

Post-traumatic Stress Disorders among Survivors of Road Traffic Crash injuries aged 18 Years and above, in Kigali City, Rwanda

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Abstract

Background

Post-traumatic Stress Disorder (PTSD) affects approximately 4% of the world's population and is one of the most prevalent mental illnesses among survivors of road traffic crashes; however, it has received little attention in the clinical setting.

Objective

The objective of this study was to evaluate the prevalence and factors associated with PTSD among survivors of road traffic crash injuries aged not less than 18 years obtaining follow-up care in public hospitals in Kigali, Rwanda.

Methods

This cross-sectional study included 288 survivors of road traffic crash injuries who were obtaining care in three public hospitals in Kigali for two months, from 1st August to 30th September 2023. The PTSD was diagnosed using a clinician-administered PTSD scale described in DSM V. Binary logistic regression was used to identify the factors linked to PTSD. The previous history of traumatic events was assessed using a Life Event Checklist for Diagnostic Statistical Manual-V (DSM-V).

Results

Of the 288 survivors, 50 (17.36%), were diagnosed to experience PTSD. The following were found to be positively associated with PTSD: age bracket of 32 to 38 ($p = 0.001$) and 39 to 45 years ($p=0.001$); absence of formal education ($p=0.03$); a history of family conflict ($p=0.001$); severe injuries ($p=0.001$); and; history of previous traumatic event ($p=0.02$).

Conclusion

Post-traumatic stress disorder is a public health concern among RTC survivors. Screening programs that capture PTSD should be an important intervention strategy.

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Keywords: PTSD, Prevalence, Associated factors, Survivors of road traffic crash

Introduction

Post-traumatic stress disorder (PTSD), is a mental disorder developed by a person after experiencing or witnessing a traumatic event.[1] PTSD is a major contributor to the global burden of disease, affecting approximately 4% of the world's population. [2] Among the survivors of traumatic events, PTSD is characterized by the following manifestations: persistently high levels of anxiety and fear in reaction to signals of the crash, mood changes, feelings of impending danger, disturbance in sleep, and hyper-vigilance lasting longer than a month. [2] Untreated PTSD is a common mental illness among the road traffic crash (RTC) survivors, causing a significant number of permanent disability.[3]

Worldwide, the proportion of RTC survivors who have PTSD has been reported to range between 6.3% and 58.3%.[3] This varies by nation; for instance, a meta-analysis study conducted among survivors of traffic crashes reported the combined prevalence of PTSD to be 22.25% in China; in Austria, it ranged from 6% to 45%.[3] In the USA, the lifetime prevalence of PTSD was reported to vary from 1.3% to 12.2%.[3] In Africa, a meta-analysis study that assessed PTSD revealed that 25% of RTC survivors experienced PTSD.[4] The prevalence of PTSD was reported to vary by country. For example, while in Nigeria the prevalence was reported to be 26.7 %, [5] in Kenya 13,3%, [6] South Africa and Ethiopia, it was 19.6% and 15.4%, respectively.[7]

Empirical evidence demonstrates that if PTSD is not well-treated, it can develop into significant undesired permanent disabilities. [8,9] However, PTSD is not appropriately diagnosed, both in medical and psychiatric practice.[10] Some scholars have attributed the under reporting of the magnitude of PTSD in routine hospital data and RTC statistics to the fact that many victims do not seek hospital care treatment due to different reasons, including avoidance symptoms and associated stigma.[11] Others have attributed these to the complexities arising

from co-occurring and delayed-onset of mental illnesses.[12] This dearth of accurate documentation of the magnitude of PTSD and the factors associated with it is a barrier to appropriate mitigation responses proportionate to the societal magnitude of the problem. As a result, the prioritization of PTSD as a major public health agenda,[13] and the identification and implementation of context-based intervention strategies are impeded.

In Rwanda, a previous study that addressed PTSD in the general population of those who experienced traumatic events during the 1994 genocide, reported that 26.1% experienced PTSD.[14] In another study, the overall prevalence of PTSD among genocide survivors was reported to be 37%. [15] Other scholars in Rwanda investigated the mental health effects of traumatic episodes experienced during the genocide period and its associations with the mental health among persons in Rwanda aged 20–35 years.[16] The study revealed that almost half of the study population had experienced the imprisonment of a close family member in their lifetime; 17.6% reported that they had witnessed atrocities such as mass killings and mutilated bodies. The study also reported that during the post-genocide period, from 2009 to 2011, 78.7% of the population revealed that they had experienced at least one traumatic episode in their lifetime.[16]

Although previous studies reveal that, in Africa, 25% of RTC survivors are reported to experience PTSD,[4] our literature review did not identify any study that documented the relationship between RTC survivors and the existence of PTSD in Rwanda. While Rwanda has made tremendous efforts in tackling road safety such as the creation of the National Road Safety Committee funded by the national budget, and the creation and proper implementation of national speed limit and motorcycle helmet laws,[18] RTC are a traumatic event that remains a leading cause of death and serious injuries in Rwanda.

