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Original Article

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Predictors of unintentional childhood injuries seen at the Accident and Emergency Units of three tertiary health care centres in Jos

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ABSTRACT

Background: Unintentional childhood injuries pose a major health challenge especially in developing countries. **Aim:** This study sought to determine the predictors of unintentional childhood injuries in the three tertiary health centres studied. **Methods:** The study was a cross-sectional study. Socio-demographic data, history and physical examination, type of injury and the outcomes were obtained using structured questionnaire. **Results:** A total of 174 children were enrolled, 108 (62.1%) were males and 66 (37.9%) were females; 63 (36.2%) were < 5years while 65 (37.4%) were >10 years. Of the injuries observed; 99 (56.9%) were by vehicular objects, 15 (8.6%) were burns, 41 (23.6%) were from falls and 19 (10.9%) poisoning. Those who were treated as outpatients were 141 (81.0%) and 25 (14.4%) were admitted for inpatient care. About ninety four percent (94.3%) of the children had no significant effect or disability, 3.4% had short-term disability while 2.3% had long term disabilities or died post-injury. There was no statistically significant relationship between the age of the subjects, gender, duration of the injury prior to presentation and the educational status of their care givers with the pattern of the injury. **Conclusion:** This study showed that 81% (141) of the children studied were treated as outpatients, 56.9% were by vehicular objects, 62.1% were in males and the pattern of injuries were not related to age, gender, educational status of care givers, place or time of injuries. There is need to incorporate these findings in the provision of preventive messages in school health services and in the interventions targeting the safety of children against injuries. Further studies to identify risk factors and plan necessary interventions will also be necessary.

Key words: Predictors, unintentional, childhood injuries, emergency departments, out-patient, tertiary health centres

INTRODUCTION

Childhood injuries are of concern globally because every child in the world matters.^[1,2] Child injuries are a growing public health and

development issue globally that requires urgent attention as they pose a major public health challenge.^[1,2] They form a significant area of concern from the age of one year and



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progressively contributes more to overall rates of death until children reach adulthood.^[1]

Over 875,000 children less than 18 years of age die annually in the world as a result of injuries.^[2] Eighty percent of these occur in low and middle-income countries (LMIC).^[2] Injuries account for 13% of the total burden of morbidity among children ≤ 15 years of age.^[3] All over the world, hundreds of thousands of children die each year from injuries or violence, and millions of others suffer the consequences of non-fatal injuries.^[1]

This study uses the definition of a child specified in the convention on the rights of the child and thus focuses on injuries occurring in children under the age of 18 years.^[1,4] Injuries are traditionally grouped according to two broad categories; intentional and unintentional.^[1] Conventionally, intentional injuries are comprised of interpersonal violence (stabbing, gun-shot wounds, assaults, gang violence and child abuse), self-inflicted injuries like attempted and completed suicides.^[1]

Motor vehicle injuries, burns, falls, drowning, poisoning and other injury classifications in which intentionality is understood to be absent constitute the broad unintentional injuries category.^[1,5] Unintentional injuries among children are a major and largely preventable cause of death and disability. Existing studies indicate that unintentional injury rates are significantly higher in Low and Middle In-come (LMIC) compared to High In-come countries (HIC).^[1,6]

A report from the United States revealed that an average of 33 children die each day and 12,000 a year from unintentional injuries.^[1] Burns, drowning, poisonings and road traffic injuries are the causes of most of these deaths with falls, suffocations and other injuries accounting for the remainder.^[1,3,7]

Unintentional injuries are one of the leading causes of death, hospitalization and disability across the world accounting for almost 90% of injuries.^[1] However, the pattern and aetiology of injuries and their outcome vary substantially within populations and across countries.^[1]

In Africa, regional figures showed that in children aged 5-14 years, injuries account for 23% of deaths with road traffic injuries predominantly among pedestrians as leading causes.^[1,8]

Although, children deaths due to violence and wars in the region are almost as numerous as childhood deaths from such causes in the rest of the world combined.^[8]

Overall, boys are at an increased risk of injury than girls, possibly because boys are more likely to engage in risky behaviour than girls.^[1] Millions of children throughout the world live on the street and are vulnerable to a myriad of hazards including violence and unintentional injuries.^[1,9] This study set out to establish the predictors of unintentional injuries in the children studied.

