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ORIGINAL ARTICLE

THE PATTERN OF PEDIATRIC TRAUMA IN AABET HOSPITAL:A CROSS-SECTIONAL STUDY USING TRAUMA REGISTRY

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ABSTRACT

Introduction: *Child injuries are a growing public health problem yet it remains overlooked in resource-limited countries.*
Objective: *We aim to assess the patterns, clinical presentation, and outcome of childhood injuries among children visiting the emergency department of AaBET Hospital, Addis Ababa, Ethiopia using a trauma registry form.*
Methods: *A cross-sectional study was conducted on pediatric injuries at the AaBET Hospital Emergency department between December 2017 to May 2018. Data were collected prospectively with a trauma registry form which priory prepared and tested 6 months before this study in the same hospital. The data were entered and analyzed using SPSS version 20 software using analytic and descriptive parameters. Pediatric trauma score and disposition from the emergency room was taken as the assessment of severity.*
Results: *In this study, 407 children aged less than or equal to 18 were included and 280(68.8%) were males. The majority of injuries were road traffic injuries 162 (39.8%) followed by falls 105 (25.5%). 78.6 % of the Road traffic injury occurred on pedestrians. Only 109(26.8%) of injured children arrived at AaBET Hospital via ambulance, only 25 (6.1%) received emergency care before arrival. 136 (33.4%) arrived after 24 hours of the injury with a mean arrival time of 1.7 days post-injury. Pediatric severity trauma score (PST) was only assessed in 211 patients there are only 5 patients who have PST score of < 8. Age between 5 to 12 [AOR = 1.91, 95% CI (1.12-3.24)] and Head injury [AOR= 1.82, 95%CI (1.06, 3.12)] are more likely to be admitted than those who are not.*
Conclusion: *Road traffic accidents are the most frequent injury and most injuries occurred in pedestrians. Use of Ambulance service and pre-hospital care, timely presentations are low. Adequate and comprehensive public education and significant improvement in advanced trauma services with improved prehospital services is imperative.*
Keywords*: Injuries, Childhood, Ethiopia, Trauma*

INTRODUCTION

Childhood injuries are a major public health problem (1). Worldwide about one million children under the age of 18 years are estimated to die annually; more than 2000 children per day (2). The majority of these childhood trauma-related injuries and deaths are the result of road traffic collisions and the cause of death is mostly due to severe head injury (1,3). Over 80% of the injury, deaths in children occur in low and middle-income countries (LMIC) (4,5). Globally the road traffic death rate among children is 10.7 per 100,000, while in the African region it is almost double at 19.9 per 100,000 (6).

Although road traffic collisions are the primary cause of trauma-related deaths in children, falls are also an important cause of morbidity and mortality (7). Children are vulnerable populations, suffering from a particularly high number of fall injuries and subsequent disabilities.

Yearly 2.8 million children < 5 years old visit an emergency room due to fall-related injuries (7). As with road traffic collisions, LMIC, especially in Africa are disproportionately affected (1,8).The epidemiology and pattern of injuries in children vary from one country to another based on socio-economic status, geographical and population-related characteristics (9). Considering that many injuries are preventable, understanding the country-specific pattern of injuries is necessary for formulating policy and instituting preventive measures (10).

Little is known in Ethiopia about the epidemiology of injuries in children. Contrary to the idea the road traffic injuries account for a majority of childhood injuries, in South West Ethiopia, injuries other than car collisions accounted for 82.2% of all cases (11). While the Ethiopian health sector program provides great attention to injuries and violence, without comprehensive data on the patterns and magnitude of injuries, it is difficult to set priorities (11,12).

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The purpose of this study is to further characterize the pattern of childhood injuries and factors associated with these injuries among children in Ethiopia using a pre-prepared trauma registry.

PATIENTS AND METHODS

Study Setting: This study was conducted in Addis Ababa Burn, Emergency and Trauma (AaBET) hospital. AaBET Hospital is the first dedicated Emergency and Trauma hospital in Ethiopia located in the capital city. AaBET hospital is an affiliated hospital of St. Paul's hospital millennium medical college. The hospital provides services in emergency and critical care, orthopedics, neurosurgery, general surgery and burn.

Study Design and Population: This was a cross-sectional study. The source population is all emergency patients seen at the Aabet hospital. The study population was all injured children below or equal to 18 years old who were observed or admitted at the hospital of the study setting during the time of December 2017 to May 2018. Children less than one month were excluded from the study, as the cause of injury in this age group is mostly birth-related and those charts with incomplete records.

