al*., 2012).

It was emphasized that lack of social support its self is a risk which might lead to a predictor to develop PTSD among people affected by the stressful event(Guay, Billette, & Marchand, 2006)

2.3. Psychosocial support services

Being a predictor to develop PTSD among people affected by stressful event, it is important to know what are the types of social support people affected are in need so that they are helped not to permanently live with the condition.

Psychosocial support services provided to people affected by PTSD are mainly related to the causes and consequences of it. In some cases, people affected by natural disasters get support from government's entities, non-governmental organizations, family members, friends, colleagues to recover, but their effects on relationship with others and welfare remains extensive and sustained for long period for affected people, especially on psychosocial and mental health aspects that cause trauma(Stanke et al., 2012). The extensively studied social support include: availability of others to help, emotional support, practical support, affective support, instrumental aid, private and government support, spouse support, appraisal support, belongingness support, and help from peers to fulfill specific needs (e.g. love, advice about a crisis)(Guay et al., 2006). In addition, mental health psychosocial support provided to people affect by the disasters range from provision of cognitive-behavioral therapy, narrative exposure therapy, psychotherapy, and psycho-education(Bangpan, Felix, & Dickson, 2019).

3. Materials and Methods

3.1. Research design

The study was a cross- sectional descriptive and quantitative study on occurrence and risk factors for PTSD in a people affected by floods and landslides in high risk zones of Nyarugenge District. Cross-sectional studies are designed to collect data at one time and analyze them. Quantitative study analyze the numerical data to come up with research conclusions(Babbie& Mouton, 2005). The research was conducted in Nyarugenge District. The district has 10 sectors namely Kimisagara, Gitega Nyakabanda, Nyarugenge, Kigali, Muhima, Mageragere, Kanyinya, Nyamirambo and Rwezamenyo. The study focused on three sectors that are hit by the natural disasters due to their geographical location namely Kimisagara with 46,753 populations, Nyamirambo with 40,292 and Gitega with 28,728 populations.

3.2. Population size

Affected sectors	Affected cells	Affected village	Number of affected households	Number of affected people
Kimisagara	Kimisagara	Nyakabingo	55	148
Nyamirambo	Kivugiza	Mpano	43	185

Gitega	Akabahizi Kigarama	27	120
Total		**125**	**453**

Source: Nyarugenge district administration

In total 453 people is a total population of the present study in 125households.

The sample was calculated by using the existing population size that constitutes the sampling frame from local administration authorities. The data base of population in selected sectors in high risk zones were determined from the local authorities.

The Yamane formula was used to calculate the sample size (Yamane, 1967). This formula is used when the population under study is known and can be identified to have a representative sample. In addition, it provides a simplified number for proportions

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n: Sample size

N: Population

e: Marginal of error=0.05(5%)

$$n = \frac{453}{1 + 453(0.05 * 0.05)} = 212.4 \approx 212$$

The number of households to be included per sector was based on proportionate sampling, where in Kimisagara sector 44 households were selected where 70 participants were part of the study, while Nyamirambo sector was represented by 35 households and 86 people selected in that sector; Gitega sector was represented by 22 households where 56 people were selected to be part of the study. A random number was used in order to get the participants in each village by means of the existing lists of people currently residing in the village and had been exposed to the disasters.

3.3. Data Analysis Procedures

In order to measure the occurrence of PTSD and CPTSD, the following diagnostic algorithm is followed

Post-Traumatic Stress Disorders(PTSD):" A diagnosis of PTSD requires the endorsement of one of two symptoms from the symptom clusters of (1) re-experiencing in the here and now, (2) avoidance, and (3) sense of current threat, plus endorsement of at least one indicator of functional impairment associated with these symptoms. Endorsement of a symptom or functional impairment item is defined as a score > 2".