METHODOLOGY

The study was conducted at the emergency units of three tertiary health care centres in Jos; Plateau State Specialist Hospital (PSSH), Our Lady of Apostolic Hospital (OLA) and Bingham University Teaching Hospital (BHUTH).

Plateau State Specialist Hospital has a bed capacity of one hundred and sixty, Our Lady of Apostolic Hospital has one hundred and two and Bingham University Teaching Hospital has two hundred. They all have Surgical, Medical, Amenity, Intensive Care Unit and Paediatric wards besides the Accident and Emergency, Emergency Paediatric Unit and the General Out-Patient Department. They all provide healthcare mainly for patients from Plateau state and the neighbouring states. The facilities also run Family Medicine residency programmes as well as comprehensive HIV/AIDS care. The facilities were chosen due to their proximity and easy accessibility to inhabitants of Jos. They all provide secondary and tertiary health care to majority of the state populace.

Approval to conduct the study was obtained from the Ethical and Research committees of the three institutions. Informed consent was obtained from the patient's caregivers or parents that met the inclusion criteria.

Patients presenting at the emergency units with unintentional injuries and who met the inclusion criteria were enrolled into the study.

Inclusion criteria

All children less than 18 years seen at the emergency departments with unintentional injuries after parental consent were obtained from legally acceptable representatives (guardians).

Exclusion criteria

1. All children with intention injuries perpetrated by others (stabbing, gunshot wounds, burns resulting from civil unrest and other physical violence or sexual abuse).
2. Self-inflicted injuries or injury related to drugs or alcohol.
3. Patients older than 18 years
4. Children with no consent given.

The sample size was calculated using the formula^[10]

$$N = \frac{Z^2 PQ}{D^2}$$

Where

- N = Minimum sample size
 Z = Level of confidence (the standard normal deviation usually set at 1.96 which corresponds to the 95% confidence interval).
 P = Prevalence of unintentional childhood injuries in low and middle income Countries (LMIC) of 13%.^[3]
 Q = 1-P
 D = Degree of accuracy desired
 95% = 0.05

Therefore

$$N = \frac{(1.96)^2 \times 0.13 \times (1 - 0.13)}{(0.05)^2}$$

$$= 174$$

Therefore sample size = 174

There was no attrition because the questionnaires were pre-tested and research assistants used to avoid missed data.

On the average, PSSH sees a total of twenty five (25) children with unintentional injuries in a month while BHUTH sees fifteen (15) and OLA ten (10). Therefore over 4 months, PSSH was estimated to see one hundred patients with unintentional injuries, BHUTH sixty and OLA forty giving a total of two hundred patients.

A. Proper sampling for number of patients enrolled per site was calculated using $(n_1)^{[10]}$
 $\frac{\text{Number over 4 month (n)} \times \text{sample size (S)}}{\text{Total number from all sites (N)}}$

Using the above formula, the number of patients enrolled from PSSH was eighty seven, BHUTH fifty two and OLA thirty five.

B. Sampling interval to avoid bias was a ratio of actual number of patients to the average number over the 4 months of collection i.e 174:200 giving a ratio of 1:1.

$$\text{Sampling interval (f)} = \frac{\text{Sample size (n)}}{\text{Total number from all sites}}$$

Sampling interval (f) is the probability of an individual being selected for the sample and it takes care of bias.

The International Classification of External Causes of Injuries (ICECI) was adapted with slight modification to fit into the study. The ICECI is a generic instrument that has been used overtime aimed at injury description.^[11]

Demographic data and injury description was obtained from the parents or legally acceptable representative on the type of injury, time of injury, duration of injury before presentation, how the child was transported to the hospital, state of the child after injury and effect of the injury. A general examination was done for each subject. The specific examination was for location of injury and degree of injury.

The questionnaire was pre-tested before the study using 10% of the total sample size with research assistants in each of the facilities. Eighteen subjects were recruited with six per site for the pre-test. The questionnaires were self administered.

Statistical analysis

EPI-INFO Version 3.51 software was used to analyze the data. The data analyzed was presented in form of tables, percentage, pie-charts and bar charts. Fisher's exact was used to test for statistically significant associations.