In 2016, for instance, WHO estimated that the road traffic death rate in Rwanda was 29.7/ per 100,000 population,[18] approximately 1.6 times higher than the global average rate which is 18.2 per 100,000 population. [18] Furthermore, about 2,508 are injured as a result of RTC annually in Rwanda.[16]

Some highly informative studies on RTC injuries in Rwanda have focused on the epidemiology and the identification of hotspots of RTC in Kigali City,[19] and the built-in environment and RTC hotspots. [20] PTSD, although commonly reported among survivors of RTC in other countries, including those in Africa, has not received adequate scholarly attention in Rwanda compared to the reported magnitude in neighboring countries.

This study therefore, aimed to fill this gap in knowledge identified in the literature by assessing and documenting the prevalence and factors associated with PTSD among RTC survivors aged at least 18 years who were obtaining follow-up care in public hospitals in Kigali, the capital city of Rwanda from August to September, 2023.

Methods

Study design

This was a cross-sectional study in which the prevalence and factors associated with PTSD were assessed among survivors of RTC, aged 18 years and above, who were obtaining follow-up care in departments of physiotherapy and orthopaedics in three public hospitals in Kigali, the capital city of Rwanda. The three study hospitals were: Kibagabaga, Masaka and CHUK. Data were collected for two months, from 1st August to 30th September 2023.

Study Setting

The study was conducted in three public hospitals, namely: Kibagabaga, Masaka and CHUK. The three hospitals were purposively selected for this study for two main reasons. First, all the three hospitals have departments of physiotherapy and orthopaedics which are used in the follow-up care of many RTC survivors.

Previous studies revealed that RTC represented the most common, 46.8%, mechanism of injury requiring orthopaedic admission and care.[22] Second, all the three hospitals are public facilities that receive, on daily basis, a large number of road traffic injury follow-up cases; this is critical in capturing sample size large enough to allow for delineating any existing variations in variables of importance among the participants.

Participants

The study population were survivors of RTC, aged 18 years and above, who presented for follow-up care in departments of physiotherapy and orthopaedics of the three public hospitals, Kibagabaga, Masaka, and CHUK, in Kigali City, during a two-month period, from 1st August through to 30th September 2023.

Sampling

A total population sampling technique involving examining all those aged at least 18 years was used. This sampling technique has three advantages.[24] First, since it involves all members within the population of interest and captures such wide coverage of the population of interest, it is possible to get insights into the variables of interest and has reduced the risk of missing potential insights from members that are not included. Second, historically, health research has evolved with the traditional emphasis on probability sampling; many scholars prefer and recommend its use with the emphasis that it permits one to make statistical inferences about the sample being studied.[25,26] The use of total population sampling, although a type of non-probability sampling, the use of which does not permit one to draw statistical inferences can allow a researcher to make analytical generalisations about the population being studied.[24,27]

In this study, every consecutive case of survivors of RTC, aged 18 years and above, who presented for follow-up care in departments of physiotherapy and orthopaedics of the three public hospitals,

Kibagabaga, Masaka and CHUK, in Kigali City, during a two-month period, from 1st August through to 30th September 2023 were interviewed. The distribution of participants interviewed in the three hospitals, CHUK, Kibagabaga and Masaka were 162, 72 and 54 respectively.

Research Instrument and Variables

The presence of PTSD was assessed using a tool adopted from the Clinician-Administrated PTSD Scale(CAPS).[28] The Clinician-Administrated PTSD Scale is an extensively validated and widely used structured diagnostic interview tool for PTSD assessment. In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders, the CAPS has been revised to correspond with the PTSD criteria. [28] The PTSD Scale (CAPS) has 7 criteria named A, B, C, D, E, F, and G with 25 items or symptoms for evaluating the presence or absence of PTSD. Five levels of severity for each of the items or symptoms were determined by scoring from 0 to 5. According to this scoring, absent is a 0 score; mild/sub-threshold is a 1 score; moderate is a 2 score); severe / markedly elevated has 3 scores, and; extreme/ incapacitating has 4 scores.[1]

PTSD was diagnosed based on the following criteria: the symptom severity score had to be rated greater than or equal to two for each of the 20 items. The diagnosis of PTSD was made if there was the presence of at least one symptom from Criteria B, one from Criteria C, two from Criteria D, two from Criteria E, and the fulfilment of Criteria F. The Life Events Checklist for DSM V was used to determine the history of prior exposure to the traumatic event and to confirm that the RTC was the only cause of PTSD from other causes. The traumatic index has been used to know if the symptoms that the survivors of RTC presented were related to RTC and not to another traumatic event.