Chronic Post-Traumatic Stress Disorders (CPTSD): "A diagnosis of CPTSD requires the endorsement of one of two symptoms from each of the three PTSD symptoms clusters (re-experiencing in the here and now, avoidance, and sense of current threat) and one of two symptoms from each of the three Disturbances in Self-Organization (DSO) clusters: (1) affective dysregulation, (2) negative self-concept, and (3) disturbances in relationships. Functional impairment must be identified where at least one indicator of functional impairment is endorsed related to the PTSD symptoms and one indicator of functional impairment is endorsed related to the DSO symptoms. Endorsement of a symptom or functional impairment item is defined as a score > 2. An individual can receive either a diagnosis of PTSD or CPTSD, not both. If a person meets the criteria for CPTSD, that person does not also receive a PTSD diagnosis".

The scores of each symptom that is a pre-requisite to confirm the occurrence of both PTSD, CPTSD and DSO is reported as follow:

Diagnostic scoring

PTSD

If P1 orP2 ≥2 criteria for Re-experiencing in the here and now (Re_dx) met

If P3 or P4 ≥ 2 criteria for Avoidance (Av_dx) met

If P5 or P6 ≥ 2 criteria for Sense of current threat (Th_dx) met

AND

At least one of P7, P8, or P9 ≥ 2 meets criteria for PTSD functional impairment (PTSDFI)

If criteria for 'Re_dx' AND 'Av_dx' AND 'Th_dx' AND 'PTSDFI' are met, the criteria for PTSD are met.

CPTSD

If C1 or C2 ≥ 2 criteria for Affective dysregulation (AD_dx) met

If C3 or C4 ≥ 2 criteria for Negative self-concept (NSC_dx) met

If C5 or C6 > 2 criteria for Disturbances in relationships (DR_dx) met

AND

At least one of C7, C8, or C9 > 2 meets criteria for DSO functional impairment (DSOFI)

If criteria for 'AD_dx' AND 'NSC_dx' AND 'DR_dx', and 'DSOFI' are met, the criteria for DSO are met.

PTSD is diagnosed if the criteria for PTSD are met but NOT for DSO.

CPTSD is diagnosed if the criteria for PTSD are met AND criteria for DSO are met.

Not meeting the criteria for PTSD or meeting only the criteria for DSO results in no diagnosis.

Dimensional scoring for PTSD and CPTSD

Scores can be calculated for each PTSD and DSO symptom cluster and summed to produce PTSD and DSO scores.

PTSD

Sum of Likert scores for P1 and P2 = Re-experiencing in the here and now score (Re)

Sum of Likert scores for P3 and P4 = Avoidance score (Av)

Sum of Likert scores for P5 and P6 = Sense of current threat (Th)

PTSD score = Sum of Re, Av, and Th

DSO

Sum of Likert scores for C1 and C2 = Affective dysregulation (AD)

Sum of Likert scores for C3 and C4 = Negative self-concept (NSC)

Sum of Likert scores for C5 and C6 = Disturbances in relationships (DR)

DSO score = Sum of AD, NSC, and DR

4. Results and Discussion

Table 4.1. Demographic characteristics

Variables		Frequency	%
Gender of the participants	Male	83	40
	Female	126	60
Age of the participants	18-25	57	27
	26-33	43	21
	34-41	36	17
	42-49	34	16
	50-57	21	10
	58 and above	18	9
Education level	Primary	45	22
	Secondary and others	164	78
Family Income	Below 50,000 Rwf	137	66
	Between 50,001and 100,000 Rwf	55	26
	100,001-200,000 Rwf	13	6
	>200,001 Rwf	4	2
Ubudehe Category	Category 1	52	25
	Category 2	77	37
	Category 3	80	38
Destruction of the property	No	20	10

| | | Yes | 189 | 90 |

Source: Primary data (2023)

The results in table 4.1 reveal that the participants who fall between 18 and 25 years old dominated the majority of the participants where 27% of the participants fall in this group while participants above 58 years old constitute the minority. Female participants dominated where 126(60%) responded to the questionnaire. The majority of the participants 164(78%) completed secondary studies and above while only 45(22%) complete primary education. 66 % have family income below 50,000 Rwf a month. The results indicated that the majority 189(90%) had the property destroyed by the flooding and landslides.

