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Research Article

Childhood Road Traffic Injuries in Enugu, Nigeria: Pattern, Management and Outcome -

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ABSTRACT

Background: Injury resulting from road traffic crashes is a growing global public health problem and a cause of death and disability in pediatric population. The purpose of this study was to determine the incidence and pattern of road traffic injuries in Enugu, south east Nigeria.

Methods: This was a retrospective study of children below 15 years of age who were treated for road traffic injuries over a 5-year period at a teaching hospital in Enugu, Nigeria. Medical records of the patients were reviewed for demographics, nature of injury, interval between incident and presentation, interval between presentation and treatment, mechanism of injury, hemodynamic status at presentation, investigations done, definitive operative procedure performed, post-operative complications and outcome of treatment.

Results: A total of 96 pediatric road traffic injuries were treated during the study period which accounted for 7.1% of all pediatric injuries. There was male predominance and the age range of the patients was 4 years to 14 years with a median 9 years. Fractures were the most common injuries sustained and pedestrians were the most affected. One-quarter of the patients presented in shock and all the patients had x rays and abdominal ultrasound. Non-operative treatment was the predominant modality of treatment and surgical site infection was the most common post-operative complication. Mortality occurred in 9 (9.4%) patients.

Conclusion: Road traffic injury is becoming an increasing medical problem in developing country like Nigeria. More awareness should be created. Road injuries can be prevented in children through good parental control, improved awareness and implementation of safety measures.

Keywords: Children; Enugu; Injury; Road; Traffic; Pedestrian

INTRODUCTION

Road traffic injuries are a significant concern and continue to rise, especially in the adult population. However this is also concerned the pediatric population. The mechanism of injury, although similar in both groups, may result in road traffic injuries in the pediatric population for different etiologies. Head injuries, chest injuries, abdominopelvic and musculoskeletal injuries may be affected by road traffic injuries. Road Traffic Injuries (RTI) are a growing global public health concern and a cause of death and disability in the pediatric population [1]. Children are exposed to hazards as they grow and expand their world beyond their homes; the needs of children are not put into consideration during road network construction [2]. Children not only use the roads as pedestrians, bicyclists and vehicle occupants but they also live close to, play and sell products on these roads. These increase their susceptibility to RTI.

In developed countries, such as the United States of America, where there is reliable data, about 1.5 million pediatric road traumas occur annually resulting in 15,000 mortalities [3]. This type of data is not readily available in the developing world, specifically in Sub-Saharan Africa. In developing countries, there are few data on RTI involving children. Even where the data are available, they are underreported. Injuries may result in physical, mental or psychological disabilities which adversely affect the quality of life of children as well as their parents/caregivers [2]. There are proven ways to reduce the likelihood and severity of injury. However, awareness of the problem and its prevention is still very low. For the purposes of this study, RTI is defined as fatal or non-fatal injury incurred as a result of a collision that occurred on a road and involving at least one moving object [4]. Road traffic fatality is defined as death occurring within 30 days of a RTI [5]. The clinical presentation of children who sustained RTI varies widely and may depend on the time of presentation and part of the body that is injured. Treatment of injured children may be multidisciplinary depending on the body systems that are affected.

Little is known about road traffic injuries in Enugu, Nigeria. The purpose of our study was to determine the incidence and the mechanism of injury in pediatric RTIs in Enugu, South Eastern Nigeria.

MATERIALS AND METHODS

This was a retrospective study of children below 15 years of age who were treated for road traffic injuries between January 2014 and December 2018 at the pediatric surgery unit of Enugu State University Teaching Hospital (ESUTH) Enugu, Nigeria. Patients with incomplete medical records, those who were brought dead and those older than 15 years were excluded from the study. Ethical approval was obtained from the ethics and research committee of ESUTH. ESUTH is a tertiary hospital located in Enugu, South East Nigeria. The hospital serves the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km². The hospital also receives referrals from its neighboring states.

Preoperative protocol

On presentation at the accident and emergency unit of the hospital, the patients were clinically evaluated using the Advanced Trauma Life Support (ATLS) protocol. Resuscitation and stabilization was achieved by the use of intravenous fluids, parenteral antibiotics and blood transfusions. Urethral catheter was passed to monitor urine output which reflects the degree of tissue perfusion. Tetanus prophylaxis is given to patients with open wounds. Appropriate investigations such as x rays, ultrasound, computed tomography scan, hematological and biochemical tests were performed based shifting on findings on clinical evaluation. Patients who require surgery were optimized prior to shifting to the operating theatre.

Intra-operative protocol

The operative procedure performed depended on the nature of the injury. For instance, children with severe or penetrating abdominal injury had laparotomy with repair or excision of damaged organs. Other injuries were treated by the appropriate specialties.

Post-operative protocol

Intravenous fluids, parenteral antibiotics and analgesics were continued until bowel function returned and patient could be fed orally. Discharge was determined by the different specialties based on the injuries they treated. For children who had abdominal trauma,



criteria for discharge were based on establishment of full oral intake and adequate wound healing.