Analysis of Data

Data was entered in Excel and then exported to IBM SPSS Statistics for Windows version 21.0 (IBM Corp, Armonk, NY, USA).[24]

Univariate analysis was used to describe the socio-demographic, psychological, and biological traits of the patients involved in RTC, and the results were displayed in tables with frequency and percentage; and for age, mean with standard deviation (SD). The results of the univariate analysis were utilized to calculate the PTSD prevalence in each independent variable category. Bivariate analysis was utilized to assess the strength and significance of the association between the identified factors and PTSD by calculating chi-square, crude odd ratio and p-value. All the factors that were statistically significantly associated with PTSD with $p\text{-value} < 0.05$ were selected for multivariable logistic regression analysis. To control and adjust for confounding variables and identify the factors associated with PTSD in RTC patients, binary logistic regression analysis was employed. The 95% confidence intervals (CIs), p-values, and adjusted odd ratios were calculated, and any factor with a p-value of less than 0.05 was considered associated with PTSD. As for missing data the techniques that are not impacted by missing values directly were used.[25]

Ethical consideration

This research was reviewed by Mount Kenya University Ethical Review Board which granted a clearance REF No. MKU/ETHICS/28/8/2023(6). The study was conducted consistently with applicable Rwanda Government Law no 058/2021 relating to the protection of personal data and privacy. The respondents provided informed consent to participate before being enrolled.

Results

Socio-demographic characteristics of participants

From 1st August to 30th September 2023, a total of 288 RTC survivors, aged 18 and above years, presented for follow-up care in departments of physiotherapy and orthopaedics in three public hospitals, Kibagabaga, Masaka and CHUK, in Kigali City, Rwanda.

The distribution of participants interviewed in the three hospitals, CHUK, Kibagabaga and Masaka were 162, 72, and 54, respectively.

The socio-demographic characteristics of respondents; the distribution of 288 participants in the Departments of Physiotherapy and Orthopaedics, at Kibagabaga, Masaka and CHUK Hospitals, between August and September 2023 are presented in Table 1. The ages ranged from 18 to 88 years, with a mean of 35.02 (SD=14.08). The males were 189 (65.6%) and the females 99 (34.4%), with a male:female ratio of 2:1.

The age groups of years 39 to 45, 25 to 31 and 46 and above comprised 62 (21.5%), 59 (20.5%) and 58 (20.1%), respectively. Slightly more than a half, 159 (55.2%) reported that they were married. Less than a half of the participants, 118 (41.0%) indicated that they were not married; 11 (3.8%) belonged to other non-defined marital statuses. Respondents with secondary, primary and non-formal education comprised 79 (26%), 73 (25%) and 70 (24%) respectively. The majority of the respondents, 184 (63.9%), reported that they were employed.

An overwhelming majority of the respondents, 275 (95%) had health insurance. Regarding the status of social support, which was determined among the respondents by assessing reported conflict within the past 1 year and whether the parents were separated or dead at the time of reporting for care, more than three quarters, 249 (86.5%) reported that they had no reported family conflict within the past one year. Vulnerable road users, motorcyclists, 83 (28.5%) and pedestrians, 75 (27.1%), were the most frequent and contributed more than half, 158 (55%) of the total. Passengers in motor vehicles and bicyclists contributed 73 (25.3%) and 43 (14.9%) respectively. Car drivers were the least reported with a contribution of 4%.

Table 1. Sociodemographic characteristics of survivors of road traffic crash; Departments of physiotherapy and orthopaedics, Kibagabaga, Masaka and CHUK Hospitals, August–September 2023; N= 288

Variables	n(%)
Age group (years)	
18–24	52(18.1)
25–31	59(20.5)
32–38	57(19.8)
39–45	62(21.5)
46 and above	58(20.1)
Sex	
Male	189(65.6)
Female	99(34.4)
Marital status	
Single	118(41)
Married	159(55.2)
Others	11(3.8)
Level of education	
No formal education	70(24)
Primary	73(25)
Secondary	76(26)
Tertiary	69(23)
Occupation	
Unemployed	104(36.1)
Employed	184(63.9)
Health Insured	
No	13(4.5)
Yes	275(95.5)
Poor family relationships or insufficient social assistance	
No conflict or other problem	249(86.5)
Family conflict	29(10.1)
Parent separation or death	10(3.5)
Misusing alcohol or cannabis	
No	285(99.0)
Yes	3(1)
Type of road user	
Car driver	14(4.0)
Motorcyclist	83(28.8)
Pedestrian	75(27.1)
Bicyclist	43(14.9)
Passengers	73(25.3)