4.2. Factors associated with the development of PTSD after severe flooding and landslides

This section report factors associated with the development of PTSD. The main factors reported as independent variables are age, gender, education level, family income, ubudehe category and the destruction of the property after the traumatic event. The relationship between occurrence and health related factors are also reported.

Table 4.2. Relationship between Occurrence of PTSD, demographic factors and health

| Variables | | OCCURRENCE OF PTSD | | |
		NO PTSD n (%)	PTSD n (%)	P- value
Gender of the participants	Male	50(23.9)	33(15.8)	**0.050**
	Female	51(24.4)	75(35.9)	
Age of the participants	18-25	25(12.0)	32(15.3)	0.217
	26-33	24(11.5)	19(9.1)	
	34-41	19(9.1)	17(8.1)	
	42-49	18(8.6)	16(7.7)	
	50-57	11(5.3)	10(4.8)	
	58 and above	4(1.9)	14(6.7)	
Education level	Primary	17(8.1)	28(13.4)	0.11
	Secondary and above	84(40.2)	80(38.3)	
Family Income	Below 50,000 Rwf	549(25.8)	83(39.7)	**0.02**
	Between 50,001 and 100,000 Rwf	34(16.3)	21(10.0)	
	Between 100,001 and 200,000 Rwf	11(5.3)	2(1.0)	
	Above 200,001 Rwf	2(1.0)	2(1.0)	
Ubudehe Category	Category 1	28(13.4)	24(11.5)	**0.021**
	Category 2	44(21.1)	33(15.8)	
	Category 3	29(13.9)	51(24.4)	
Destruction of the property	No	15(7.2)	5(2.4)	**0.012**
	Yes	86(41.1)	103(49.3)	

Source: Primary data (2023)

The results in Table 4.2 show that the present study revealed that gender of the participants [P=0.05], family income[P=0.02], ubudehe category[P=0.021], and destruction of the property [P=0.012] were the factors associated with the development of PTSDs among the studied population. The factors that are reported to be associated with the occurrence of PTSD were entered in a multivariate model to confirm its relationship and influence on occurrence. In addition psychosocial support factors that were

reported to be associated with occurrence of PTSD were combined with other factors in multivariate model to confirm its association.

The results revealed that two variables remained significantly associated with occurrence of PTSD when entered into multivariate analysis,the fact that the participants who fall in low Ubudehe category leads to the development of PTSD among study population though its likelihood was less Ubudehe category 1 (AOR= 0.221; 95% CI=0.087-0.564; P=

0.002) and Ubudehe category 2 (AOR= 0.338; 95% CI=0.155-0.734; P= 0.006).

4.3. Psychosocial support services provided to communities post severe flooding and landslides

This section reports the support provided to the communities affected by landslides and natural disasters, it also provides a discussion basing on the results from the present study.

Table 4.3. Psychosocial support provided

Variables		N	%	OCCURRENCE OF PTSD		P-Value
				NO PTSD	PTSD	
Counseling	No	159	76	79	80	0.483
	Yes	50	24	22	28	
Family support	No	140	67	72	68	0.201
	Yes	69	33	29	40	
Peer support	No	147	70	77	70	0.071
	Yes	62	30	24	38	
Neighbor visits	No	137	66	68	69	0.601
	Yes	72	34	33	39	
Support from the nearest health center	No	188	90	97	91	**0.005**
	Yes	21	10	4	17	
Government support	No	79	38	50	29	**0.001**
	Yes	130	62	51	79	
NGOs support	No	204	98	100	104	0.2
	Yes	5	2	1	4	
None	No	180	86	83	97	0.111
	Yes	29	14	18	11	

Source: Primary data (2023)

It is evident in table 4.3 that people affected by flooding and landslides did not get support needed in due time where almost all highlighted support was not given as report by the majority of the study participants. 14 % of the participants scored that they did not receive support at all. Government support was the main provided (62%) while NGO was the least to provide support (2%).