RESULTS

Males constituted 62.1% (108) of the patients enrolled while females 37.9% (66). Majority (55.2%) of the patients had pre-primary and primary education. Over eighty nine percent (89.6%) of the mothers/guardians had primary and secondary school education.

The pattern of injuries showed that 41 (23.5%) had falls, 19 (10.9%) had accidental poisoning while 15 (8.6%) had burns.

The patients who presented less than 6 hours after the injury were 94,3% (164), 80 (46.0%) were transported to the hospital using taxis. Over 141 (81.0%) of the patients were treated and discharged. Three (1.7%) of the patients were brought to the hospital unconscious while 98.3% (171) were conscious.

Majority (94.3%) of the patients had no significant effect after the injury, 6 (3.4%) had short-term temporary disability and 4 (2.3%) died.

Table 1: Socio-demographic characteristics of study group

Variables	Frequency	Percentage
Sex		
Female	66	37.9
Male	108	62.1
Total	174	100.0
Age group (year)		
< 5 Years	63	36.2
5 – 10 Years	46	26.4
>10 Years	65	37.4
Total	174	100.0
Mean age	8.94 ± 5.6 years	
Child's level of Education		
None	29	16.7
Pre-Primary	23	13.2
Primary	73	42.0
Secondary	49	28.2
Total	174	100.0
Mother's highest level of Education		
None	8	4.6
Primary	62	35.6
Secondary	94	54.0
Tertiary	10	5.8
Total	174	100.0

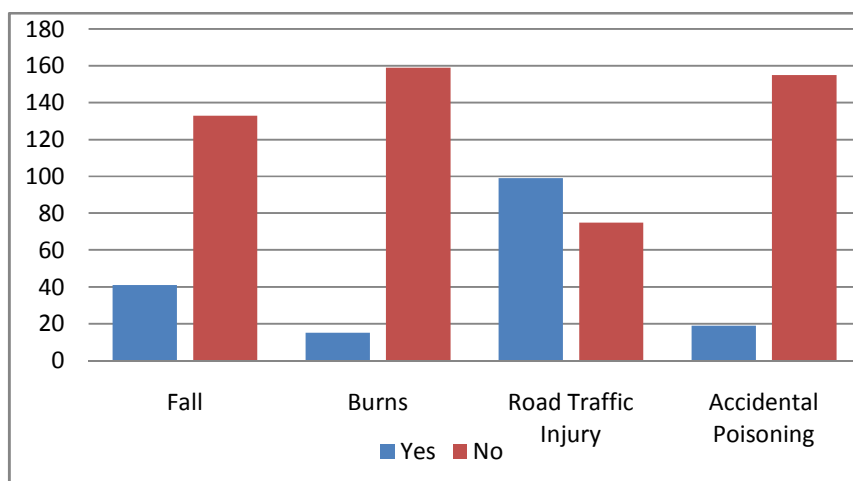


Figure 1: Types of injury sustained by study participants

KEY

Yes - Individuals with specified injuries; No - Individuals with no specified injuries

Table 2: Duration of injury and circumstances surrounding hospital presentation

Duration of Injury	Frequency	Percentage
<6 Hours	164	94.3
6 – 24 hours	6	3.5
1-7 days	2	1.1
>7 day	2	1.1
Total	174	100.0
Means of transportation of the child to the hospital		
Motorcycle	18	10.5
Private Car	76	43.7
Taxi	80	46.0
Total	174	100.0
Who took the child to the hospital		
Driver	1	0.6
Neighbor	56	32.2
Parents	92	52.9
Teachers	21	12.1
Others	4	2.3
Total	174	100.0
State of the Child after Injury		
Admitted into the ward	25	14.4
Admitted for emergency surgery	4	2.3
Treated and discharged	141	81.0
Died in the ward	4	2.3
Total	174	100.0