Prevalence of PTSD among survivors of road traffic crash

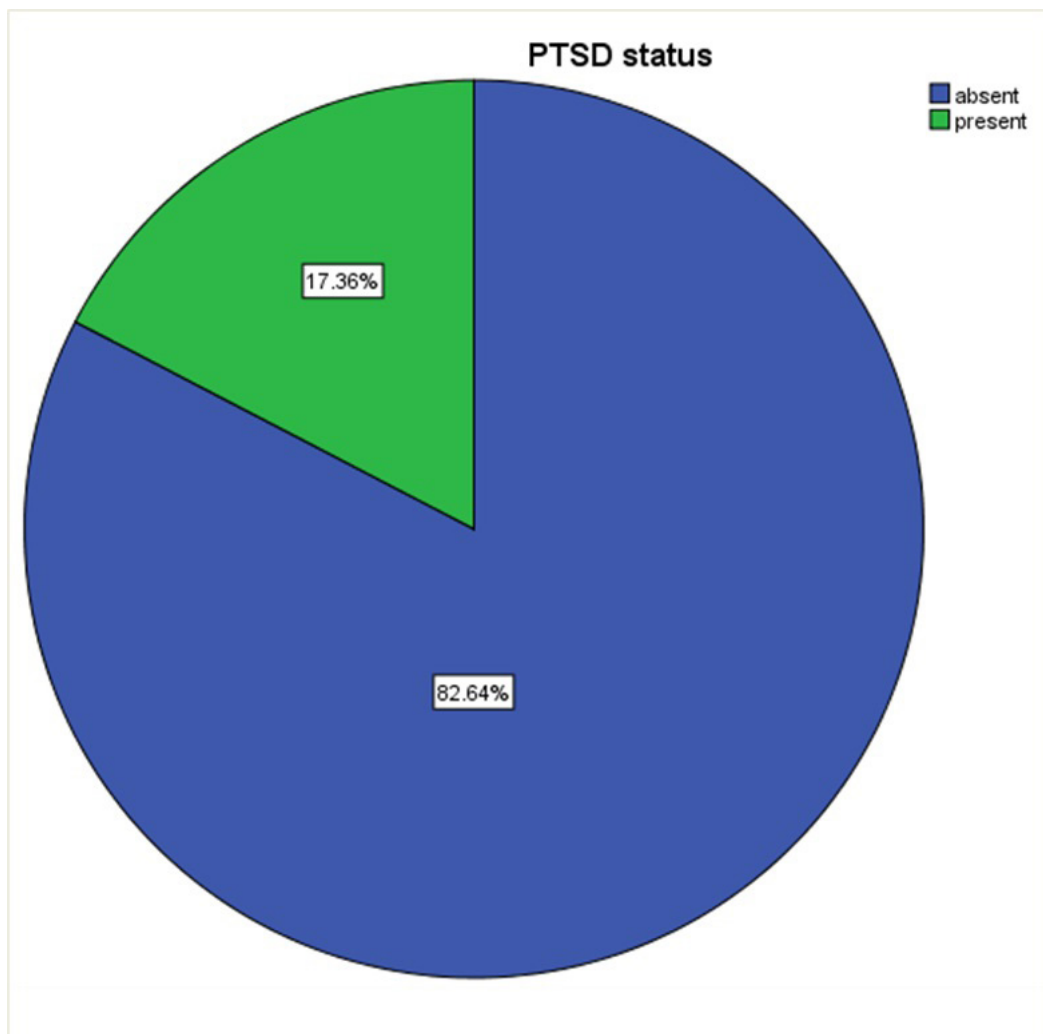


Figure 1. Prevalence of PTSD among survivors of road traffic crash Departments of physiotherapy and orthopaedics, Kibagabaga, Masaka and CHUK Hospitals, August–September 2023; N = 288

Of the 288 RTC survivors aged 18 years and above who presented for follow-up care in departments of physiotherapy and orthopaedics in three public hospitals, Kibagabaga, Masaka and CHUK, in Kigali City, 50 (17.36%) were diagnosed with PTSD (Figure 1).

Characteristics of those diagnosed with Post Traumatic Stress Disorder

Among the 50 (17.36%) of the total participants who were diagnosed with PTSD, the majority, 34(68 %) were in the age range of 32 to 38 years and 39 to 45 years. Of those diagnosed 28 (58%) were female making the male to female ratio 0.79:1. Passengers of motor vehicles and pedestrians were the leading road user categories, and comprised 17 (32%) and 15 (30%) respectively of those with PTSD (Table 2).