In order to link the support participants got from different sources with occurrence of PTSD, attempt was made to do a bivariate analysis to report possible relation in this section

The results show that support from the nearest health center was associated with the development of PTSD(P=0.005) and government support(P=0.001). Other social supports are not associated with the development of PTSD.

Those factors were support from nearest health center and government support

Among the variables entered in multiple logistic regression model, only four were reported to be significant. The fact that the participants fall in low Ubudehe category leads to the development of PTSD among study population though its likelihood was less; Ubudehe category 1 (AOR= 0.221; 95% CI=0.087-0.564; P= 0.002) and Ubudehe category 2 (AOR= 0.338; 95% CI=0.155-0.734; P= 0.006). The lack of support from the nearest health center was less likely to be associated with the development of PTSD (AOR= 0.188; 95% CI=0.052-0.687; P= 0.011) as well as lack of government support (AOR= 0.423; 95% CI=0.221- 0.813; P= 0.010).

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Table 4.4. Multivariate analysis of factors associated with the development of PTSD after severe flooding and landslides and psychosocial support provided

Variables		AOR	OCCURRENCE OF PTSDs 95% C.I.		P-Value
			Lower	Upper	
Gender of the participants	Male	0.724	0.373	1.407	0.341
	Female(Ref)				
Family Income	Below 50,000 Rwf	2.668	0.288	24.677	0.387
	Between 50,001 and 100,000 Rwf	0.662	0.069	6.353	0.721
	Between 100,001 and 200,000 Rwf	0.244	0.016	3.632	0.306
	Above 200,001 Rwf(Ref)				
Ubudehe Category	Category 1	0.221	0.087	0.564	**0.002**
	Category 2	0.338	0.155	0.734	**0.006**
	Category 3(Ref)				
Destruction of the property	No	0.347	0.105	1.142	0.082
	Yes(Ref)				
Support from the nearest health center	No	0.188	0.052	0.687	**0.011**
	Yes(Ref)				
Government support	No	0.423	0.221	0.813	**0.010**
	Yes(Ref)				

AOR: Adjusted Odd Ratio
Source: Primary data (2023)

4.3. Discussion

In this section, the results are discussed this section in relation to the available literature on the same topic in other contexts. Demographic characteristics are discussed, followed by the occurrence of PTSD; after that, the factors associated with the development of PTSD and finally the psychosocial support services provided to people affected by PTSD.

The present study revealed that the participants who fall between 18 and 25 years old dominated the majority of the participants where 27% of the participants fall in this group while participants above 58 years old constitute the minority. Age group in this category is dominated by young population which is highly represented in Rwandan population.

Female participants dominated where 126(60%) responded to the questionnaire. The majority of the participants 164(78%) completed secondary studies and above while only 45(22%) complete primary education, 137(66%) have family income below

50,000 Rwf a month. The results indicated that the majority 189(90%) had the property destroyed by the flooding and landslides. The descriptive data on the demographics data of the participant's reveal that the development of PTSD differ across the different age range as well as the gender of the participants, family income as well as education levels also are factors not to be undermined in the reports related to PTSDs (Fincham, 2008). The details are provided in the factors affecting the development of PTSDs.