Sample size determination: The sample size was drawn by using formula

$$n = \frac{[Z_{1-\alpha/2}]^2 p(1-p)}{D^2}$$

Where:

n = the minimum sample size required

P= estimated prevalence rate of the population

D= the margin of tolerance

Z= the standard normal variation at confidence level and α is mostly 5% with 95% confidence level

The minimum sample size required was obtained by taking a prevalence rate of 50% (0.5) Taking the prevalence of child injury 50% (in absence of previous study in the same setting) and confidence interval of 95% and the margin of error is 5% (0.5).

The sample was calculated as

$$n = \frac{[1.96]^2 0.5(1-0.5)}{(0.5)^2} = 384$$

Considering a 10% incomplete data rate finally, the sample size of 423 was calculated but after clearing the data, we used 407 patients. All patients less than or equal to 18 years old presenting to AaBET Hospital with injury were included during the study period until the sample size reached.

Data Collection: Data elements collected were modeled after standardized data elements proposed for pediatric trauma registries by the World Health Organization was modified and tested 6 months before the start of the study in the same hospital, the required adjustment was done, and the final version was the one used on all the patients.

Data included demographics, injury characteristics, and physical exam findings at presentation. These data were maintained in a trauma registry. General practitioners trained in the process of data collection were responsible for obtaining data and maintaining the trauma registry. The emergency department log was examined each day to identify patients presenting with traumatic injuries over the last 24 hours.

Data Management: Data were entered into SPSS version 20. The investigators were strictly following the data collection process and were checking for completeness of data daily.

Data Analysis: Data were entered and analyzed using SPSS version 20. Severity was defined using a pediatric trauma score (13). We classified the severity of the patients using a pediatric trauma score (PTS) and looking disposition of the patient (considering admitted are sever compared to not admitted) to the hospital. The Glasgow coma scale (GCS) used to define severity for Head injury (14).

Descriptive analyses of independent variables (gender, age, categories of injuries, clinical presentation and duration of injuries, and outcomes) reported as number, percentages, and mean ± standard deviation. A bivariate logistic regression analysis was performed to assess the association of various predictors with the outcome of interest; severity of childhood injury.

Multivariate logistic regression analysis was performed to assess the association of combinations of predictors with severity. A P-value <0.05 and 95% confidence intervals were used to test for statistical significance.

Ethical Considerations: the Institutional Review Board of St Pauls Hospital Millennium College approved this study. Data retrieval forms were made anonymous. The data were kept in a secure place and did not transfer to a third person.

RESULTS

During the study period there were 8,520 patients seen in the emergency department of AaBET hospital. Of these, 6,700 were seen for traumatic injuries where 594 of the trauma patients were <18 years of age. Four hundred and seven medical records were completed and utilized who fulfilled the eligablity crateria were taken till the sample size reached (Table 1) and 284 (69.8%) were males.

The mean age was 11.7 ± 5.1 years. While most of the patients arrived at the hospital within 24 hours of injury, 134 (33%) presented more than a day after the injury. Socio-demographic factors of the patients are presented in Table 1.

Table 1: Demographic characteristics of patients AaBET Hospital, Addis Ababa, Ethiopia, December 2017 to May 2018 (n=407).

	Number (407)	Percentage (%)
Age (years)		
< 5	65	16.0
5 – 12	138	33.9
13-18	204	50.1
Region of residence		
Addis Ababa	200	49.1
Oromia	166	40.8
SNNPR	16	3.9
Amhara	7	1.7
Other	18	4.3
Transport		
Scene	164	40.3
Transfer	230	56.7
Unknown	13	3.2
Place of injury		
Home	81	19.9
Street	184	45.2
School	8	2.1
Public building	6	1.6

The major mechanisms of injury were road traffic accidents (RTA) 162 (39.8%), falls 105 (25.8%), physical assaults 71 (17.4%) and burn account 20 (4.9%) (Table 2). The majority of RTA injuries 130 (80.2 %) pedestrians, 27 (16.7%) passengers and 5 (3.1%) on drivers.

Vehicles involved for RTA were by car 139 (85.8%), 10 (6. %) bicycle, Bajaj (tricycle motor), 9 (5.6%) motorbikes, 3 (1.8%) and cart 1 (0.6%). The five drivers who sustained RTA which includes 3 by bicycle and 2 by automobile (with age 17 years and 18 years old). There was a marked age variation in the different injury mechanisms (Figure 1).

Males accounted for the majority of injuries in all categories of injury except burns, where the gender distribution was even seen (Figure 2). Around 108 (26.5%) of injured children used an ambulance for transportation to the hospital but only 27 (6.6%) of the injured children received pre-hospital care from the scene and on the way to the transportation to the hospital.