Table 2. Characteristics of survivors of road traffic crash injuries diagnosed with Post Traumatic Stress Disorder at hospitals in Kigali City, 2022, (N = 50)

Variables	n (%)
Age groups (years)	
8–24	1(2.0)
25–31	9(18)
32–38	17(34.0)
39–45	17(34.0)
≥46	6(12.0)
Total	50(100.0)
Sex of survivors	
Male	22(44.0)
Female	28(58.0)
Total	50(100.0)
Marital status	
Single	15(30.0)
Married	34(68.0)
Others	1(2.0)
Total	50(100.0)
Level of education	
No formal education	0(0.0)
Primary	26(52.0)
Secondary	24(48.0)
Tertiary	0(0.0)
Total	50(100.0)
Occupation	
Unemployed	30(60.0)
Employed	20(40.0)
Total	50(100)
Type of road user	
Motorcyclist	13(26.0)
Pedestrians	15(30.0)
Bicyclist	5(10.0)
Car driver	1(2.0)
Passenger	16(32.0)
Total	50(100.0)

Factors associated with post-traumatic stress disorder among survivors of road traffic crash

The binary logistic regression analysis final model on factors associated with PTSD among survivors of RTC, showed age groups of 32 to 38 years (AOR =17.35; 95% CI: 3.76 to 80.72, p-value of 0.001) and 39 to 45 years (AOR=11.81; 95% CI: 2.61 to 53.37, P=0.001) to be associated with the development of PTSD with much higher odds than the 18 to 24 years age group.

Education level was found to be an important factor in the development of PTSD. Survivors of traffic crashes who reported that they had no formal education were found to be eight times more likely to experience PTSD compared with those who had secondary education (AOR= 8.33; 95%CI:2.79-11.21; p=0.03). Family violence was statistically significantly associated with the development of PTSD (AOR=4.19; 95%CI:2.11–8.25; P=0.001) compared to those without conflict.

Development of PTSD was found to be associated with injury severity as measured by simple, moderate, severe and others in the clinical records. The severely injured were found to be more likely to develop PTSD (AOR=5.63; 95% CI: 8.48–15.72; p=0.001). History of traumatic events was also found to be an important factor whereby those who had experienced previous traumatic events were twice as likely to develop PTSD as those who had not (AOR=2.69; 95%CI: 2.18–6.36; P=0.02 (Table 3).

Table 3. Factors associated with post-traumatic stress disorder among survivors of road traffic crash (N=50)

Variables	COR	95% CI for COR		p-value	AOR	95% CI for AOR		P-value	
		Lower	Upper			Lower	Upper		
Age groups									
18–24	Ref				Ref				
25–31	1.23	1.27	42.31	<0.001	0.76	0.98	35.63	0.12	
32–38	1.33	2.36	14.56	<0.001	17.35	3.76	80.72	0.001	
39–45	3.12	1.03	10.13	0.01	11.81	2.61	53.37	0.001	
≥46	3.11	1.59	9.01	0.02	0.39	0.76	19.63	0.19	
Level of education									
No education	2.89	1.73	8.32	<0.001	8.33	2.79	11.21	0.03	
Primary	0.22	0.34	1.29	0.094	0.79	0.25	2.49	0.18	
Secondary	0.59	0.75	1.56	<0.001	0.28	0.01	1.73	0.11	
Tertiary	Ref				Ref				
Poor family relationships or insufficient social support									
No violence in family	Ref.				Ref				
Report of violence in family	0.84	0.22	5.39	0.01	4.19	2.11	8.25	0.001	
Parental separation or death	1.21	0.19	3	<0.001	0.37	0.58	10.17	0.64	
Severity of injury									
Simple	Ref.				Ref.				
Not categorized and others	1.07	1.96	7.41	0.02	0.23	0.45	1.67	0.39	
Moderate	4.31	2.31	6.56	<0.001	5.63	8.48	15.72	0.001	
Severe	1.47	0.93	5.89	<0.001	0.23	0.89	2.51	0.16	
History of exposure to the prior traumatic event									
No	Ref				Ref				
Yes	4.1	2.01	7.13	<0.001	2.69	2.18	6.37	0.02	

AOR: Adjusted odd ratio, CUR: Crude odd ratio, CI: Confidence interval

Discussion

We aimed to assess and document the prevalence of PTSD and the associated factors among survivors of RTC, aged at least 18 years who presented for follow-up care in selected public hospitals in Kigali, the capital city of Rwanda. This study used a public health approach to understanding and solving health problems. This multisectoral and science-based framework involves four key steps,[21] determination of the magnitude, scope, and characteristics of the problem; identification of the factors

that increase the risk of disease or health event and those that are potentially modifiable with the current knowledge; assessment of the possible intervention strategies that can alleviate the problem, based on information gathered in step two to design pilot test and evaluate interventions, and; implementation of the most promising interventions on broad scale.[21]