The study measured occurrence of Post-Traumatic Stress Disorders in a population affected by severe flooding and landslides and found out that out of 209 participants, 108(52%) reported the symptoms of PTSD while only 101(48%) did not report any symptom of PTSD. The reported occurrence is high and in the lens of similar studies whereby by depending on geographical areas, it ranged from 20 to 40%, but higher than the occurrence that was reported in the general population which was believed to be between 3 and 5% elsewhere (Bromet *et al*., 2017). The present results again are higher than the results reported in the global survey conducted to report on the prevalence and other

factors which might be associated with natural which reported a prevalence range from 0.0 to 3.8 among studied adults and higher than the occurrence of 3.7 % which was reported in the United States of America (Kessler *et al*., 2012). The present results concur with the results found in African contexts whereby in Kenya the reported prevalence of PTSD was 48% in studied population(Jenkins *et al*., 2015), while it is close to the one found in Democratic Republic of Congo(DRC), whereby factors such sexual abuse, human rights violation of citizens of particular Eastern DRC territories, including information on basic needs, access to health care, and physical and mental health, coupled with PTSD were reported and revealed that 50.1% of the 998 study participants met PTSD symptom criteria (Jenkins *et al*., 2015). The results are also higher than the one found in Ethiopia whereby among the studied population, 37.3% of the them had symptoms of PTSD (asnakew *et al*., 2019). The reported occurrence of PTSD of 52 % in the studied population again concur with the results of a quite similar study conducted to examine mental health and related factors with exposure to trauma during the 1994 genocide against Tutsi in Rwandan men and women aged 20–35years which reported the occurrence of PTSD to be 26.1 percent of the 962 studied population (Fodor et al., 2015; Rugema et al., 2015).

The reasons behind the higher occurrence reported in the present study can be attributed to the fact that this study was conducted in a very homogenous population which was exposed to the same event in the same period, therefore, the likelihood of the effect is very high. It is again believed that the reported high occurrence can be attributed to the close spatial distribution of the participants who were only in the city without taking into account the remote areas who might have other strategies to mitigate the effect of severe flooding and landslides.

The results from bivariate analysis reported that gender of the participants [P=0.05], family income[P=0.02], ubudehe category[P=0.021], and destruction of the property[P=0.012] were the factors associated with the development of PTSDs among the studied population.

Age and gender of the participants were reported by prior studies to play an a pivotal role in the development of PTSD, the results reported that gender is linked with the development of PTSD among the study participants[P=0.05], the present study is in line with the study on combined effect of gender and age on post-traumatic stress disorder whether men and women show differences in the lifespan distribution of PTSD which found out that the highest prevalence of PTSD is seen in the early 40s for men and in the early 50s for women, while

the lowest prevalence for both genders was in the early 70s. Women had an overall twofold higher PTSD prevalence than men(Ditlevsen & Elklit, 2010). The results concur with the study conducted in Rwanda on factors associated to the development of PTSD in Rwanda post genocide where being women compared with men of the same age group, predispose to a risk to develop PTSD , person vulnerability to rape and abuse were related to all of these conditions with high risks in women relative to men in the same age group (Rugema et al., 2015) which is was not studied in the present study.

Socio-economic factors such family income[P=0.02], ubudehe category[P=0.021], and destruction of the property[P=0.012] were the factors associated with the development of PTSDs among the studied population; this is in line with prior studies which confirmed that economic factors such as homelessness, lack of employment, less income following a stressful event and family income structures are the main factors that influence the development of PTSD among the affected ones (Asnakew et al., 2019; Guay et al., 2006). The results from multiple logistic regression analysis showed that the fact that the participants fall in low Ubudehe category leads to the development of PTSD among study population though its likelihood was less due to the Confidence Intervals close to 0; Ubudehe category 1 (AOR= 0.221; 95% CI=0.087-0.564; P= 0.002) and Ubudehe category 2 (AOR= 0.338; 95% CI=0.155-0.734; P= 0.006). The results of the present concur in part with the results from the interview conducted in Ethiopia on 830 participants to report on factors associated with the development of PTSD among the survivors of Koshe landslide which highlighted that demographic factors played a big role in the development of PTSD whereby being female, family separation, serious physical trauma, drug addiction background, familial history of depression, negative affect and perceived higher tension were found to be among the factors associated with PTSD (Asnakew *et al*., 2019). The results are quite different from the one found in the DRC whereby conflicts were reported to be main factors behind the development of PTSD which indicated that among people prone to disasters where regions without conflicts reported a lower prevalence of 8% compared to regions in conflicts 30% (Id et al., 2020).