Table 3: Predictors of pattern of unintentional injuries in study population

	ALIVE	DEAD	TOTAL	P-VALUE
AGE				
<5	62(98.4)	1(1.6)	63(100)	1.00*
5-10	45(97.8)	1(2.2)	46(100)	
>10	63(96.9)	2(3.1)	65(100)	
TOTAL			174	
GENDER				
FEMALE	64(97.0)	2(3.0)	66(100)	0.489*
MALE	106(98.1)	2(1.9)	108(100)	
TOTAL	170	4	174	
CARE GIVERS HIGHEST EDUCATIONAL QUALIFICATION				
NONE	8(100)	0(0)	8(100)	0.7747*
PRIMARY	60(98.8)	2(1.2)	62(100)	
SECONDARY	92(97.9)	2(2.1)	94(100)	
TERTIARY	10(100)	0(0)	10(100)	
TOTAL	170	40		
PLACE OF INJURY				
HOME	45(100)	0(0)	45(100)	0.3836*
ROAD	95(96)	4(4)	99(100)	
SCHOOL	29(100)	0(0)	29(100)	
OTHERS	1(100)	0(0)	1(100)	
TOTAL	170	4	174	
TIME OF INJURY				
MORNING	47(100)	0(0)	47(100)	0.2249*
AFTERNOON	68(94.4)	4(5.6)	72(100)	
EVENING	35(100)	0(0)	35(100)	
NIGHT	20(100)	0(0)	20(100)	
Total	170	4	170	

DISCUSSION

The focus of this study was to find out the common childhood injuries, causes and predictors of the pattern of the injuries. This study shows that majority of the children (72.6%) were between 1-10 years of age with a mean age of 8.94±5.6 years which is in agreement with reported studies worldwide.^[1] This study also showed that the prevalence of unintentional childhood injuries is higher in males (62.5%) than in females and the gender difference was particularly evident among older children. This may be because of increased frequency of injury among boys.^[1] Boys are at an increased risk of injury than girls, possibly because boys are more adventurous than girls.^[1] Another reason for the increased male frequency could be due to preference given to male sex in our localities or risk seeking behaviour.^[1,11] Most of the injuries as observed from the findings of this study occurred in pre-primary and primary school aged children, possibly because of increased activities, use of the roads with poorly developed sense of safety precautions, poor supervision by adults and the fact that the study was conducted during the day time when most children are in school and engaging in high energy activities.^[1,9,11,12,13]

Several studies have linked prevalence of childhood injuries to poor maternal level of education and socio-economic status.^[1,11,12] In this study, 89.6% of the mother's had primary and secondary education but there was no significant relationship between prevalence and outcome of injury statistically.

The commonest childhood injury is RTI which accounted for 56.9% followed by fall 23.6%, poisoning 10.9% and burns 8.6%. Previous studies on unintentional childhood injuries reported a similar incidence in developing countries.^[1,11] The reported high incidence of RTI in this study and other developing countries is due to increase in traffic flow, faulty vehicles plying our roads, poor road network, children living in residential houses close to roads, driving under the influence of alcohol or peer group pressure, poor use and observance of road signs and safety measures, increasing use of vehicular and motorcycle transport by younger ages and adolescents.^[1,11] Ninety four percent (94.3%) of the children presented <6 hours after the injury to the

hospital, 3.5% between 6-24 hours post-injury, 1.1% between 1-7 days and >7 days. This is similar to report from other developing and developed countries.^[1,11,12]

Forty six percent of the patients were transported to the hospital after the injury using taxi, 43.7% using private cars while 10.3% were by motorcycle. This is similar to reports from other developing countries where 33% arrived at the emergency department by taxi and 28% by private cars and a lesser proportion by ambulances.^[11] There was no use of ambulance in this study due to the challenges in our environment and poorly-structured emergency services and response as well as inadequate manpower and training on emergency response to injuries. This is in contrast to the well-equipped and organized response seen in developed countries.^[1,3,14]

Our findings revealed that 81% of the injured children were treated and discharged home, 1.4% were admitted into the ward, 2.3% had emergency surgeries while 2.3% died either at the site of injury or within the hospital. This is similar to prospective study in four LMIC where majority of injured children were treated and discharged home, but about one-third were admitted to the hospital while seventy one (4.6%) required emergency surgery.^[11]

Ninety four percent (94.3%) of the children had no significant effect or disability. 3.4% were expected to have short-term effects while 2.3% had permanent effects or died post-injury. This is similar to reports from GCUI and other developing countries compared to developed.^[1,11] Ninety seven percent (97.7%) were alive while 2.3% died. The major cause of death in this study was from RTI similar to the GCUI study.^[11]