The current study contributes to the first two steps in the public health approach to any health problem in that it describes and documents the prevalence of PTSD and contributes to a critical and vital first step

in achieving a public health solution to the burden of PTSD among survivors of RTC in Kigali City. In addition, it determines the factors associated with PTSD among survivors of RTC; this contributes to the second step in the public health approach to addressing the burden of injuries in the community. Our findings indicate that 17.36% of survivors of RTC were diagnosed to experience PTSD. The reported prevalence falls within the average prevalence of PTSD of survivors of RTC, globally, which were reported to vary from 6% to 45%. [3] This reported prevalence, however, is approximately 1.5 times lower than the prevalence of 25%, the average prevalence of PTSD reported in both the meta-analysis study of PTSD among RTC in Africa [4] and the reported prevalence of 26.7 among RTC victims in Nigeria. [5]

This finding of a comparatively lower prevalence of PTSD among survivors of RTC could be attributed to strategies that the Government of Rwanda has been implementing to address mental health such as decentralization of mental health care in general hospitals; integrating mental health care into primary health, and strengthening efforts aimed at increasing access, acceptability, and quality of mental health services. [29]

The other key finding in this study is that family violence is significantly associated with the development of PTSD. This finding is congruent with previous studies, [1] which reported that a lack of social support, [30] and having serious negative family relationships [31] are associated with the development of PTSD amongst RTC survivors. This could be explained, at least partly, by the documented report that although marriage can operate as a protective factor, it can also be a selective factor in health. [32] The findings of this study that there is an association between family violence and the development of PTSD is consistent with which revealed that the rates of child maltreatment were substantially associated with the development of PTSD. [34]

The current study reveals that education level is an important factor in the development of PTSD; it reports that survivors of RTC who had no formal education were eight times more likely to experience PTSD, compared to those who had secondary education. This report reinforces the consistently reported finding that educational status is one of the strongest health-behavior measures; [35,36] it underlines that illiteracy or low formal education stands out among the indicators of inequalities in confirming the relative deprivation hypothesis. [37] Education, with knowledge, attitude, and skills, that come with years of schooling can be viewed as enabling or coping [39] In Rwanda, the strategies of the Ministry of Education aimed at promoting access to education at all levels, improving the quality of education and training as published in revised Education Sector Strategic Plan, [40] may have important public health implication as broader multidisciplinary intervention strategies aimed at reducing the societal burden of PTSD and the health of the population generally.

Strengths and Limitations of the study

This study has a number of strengths including the fact that it was retrospective, hence based on real-world data, much less costly; and it was completed in a limited timeframe. The findings of this study however, are subject to at least four limitations. First, the study was confined to survivors of RTC, aged 18 years and above, who presented for follow-up care in three public hospitals, Kibagabaga, Masaka and CHUK, in Kigali City. The reported magnitude and factors of PTSD could be underestimated since the younger age group below 18 years was not captured. Second, although the cases attending care in public hospitals is a conglomeration of patients from different places, they are more inclined to represent a particular geographical catchment area. [33] Therefore, caution should be exercised in their general application. Third, our information on prevalence and factors associated with PTSD were based on cases attending

health facilities for care who represent only a small proportion of such cases in need of such care.[33] Fourth, patients seeking follow-up care, tend to visit health facilities many times a year. It is therefore likely that they could have been regular recipients of health talks on self-care that are routinely delivered to patients at the facilities. Consequently, it is not certain to what extent such experience may have influenced the magnitude of PTSD reported.

Conclusion

Among RTC survivors who presented at hospitals in Kigali City for follow-up care, PTSD is a public health concern. The majority of them are females; and in the age groups of 32 to 38 years and 39 to 45 years. Passengers and pedestrians were the most affected. Age, education level, Poor family relationships or insufficient social support, injury severity and history of previous traumatic events were found to be statistically significantly associated with the development of PTSD. There is a need to strengthen efforts aimed at expanding screening programs and include the RTC survivors. Those in the age groups and passengers and pedestrians who are more likely to develop PTSD following RTC, should be specifically receiving focused attention.

Authors' contribution

AM and JO both conceived the study; AM contributed to data analysis; AM and JO reviewed and finalized the manuscript.

Conflict of Interest

There is no conflict of interest.