One-third of 136 (33.4%) of the cases arrived at AaBET Hospital after 24 hours of the injury. For those who had a neck collar that is 152 patients only 4 had at prehospital, 1 scene, 3 in the ambulance.

Table 2: Mechanism, nature and severity of injured AaBET Hospital, Addis Ababa, Ethiopia, December 2017 to May 2018 (n=407).

Variables	Frequency	Percentage (%)
Mechanism of injury		
Road Traffic collision	162	39.8
Fall down	105	25.8
Physical assault	71	17.4
Burn	20	4.9
Hit by object /machine	19	4.7
Animal related kick	10	2.5
Hit by falling stone	9	2.2
Gun shot	6	1.5
Other	5	1.2
Types of Road Traffic Accident		
Pedestrian RTA	121	78.6
Passenger	28	18.2
Driver	5	3.2
Triage category		
Red	5	1.2
Orange	22	5.4
Yellow	307	75.4
Green	28	6.9
Not documented	45	11.1
Injury to Arrival to hospital (hr)		
Within 24 hour	271	66.6
Greater than 24 hour	136	33.4
Head Injury severity by GCS (n=101)		
Mild	78	77.2
Moderate	18	17.8
Sever	5	4.9
Disposition from ED		
Home from the Emergency room	291	71.5
Admitted to the hospital ward	110	27.0
Admitted to ICU	5	1.2
Death	1	0.2

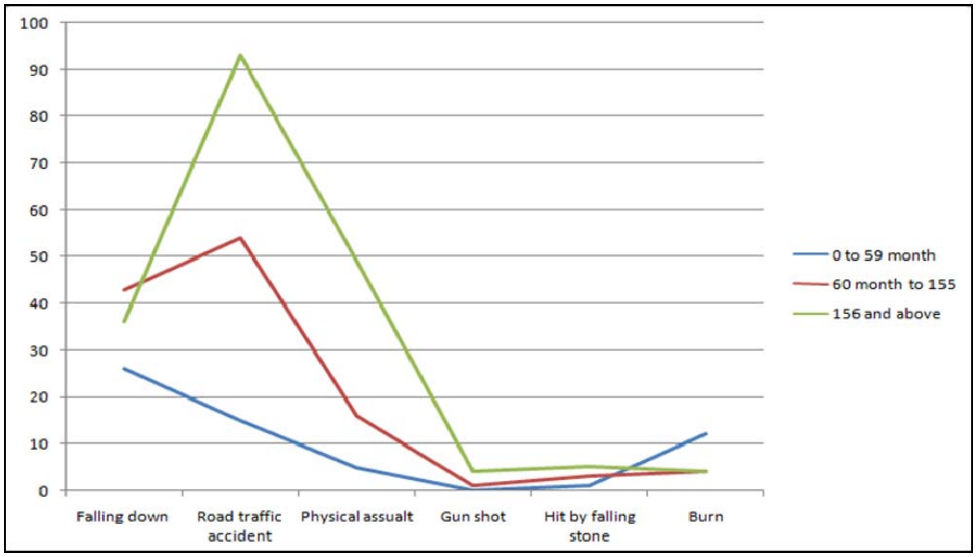

Figure 1 : Injury type by age category at Aabet

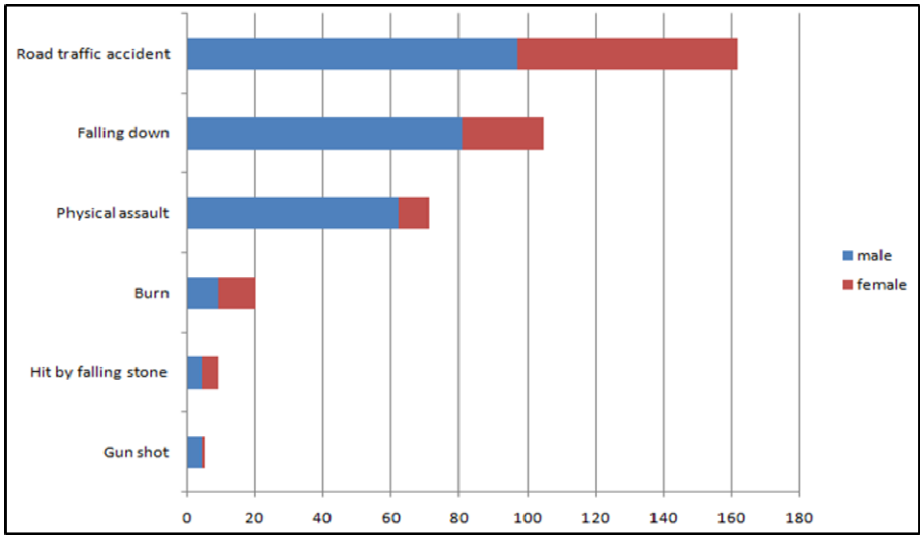

Figure 2: Distribution of mechanism of injury by sex of the pa

Most patients had isolated injuries, only 3% had multiple injuries. The site of Injuries was head injury 101 (25%), extremity 113 (28%), and abdominal134 (33%).