Data collection and analysis

Data were extracted from the medical records, operation notes, operation register, and admission-discharge records. The information obtained included age, gender, nature of injury, interval between incident and presentation, interval between presentation and treatment, mechanism (etiology) of injury, hemodynamic status, vital signs, Glasgow coma scale, injury severity score, pediatric trauma score, investigations done, definitive operative procedure performed, post-operative complications, duration of hospital stay and outcome of treatment.

Statistical Package for Social Science (SPSS) version 21, manufactured by IBM Corporation Chicago Illinois, was used for data entry and analysis. Data were expressed as percentage, median, mean and range.

RESULTS

Patients' demographics

There were 107 cases of pediatric road traffic injuries recorded during the study period but only 96 cases had complete case records and formed the basis of this report. All pediatric injuries recorded during the study period were 1352 cases. This gave an incidence of pediatric road traffic injuries of 7.1%. Detail of the demographics is shown in table 1.

Nature of injury

The injury sustained by the patients is depicted in table 2.

Mechanism of injury

The etiology of injury occurrence is shown in table 3.

Hemodynamic status of the patients at presentation

Twenty three (24%) patients were hemodynamically unstable at presentation while 73 (76%) were hemodynamically stable.

Vital signs, Glasgow coma scale, Injury severity scale, Pediatric trauma scale

These are shown in table 4.

Investigations

Hematological investigations: All the patients had full blood count and serum electrolyte. Twenty one (21.9%) patients had a hemoglobin level of less than 10 grams per deciliter at presentation and required blood transfusion. Serum electrolytes particularly potassium were found to be deranged in 4 (4.2%) patients.

Imaging investigation: All the patients had x rays and abdominal ultrasound. Computed Tomography (CT) scan was performed in 31 (32.3%) patients. Magnetic resonance imaging was not done in any of the patients.

Treatment offered

Forty seven (49%) patients were managed non-operatively while 49 (51%) patients had one surgery or another depending on the injury sustained. For the intra-abdominal injuries, the spleen was the most injured organ, followed by the liver. The injured intra-abdominal organs were repaired, none was removed.

Table 1: Demographic profile of the patients.

Gender	
Male	71 (74%)
Female	25 (26%)
Age range	4 years to 14 years (median 9 years)
Interval from incident to presentation	2 to 7 days (median 4 days)
Interval from presentation to treatment	1 to 3 days (median 2 days)
Mean duration of hospitalization	13 days (range 8-22)

Table 2: Distribution of the injuries (n = 96).

Type of injury	Number	Percentage
Fractures	32	33.3
Lower limb	10	10.4
Upper limb	7	7.3
Skull/maxillofacial	6	6.3
Clavicular/rib	5	5.2
Pelvic	4	4.2
Intracranial injuries	28	29.2
Epidural hemorrhage	8	8.3
Subdural hemorrhage	8	8.3
Intracerebral hemorrhage	8	8.3
Subarachnoid hemorrhage	4	4.2
Thoracic injuries	20	20.8
Hemothorax	7	7.3
Pneumothorax	6	6.3
Pneumohemothorax	5	5.2
Diaphragmatic	2	2.1
Lacerations/soft tissue injuries	10	10.4
Intra-abdominal injuries	6	6.3
Spleen	4	4.2

Table 3: Mechanism of injury.

Mechanism of injury	Number of patients (%)
Pedestrians	46 (47.9)
Bicyclist	23 (24)
Motorcyclist	16 (16.7)
Vehicle	
Passenger	10 (10.4)
Driver	1 (1.0)

All the unstable patients (24%) and the patients with head injury (29.2%) were resuscitated and monitored in the intensive care unit (ICU) and taken to theatre if indicated from the ICU.

Post-operative complications

Surgical site infection was the most common complication and this occurred in 12 (12.5%) patients. Other complications were anemia in 5 (5.2%) patients, fracture malunion/nonunion in 4 (4.2%) patients and tetanus in 1 (1%) patient.

Outcome

Eighty seven (90.6%) patients recovered and were discharged



Table 4: Vital signs, Mean Glasgow coma scale, Injury severity scale, Pediatric trauma score.

Parameters assessed	Number of patients (%)
Vital signs	
Unstable	23 (24)
Stable	73 (76)
Glasgow coma scale	
1-4	48 (50)
5-8	28 (29.2)
> 9	20 (20.8)
Injury Severity Score	
1-8 (minor)	20 (20.8)
9-15 (moderate)	38 (39.6)
16-24 (serious)	18 (18.8)
25-49 (severe)	15 (15.6)
50-74 (critical)	5 (5.2)
75 and above	0 (0)
Pediatric Trauma Score	
9-12 (Minor trauma)	10 (10.4)
6-8 (Potentially life threatening)	67 (69.8)
0-5 (Life threatening)	10 (10.4)
< 0 (Usually fatal)	9 (9.4)

home. Five (5.2%) patients expired due to overwhelming sepsis and 4 (4.2%) patients had head injuries.

DISCUSSION

Children have a right to a safe environment and to protection from injury. Every child's life matters. The injuries suffered by children vary from place to place due to physical, social, cultural, political and economic differences [2]. Road traffic injuries in children differ widely from minor whiplash to fatal injuries [4]. The World Health Organization has categorized road traffic injury as the ninth leading contribution to the burden of disease and tenth leading cause of all death worldwide [6].