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References

1. Roehr B. American Psychiatric Association explains DSM-5. *BMJ*. 2013 Jun 6;346(jun06 1):f3591–f3591. doi:doi.org/10.1136/bmj.f3591
2. Koenen KC, Ratanatharathorn A, Ng L, McLaughlin KA, Bromet EJ, Stein DJ, et al. Posttraumatic stress disorder in the World Mental Health Surveys. *Psychol Med*. 2017 Oct;47(13):2260–74. doi:doi.org/10.1017/S0033291717000708
3. Lin W, Gong L, Xia M, Dai W. Prevalence of posttraumatic stress disorder among road traffic accident survivors: A PRISMA-compliant meta-analysis. *Medicine (Baltimore)*. 2018 Jan;97(3):e9693. doi:10.1097/md.0000000000009693
4. Mekonnen N, Duko B, Kercho MW, Bedaso A. PTSD among road traffic accident survivors in africa: A systematic review and meta-analysis. *Heliyon*. 2022 Nov;8(11):e11539. doi.org/10.1016/j.heliyon.2022.e11539
5. Iteke O, Bakare MO, Agomoh AO, Uwakwe R, Onwukwe JU. Road traffic accidents and posttraumatic stress disorder in an orthopedic setting in south-eastern Nigeria: a controlled study. *Scand J Trauma Resusc Emerg Med*. 2011;19(1):39. doi:https://doi.org/10.1186/1757-7241-19-39
6. Ongecha-Owuor F, Kathuku D, Othieno C, Ndeti D. Post traumatic stress disorder among motor vehicle accident survivors attending the orthopaedic and trauma clinic at Kenyatta National Hospital, Nairobi. *E Af Med Jrnl*. 2004 Oct 22;81(7):362–6. doi:10.4314/eamj.v81i7.9192
7. Bedaso A, Kediro G, Ebrahim J, Tadesse F, Mekonnen S, Gobena N, et al. Prevalence and determinants of post-traumatic stress disorder among road traffic accident survivors: a prospective survey at selected hospitals in southern Ethiopia. *BMC Emerg Med*. 2020 Jun 26;20(1):52. <https://doi.org/10.1186/s12873-020-00348-5>

8. Kessler RC, Aguilar-Gaxiola S, Alonso J, Chatterji S, Lee S, Ormel J, et al. The global burden of mental disorders: An update from the WHO World Mental Health (WMH) Surveys. *Epidemiol Psychiatr Soc.* 2009 Mar;18(1):23–33. <https://doi.org/10.1017/s1121189x00001421>
9. Morina N, Wicherts JM, Lobbrecht J, Priebe S. Remission from post-traumatic stress disorder in adults: A systematic review and meta-analysis of long term outcome studies. *Clinical Psychology Review.* 2014 Apr;34(3):249–55. <https://doi.org/10.1016/j.cpr.2014.03.002>
10. Zimmerman M, Mattia J. . and Mattia, J.I. Is posttraumatic stress disorder underdiagnosed in routine clinical settings? *The Journal of nervous and mental disease.* 1999;7(187). doi: 10.1097/00005053-199907000-00005
11. Trusz SG, Amy W Wagner, Joan R, Love Jeff, Douglas FZ. Assessing Barriers to Care and Readiness for Cognitive Behavioral Therapy in Early Acute Care PTSD Interventions. *Psychiatry: Interpersonal and Biological Processes.* 2011;74(3):207–23. <https://doi.org/10.1521/psyc.2011.74.3.207>
12. Nielson JL, Megler JD. Ayahuasca as a Candidate Therapy for PTSD. In: Labate BC, Cavnar C, editors. *The Therapeutic Use of Ayahuasca* . Berlin, Heidelberg: Springer Berlin Heidelberg; 2014. p. 41–58. http://link.springer.com/10.1007/978-3-642-40426-9_3. https://doi.org/10.1007/978-3-642-40426-9_14
13. Collins PY, Patel V, Joestl SS, March D, Insel TR, Daar AS, et al. Grand challenges in global mental health. *Nature.* 2011 Jul;475(7354):27–30. <https://doi.org/10.1038/475027a>
14. Lawrence Rugema, Ingrid Mogren, Joseph Ntaganira, Krantz Gunilla. Traumatic episodes experienced during the genocide period in Rwanda influence life circumstances in young men and women 17 years late. *BMC Public Health.* 2013;13(1234):1–12. <https://doi.org/10.1186/1471-2458-13-1235>
15. World Health Organization. Global status report on road safety 2018. Geneva: World Health Organization. 2018. 403 p. <https://iris.who.int/handle/10665/276462>. Accessed 25 November 2023
16. Patel A, Krebs E, Andrade L, Rulisa S, Vissoci JRN, Staton CA. The epidemiology of road traffic injury hotspots in Kigali, Rwanda from police data. *BMC Public Health.* 2016 Dec;16(1):697. <https://doi.org/10.1186/s12889-016-3359-4>
17. Wang D, Krebs E, Nickenig Vissoci JR, De Andrade L, Rulisa S, Staton CA. Built Environment Analysis for Road Traffic Crash Hotspots in Kigali, Rwanda. *Front Sustain Cities.* 2020 Jun 5;2:17. <https://doi.org/10.3389/frsc.2020.00017>
18. Hardaker WM, Jusabani M, Massawe H, Pallangyo A, Temu R, Masenga G, et al. The Burden of Orthopaedic Disease in Sub-Saharan Africa: A Focus on Tanzania. *In Review.* 2021 . <https://doi.org/10.21203/rs.3.rs-402380/v1>
19. Laerd dissertation. Getting Started Quantitative Dissertation Fundamentals .Laerd dissertation website. 2012. <https://dissertation.laerd.com/total-population-sampling.php>. Accessed 20 December 2023
20. Cochran WG. Sampling Techniques. *John Wiley & Sons*; 1977.
21. Mahalanobis P. The Sample Census of the Area under Jute in Bengal in 1940. *The Indian Journal of Statistics, Series B (1960-2002).* 1967. 81–182 p.
22. Arnab R. Survey sampling theory and applications. London, United Kingdom ; San Diego, CA, United States: Elsevier/AP, Academic Press, an imprint of Elsevier. 2017. 899 p.
23. Weathers FW, Bovin MJ, Lee DJ, Sloan DM, Schnurr PP, Kaloupek DG, et al. The Clinician-Administered PTSD Scale for DSM–5 (CAPS-5): Development and initial psychometric evaluation in military veterans. *Psychological Assessment.* 2018 Mar;30(3):383–95. doi:10.1037/pas0000486