Of the patients with head injuries, the severe head injury with GCs < 8 was five (4.9%) of all injuries that occurred (Table 3).

Table 3: Trauma severity using disposition from the emergency room

Characteristic		Disposed At Home		Disposed not home	Crude OR (95% CI)	Adjusted OR (95% CI)
Age (in years)	< 5	50		14	0.84(0.43,1.65)	0.98(0.45-2.11)
	5-11	87		51	1.76(1.1,2.8)	1.91(1.12-3.24) *
	12-18	153		51	1	
Region	Addis Ababa	165		36	0.53 (0.31,0.89)	0.52(0.31,0.89)*
	Out of Addis	126		80	1	
Prehospital care given	yes	15		10	1.74 (0.75, 3.98)	1.28(0.52-3.17)
	no	276		106	1	
Mode of transport	Ambulance		65	42	1.97(1.24,3.13)*	1.5(0.88,2.55)
	Non Ambulance		226	74	1	
Mechanism of Injury	Road traffic accident		128	34	0.35(0.19,0.643)*	0.31 (0.16,0.61)
	fall		81	26	0.42(0.22,0.81)*	0 .38 (0.19, 0.79)
	Physical assault		44	27	0.80(0.41,1.59)	0 .58 (0.27 ,1.26)
	Other		38	29	1	
Time of arrival from injury to ED in hrs	< 24		208	63	0.47(0.3,0.74)**	0.63(0.36,1.05)
	>24		83	53	1	
Presence of Head injury	yes		55	46	2.82(1.76,4.53)*	1.819(1.06,3.12) *
	No		236	70	1	
Presence of poly-trauma	No		285	109	1	
	yes		6	7	0.33(0.12,0.99)	0.27 (0.08,0.92)

* is less than 0.5 % of significance

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Computed tomography (CT) scan were performed in 47 patients with head injuries. While 17(36.2%) of the scans were negative, the majority showed a variety of injuries epidural hematoma (21%), subdural hematoma (8%), diffuse axonal injury, (11%) depressed skull fracture (19%), and brain contusion (4%).

Overall, 291 (71.5%) of patients were discharged and 115 (28.2 %) were admitted, with 1(0.2%) patients died in the emergency unit (Table 2). The patient's arrival from distances (out of Addis Ababa), ages between 5 to 12 years [AOR = 1.91, 95% CI (1.12-3.24)] and head injury [AOR= 1.82, 95%CI(1.06, 3.12)] are more likely to be admitted than those who are not (Table 3).Only 212 (52.1%) could be scored for Pediatric trauma severity score because of the absence of pediatric blood pressure measurement and only 5 patients identified with PTS score less than 8.

DISCUSSION

In many low-and middle-income countries (LMICs), children face a greater risk of mortality and disability from injuries than in high-income countries. It is important to understand the local epidemiology of injuries to target interventions with the most impact. Despite the high burden of injuries, little data is describing the epidemiology of injuries in Ethiopian children (15). This study further characterizes the pattern of traumatic injuries for children in Ethiopia seen at a tertiary referral hospital.

The most common cause of injury in this study was road traffic accidents accounting for almost 40%. Although RTA is the most common mechanism in other African settings (16), there has been conflicting data in Ethiopia (11,15). RTAs are the most important cause of injury-related deaths in Ethiopian children using survey data with projection estimates (12). Other studies have shown that falls were the most frequent cause of injury (11,15). Wolde, et al examined visits to all health facilities in the Addis health bureau in one year and found that falls accounted for the most injuries in children (17).

While falls may account for a significant number of visits to health facilities, our data, from a tertiary referral hospital, and the data of Li et al suggest that RTA account for more mortality and long term morbidity (18). Mariam, et al found that non RTAs were the most cause of injury in children visiting an emergency department at Jimma University Hospital in southwest Ethiopia (11). Similarly, a study in Amhara National Regional State also found falls to be the leading cause of injury in children in one month.