In the present study, road traffic injuries accounted for 7.1% of all injuries that happened to children. This finding is consistent with one report from Singapore [7]. However, Thanni, et al. [8] reported an incidence of pediatric road traffic injury of 33%. The wide difference in the incidences of road traffic injury of these studies is difficult to explain although the nature of injuries considered by the studies such as pedestrian or motor vehicle injuries may be responsible. The male dominance recorded in the present study is consistent with the report of other series on pediatric road traffic injuries [9,10]. The reason for male predominance may be due to the impulsive and risky behavior of boys that keeps them outdoors [9]. The median age of our patient is similar to the reports of other authors [1,9]. However, Simon et al reported a median age of 5 years [11]. The predominant mechanism of injury may determine the age group mostly affected in road traffic trauma. For instance, infants are unlikely to be involved in bicycle associated injury because infants cannot ride bicycle. Late presentation of the patients is evident in the 4 days lag period before presentation to the hospital. Delayed presentation of patients to the hospital is consistent with poverty and lack of awareness that is quite common in developing countries. Paucity of funds and lack

of well-established health insurance scheme may have accounted for the delay between presentation and treatment. Finance was required to procure drugs and materials required for treatment. The length of hospitalization of our patients is at variance with the report of Rahman, et al. [12]. The length of time children with road traffic injuries stay in hospital may be dependent on the nature (severity) of the injury and the modality of treatment. Operative treatment is associated with long hospital stay.

Fracture was the most common injury recorded in the current study. This is comparable to the report of other researchers [2,13]. However, other authors reported head injury as the most common injury sustained during road traffic accidents [9,11]. Ekenze, et al. [14] reported soft tissue injury such as laceration as the most common injury. The nature of the causative agent and its point of bodily impact may explain the resultant injury.

Children who sustained road traffic injuries in the current study were pedestrians. This finding is consistent with the findings of Behzadnia, et al. and Simon, et al. [9,11]. However, one study from Singapore reported motor vehicle passengers as the most injured group in pediatric road accidents [1]. Another study from China reported bicycle-related road traffic injuries in more than 70% of their patients [15]. The authors reported that cyclists run a higher risk of being injured in road crash due to risky behaviors, low awareness of traffic rules and bicycle riding is hazardous [15].

About one-quarter of our patients were hemodynamically unstable at presentation. This hemodynamic instability was evidenced by tachycardia, tachypnea and hypotension. Shock in children with road traffic injury may result from blood loss (hemorrhage), cardiac injury like cardiac tamponade) or from vaso-vagal stimulation. This number of patients presenting in a clinical state of shock may be a reflection of the severity of the injury or due to late presentation.

Hemoglobin level of less than 10 grams per deciliter was obtained in about one-fifth of our patients. Most children in developing countries have low hemoglobin levels due to malnutrition, infections and infestations [16]. The anemia noticed in these injured children may have been present before the incident or resulted from blood loss following the road traffic injury. Anorexia, nausea and vomiting that follow trauma may be responsible for the deranged electrolytes noticed in 4 of our patients. Radiographs and ultrasound were performed in all patients. Radiograph is part of the trauma series that includes cervical, thoracic, abdominal x rays for evaluation of neck, chest and abdominal injuries respectively [17]. X rays and ultrasound are cheap, affordable and available in most hospitals in low income countries. Unlike x ray and ultrasound, Computed Tomography (CT) scan was done in only a few patients because of cost and risk of radiation exposure which is an important consideration in children.

The definitive treatment rendered to the patients depended on the injury sustained. Supportive (non-operative) treatment was the modality of treatment for non-life threatening injuries that can heal without surgery. A study from Ilesa south west Nigeria reported the predominance of non-operative treatment similar to our finding in the present study [18].

Surgical site infection was the most common complication noted in our patients. Ameh, et al. [19] reported the high rate of surgical site infection in low income countries. The occurrence of surgical site infection following road traffic injuries may be multifactorial involving patient related factors and injury related factors. It is

important to note that one of the patients that sustained a laceration developed tetanus despite receiving anti-tetanus prophylaxis. The reason for this incident could not be explained.

The overall outcome of treatment of our patients who had road traffic injury was good. This is comparable to the report of a similar study from Nigeria [18]. However, no mortality was recorded in one series from a tertiary hospital in Nigeria [18]. The severity of the injury, treatment received, available facility and expertise of the surgeon may have affected outcome.

CONCLUSION

Pediatric road traffic injury is increasingly becoming a cause of morbidity and mortality in a developing country like Nigeria. Pedestrians were mostly affected. More males than females are involved and late presentation is still a problem in our setting. Most road traffic injuries among children in Enugu are preventable using appropriate strategies such as good parental control. With concerted efforts, safety of children in our roads can be achieved.

DECLARATIONS

Ethical considerations

Ethical approval was obtained from ethics and research committee of the hospital.

Availability of data

Data is available with corresponding author and can be provided on request.

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