24. Heck RH. Multilevel and Longitudinal Modeling with IBM SPSS. 2nd ed. *Routledge*. 2013. <https://doi.org/10.4324/9780203701249>
25. Enders CK, Little TD. Applied missing data analysis. Second Edition. *New York London: The Guilford Press*. 2022. 1 p. (Methodology in the social sciences). ISBN 9781462549863
26. Krug EG, Sharma GK, Lozano R. The global burden of injuries. *Am J Public Health*. 2000;90:523–6. doi: 10.2105/ajph.90.4.523
27. Ministry of Health. National Mental Health Policy in Rwanda. *Ministry of Health website*. 2011. https://www.rbc.gov.rw/fileadmin/user_upload/mental/men/4.%20National-Mental-health-Policy.pdf. Accessed 15 January 2024
28. Yohannes K, Gebeyehu A, Adera T, Ayano G, Fekadu W. Prevalence and correlates of post-traumatic stress disorder among survivors of road traffic accidents in Ethiopia. *Int J Ment Health Syst*. 2018 Dec;12(1):50. doi:10.1186/s13033-018-0229-8
29. Mekonnen N, Duko B, Kercho MW, Bedaso A. PTSD among road traffic accident survivors in africa: A systematic review and meta-analysis. *Heliyon*. 2022 Nov;8(11):e11539. doi:10.1016/j.heliyon.2022.e11539
30. Syme. Behavioral factors associated with the etiology of physical disease: a social epidemiological approach. *American Journal of Public Health*. 1974;64(11):1043-1045. doi:10.2105/ajph.64.11.1043
31. Gwadz MV, Nish D, Leonard NR, Strauss SM. Gender differences in traumatic events and rates of post-traumatic stress disorder among homeless youth. *Journal of Adolescence*. 2007 Feb;30(1):117–29. doi:10.1016/j.adolescence.2006.01.004
32. Green LW. Manual for scoring socioeconomic status for research on health behavior. *Public health reports*. 1970;9(85).
33. Metcalf P, Scragg R, Davis. Relationship of different measures of socioeconomic status with cardiovascular disease risk factors and lifestyle in a New Zealand workforce survey. *The New Zealand Medical Journal*. 2007;120(1248).
34. Kunst AE, Mackenbach JP. The size of mortality differences associated with educational level in nine industrialized countries. *Am J Public Health*. 1994 Jun;84(6):932–7. doi:10.2105/ajph.84.6.932
35. Oxford textbook of public health. 1: The scope of public health. 5. ed. *Oxford: Oxford Univ. Press*; 2009. 392 p. ISBN (Hardback): 978-0-19-957943-3
36. Ministry of Education. Education Sector Strategic Plan 2018/19 to 2023/24. *Ministry of Education* ; 2018. https://www.mineduc.gov.rw/fileadmin/user_upload/Mineduc/Publications/ESSP/1_Education_Sector_Strategic_Plan_2018_2024.pdf. Accessed 20 July 2023
37. Friis RH, Sellers T. Epidemiology for public health practice. *Jones & Bartlett Learning*. 2020. ISBN (Hardback): 0-7637-5161-8