However, this study excluded children who were transferred to other hospitals because of injury (15). The difference in our results may be due to the higher traffic burden in Addis Ababa compared to these settings and the fact that many patients were transferred from other hospitals to AaBET because of the nature of their injuries and need for more advanced care. In our study, the majority of RTA in children (80%) were pedestrian injuries. This is similar to a previous study from Tikur Anbessa Hospital in Addis, in which 71% of RTA seen in the emergency department were pedestrian injuries (19). It is also similar to the burden of RTA pedestrian injuries reported in other LMIC settings (8,20-21).

Falls were the second most common injury in children in our study, and the most common cause for those between 5-13 . This has been shown globaly [22] and in African countries (8,20) and in Asia (20). The majority of the fall injuries were in males. Most of these falls occurred in home setting .This is similar to previous studies from Mozambique and Malawi (8,23). The age distribution also is in keeping with previous studies on falls (24) .It is the primary reason for an emergency visit and the second leading cause of unintentional injury death globally following road traffic injuries (7).

The predominance of boys in trauma presentation was seen in this study. This remains consistent with reports from Malawi and Mozambique (8,23). Road traffic injury steadily increased across increasing age groups in our study. This is also consistent with WHO and UNICEF joint reports on children and road traffic injury showed a similar increment until the age of 18 years (1). Falls have had a decrement as the age progressed especially in adolescents. This again is not unusual considering childhood years especially in the preschool phase have higher motility but underdeveloped judgment. This is also evidenced by Perez-Suarez *et al* on fall from height in pediatric population reporting preschool children covering 51% of the incidence while adolescents covered 21% (25).

Only 6.1% of patients in our study had some sort of prehospital care and transportation by ambulance was low only 26%. This is quite low even when compared to another study in Ethiopian by Meskere et al, which showed 16.7% of adult patients study in Tikur Anbessa hospital which is the same city of our study (26).

Both studies conducted here show alarmingly low coverage of prehospital services. This is also similar to the Mozambique study (8). A significant number of patients in our study presented to the hospital for more than 24 hours after the injury. These delays are common especially seen in LMIC (8,27). Delays in arrival to the emergency department and initiation in treatment can have impacts on prognosis and outcomes. Similarly, many of our patients were transferred from outside facilities, often without the initiation of treatment.

These transfers with a lack of initiation of treatment at primary sites again may negatively affect the outcome. The timely transport and an efficient system of prehospital care have been shown to have positive impacts on outcome in developed countries (27,28). Many of the patients transported by ambulance had no interventions performed, including simple measures like placing c-collar. These simple measures may have an impact on morbidity in trauma patients. It is important to help educate our prehospital providers in basic trauma care (28,29)

The majority of patients presented to AaBET hospital were sent home with emergency team involvement alone. This is a common trend across LMIC for example a Southern Indian study showing 56.6% emergency discharge rate, the rate presented in our study is significantly higher (30). Pediatric trauma score had been done only in nearly half of the patients due to the lack of the blood pressure cuff and therefore difficult to measure severity for different variables. Patients who have a head injury and arrival from a longer distance, outside of Addis and children from age 5 to 9 years are more likely to have a severe injury and with more propensity to be admitted. This was an expected outcome as higher mortality attributed to traumatic brain injuries both in prehospital and in-hospital care phases (31,32)

This is a study in a tertiary referral hospital. Such hospital-based studies underestimate the burden of mild to moderate injuries which may be treated in other settings or at home. The death reported in this study will not reflect the actual death. This is because it does not take into account those injuries that were treated those who died at the scene. Other limitations of this study include incomplete availability of resources made it not to do pediatric trauma score. The study also doesn't cover all seasons. Despite these limitations, our study highlights the importance of continuing surveillance to understand mechanisms of injury in Ethiopian children and target interventions to address both risk and prevention as well as improving treatment for these injuries.

Conclusions

The most frequent mechanisms of injury presenting to the AaBET Hospital were road traffic injury, falls, and physical assault. RTI is being the comments and occurs mostly in pedestrians. There was a low pre-hospital care service. Overall, these results show that there is a need to continue to improve injury surveillance for injury prevention programs as well as improve immediate emergency care services.

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Authors' contribution

TB brought the idea and wrote the proposal, entered the data and did the analysis, wrote the manuscript. JS: helped in proposal writing, helped in data presentation and in writing the final manuscript. TG: helped in proposal writing and the data collection . SK: helped in data presentation and final manuscript writing. ND proposal writing, data analysis and final manuscript.

Conflict of interest:

All the authors have reviewed these manuscript and do not have a competing interest.

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