Another study by (Munyandamutsa et al., 2012) revealed that having to live in severe poverty, witnessing the assassination of a family member in 1994, being divorced or wedded, missing both family and residing in the South Province in between ages of 25 and 34. Depression and alcohol dependency were most common in participants who met the diagnostic criteria for PTSD than respondents

without PTSD in the same study population (Munyandamutsa *et al*., 2012).

The results in the present study showed that people affected by flooding and landslides did not get enough support as needed in due time where 14 % of the participants scored that they did not receive support at all. Government support was the main source of support (62%) while NGO was the least to provide support (2%). Only 24% get counselling services among other services. It is very crucial to get support after a traumatic event. It is important to know what are the types of social support people for people affected by natural disasters depending on their causes. The results from bivariate analysis between social support received and occurrence of PTSD showed that support from the nearest health center was associated with the development of PTSD(P=0.005) government support(P=0.001). These two variables were entered into multivariate analysis along with other social demographic factors and found that The lack of support from the nearest health center was less likely to be associated with the development of PTSD (AOR= 0.188; 95% CI=0.052-0.687; P= 0.011) as well as lack of government support (AOR= 0.423; 95% CI=0.221-0.813; P= 0.010). Other social support is not associated with the development of PTSD.

Lack of social enough support is likely to be a factor to develop PTSD among people affected by stressful event, therefore, it is important to know what are the types of social support people affected are in need so that they are helped not to permanently live with the condition.

The results of the present study have shown that the support provided was not as enough as it was required considering that people affected by natural disasters get support from government's entities, non-governmental organizations, family members, friends, colleagues to recover, but their effects on relationship with others and welfare remains extensive and sustained for long period for affected people, especially on psychosocial and mental health aspects that cause trauma(Stanke et al., 2012). In relation to the reported literature, the support provided to people affected by disasters in other settings get social support emotional, practical, affective, instrumental governmental and non-governmental spouse support, appraisal support, belongingness support, availability of help or support from others to fulfill specific needs (e.g. love, advice about a crisis (Guay et al., 2006). In addition, mental health psychosocial support provided to people affect by the disasters range from provision of cognitive-behavioral therapy, narrative exposure therapy, psychotherapy, and psycho-education(Bangpan et al., 2019). It was emphasized that lack of psychosocial support after one has lost his close relative due to

natural disasters its self is a risk which might lead to a predictor to develop PTSD among people affected by the stressful event(Guay et al., 2006). In addition, prior scholarship at the global scale reported that the factors ranging from the death of someone close to the victim, severe injury or forced relocation from home, and pre-existing vulnerabilities are factors influencing onset of PTSD among people affected by natural disasters (Bromet et al., 2017).

The present study did not attempt to deepen and explore support given to people affected by the natural disasters. It is of a need to conduct a separate study taking into account the support provided in this area.

5. Conclusions

The multivariate analysis reported that the factors that the participants fall in low Ubudehe category leads to the development of PTSD among study population though its likelihood was less due to the Confidence Intervals close to 0; Ubudehe category 1 (AOR= 0.221; 95% CI=0.087-0.564; P= 0.002) and Ubudehe category 2 (AOR= 0.338; 95% CI=0.155-0.734; P= 0.006). The results from bivariate analysis between social support received and occurrence of PTSD showed that support from the nearest health center was associated with the development of PTSD(P=0.005) government support(P=0.001). The lack of support from the nearest health center was less likely to be associated with the development of PTSD (AOR= 0.188; 95% CI=0.052-0.687; P= 0.011) as well as lack of government support (AOR= 0.423; 95% CI=0.221- 0.813; P= 0.010). Other social support is not associated with the development of PTSD.

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