Ninety eight percent (98.3%) of the children were conscious on presentation while 1.7% were unconscious. This is similar to reports from developing and developed countries because of accessibility to health facilities and prompt response.^[1,11]

Seventy three percent (73.3%) of the children who had burns presented with <5% degree of burns, 20% had between 5-10% and 6.7% >10%. Specific locations of the burns were 53.3%

affecting the abdomen, 26.7% the trunk, 13.3% the limbs and 6.7% the scalp. There are however, few studies that describe common site of burns. Scald burns most of the time affect the trunk and extremities while contact burns the hands and electrical the mouth and lips when children put electrical cables in their mouth.^[1,15,16] Of the total number of children with injuries other than burns, 68.6% of the children had injury to the limbs, 24.5% the trunk, 3.8% the abdomen and 3.1 the scalp.

For children who had injuries, 69.2% had bruises, 27.7% had laceration, 2.5% had fracture and 0.6% had perforated viscus. The commonest parts of the body affected in childhood road traffic collisions are the head and limbs. The severity of the injury will vary depending on the child's age, type of road user and whether protective devices like helmets were used.^[1,11] WHO conducted a school based survey among children between 13-15 years of age in 26 countries.^[1,17] The outcome of the survey was that for children reporting an injury involving motor vehicle in the previous 12 months, 10% sustained minor head injuries while 37% had fractured limbs.^[1,17] Although head and limbs injuries were common, chest and abdominal did occur with serious consequences due to organ involvement.^[18]

In this study there was no statistically significant relationship between age and outcome of injury. Childhood mortality in the GCUI study was from fall with children <1 year more at risk of long-term disability and dead meaning the relationship was statistically significant.^[1,11] According to the survey, the rate of permanent disability resulting from road traffic injuries among children 1-17years of age was 20 per 100,000 children.^[1,11]

In this study there was no statistically significant relationship between sex and severity of injury. This is similar to studies from other parts of the world because sex does not determine severity of injury but is a common factor in determining types of injuries and gender relationship.^[1,11]

From this study, 70.7% of falls occurred in males. This is similar to studies from other parts of the world.^[1] Males are more at risk of childhood mortality from falls according to the WHO 2004 report and that among 70 member states.^[1,12,19,20] Sixty six percent of falls resulted

from a height while 8% resulted from falls on the same level.^[1,12,19,20]

In this study, 60% of burns occurred in females. This is similar to other childhood studies on burns. Burns are the only unintentional injury where females dominate or have a higher rate.^[1,11] The fire related death rate is 4.9 per 100,000 in females compared with 3.0 per 100,000 in boys.^[1] However in the GCUI study, children of both genders were similarly affected and 52% were <5 years of age.^[1,11]

In this study, 57.9% of accidental poisoning occurred in females. In contrast, several studies on childhood poisoning showed male predominance.^[1,11] In developing countries, children 1-4 years of age comprise the largest group of poisoning victims (56%) and males were most commonly involved (65%).^[1,11]

This study documents no case of drowning probably due to under-reporting as most of the victims die before they are rescued while others might be taken to other health facilities for emergency care. In a retrospective review of in-patient records of cases of childhood drowning and near drowning, a total of seven cases were admitted during the period. Five (71.43%) were males and two (28.57%) females.^[22] Several other studies show male dominance as victims of drowning and younger age group.^[1,13,21,22,23]

CONCLUSION

In this study, 62.1% of childhood injuries occurred in males, 56.9% were by vehicular objects and 81% of these children were treated as outpatients. The patterns of injuries were not related to age, gender, and educational status of care givers, place or time of injuries. There is need to incorporate these findings in the provision of preventive messages in school health services and in the interventions targeting the safety of children against injuries. Further studies to identify risk factors and plan necessary interventions will also be necessary.

There is need for policy makers to integrate child injury into child survival programmes, develop and implement child injury prevention policies, strengthen health systems to address child injuries, fund research on the causes, consequences, costs and prevention of child injuries. There is also need for community

awareness on prevention of childhood injuries both in and outside the home environment.

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