Nigerian Journal of Paediatrics 2003; 30(3)86-92

Causes, Patterns and Outcome of Severe Injuries in Children – A Hospital-based Study

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Summary

Oyedeji GA, Oyedeji AO. Causes, Patterns and Outcome of Severe Injuries in Children – A Hospital-based Study *Nigerian Journal of Paediatrics* **2003;30:86**

Background: Injuries are important causes of morbidity and mortality in childhood. There is therefore a need, especially in developing countries, to determine the relative contributions made by injuries singly and in combinations, to childhood morbidity and mortality in hospital practice.

Objectives: To determine the causes, patterns, and outcome of various childhood injuries resulting in hospital admissions over a 15-year period.

Design: Retrospective analysis of hospital records.

Patients and Methods: The case files of all children aged 16 years and below, admitted to the Wesley Guild Hospital, Ilesa, between 1984 and 1998 with burns, poisoning, animal bites and stings, bone, joint, head, soft tissue and other injuries, were analysed and the data on various injury types, compared.

Results: Injuries accounted for 5.1 percent of total paediatric admissions and 5.4 percent of deaths during the study period, with males predominating in every injury type. Fractures, burns, poisoning, soft tissue and head injuries constituted 36.5, 23.4, 13.3, 12.2 and 10.6 percent respectively, of the 1,249 total injuries seen. Motor vehicle accidents and falls were responsible for 85.6 percent of all fractures, soft tissue and head injuries. Hot water caused 52.1 percent of all burns while 36.7 and 24.7 percent respectively, of poisoning were due to kerosene and traditional drug mixtures. Vehicle related injuries constituted a significant percentage of all injuries in the last decade of the review. Duration of hospitalisation was significantly longer for fractures than for any other injury type. Mortality rates were 9.2 and 12.7 percent respectively, for burns and poisoning, both of which accounted for 71.6 percent of deaths due to injuries.

Conclusion: Health promoting and injury preventive interventions should be instituted to reduce the rate of injuries and their effects on children.

Keywords: Injuries, Nigerian children, Causes, Patterns.

Introduction

ACCIDENTS are important causes of childhood morbidity and mortality all over the word.[1-4] Nigeria has experienced recent increase in industrialization and motorisation with attendant increase in the number of accidents. According to a recent report published by a national newspaper, the Federal Road Safety Corps reported increases in road accidents and deaths in Nigeria from previous levels of 5834 accidents and 3012 deaths in the first six months of the year 2000, to 7036 accidents and 4074 deaths in the corresponding period of the following year.

A number of studies have examined childhood injuries from the point of view of the nature of individual injuries[5,6] and their causes.[7-9] The purpose of the present study was to examine the trends in the patterns of injuries responsible for hospital admissions

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over a period of 15 years and the relative importance of individual injuries as causes of childhood morbidity and mortality. The study took place at the Wesley Guild Hospital, Ilesa, which receives patients from a 40-kilometer radius around its location, and is the only public health care facility providing specialist and general paediatric care to the Ijesa population of south western Nigeria.

Materials and Methods

The names and hospital numbers of patients aged 16 years and below, who were admitted to the Wesley Guild Hospital, Ilesa from January 1984 to December 1998, with burns, poisonings, animal bites and stings, bone, joint, head, soft tissue and other injuries, were compiled from the Diseases Diagnostic Index Cards International lists kept in the records department of the hospital. The case notes were retrieved and various data including socio-demographic details, the date, duration and outcome of admission as well as the nature and circumstances of the injuries were obtained from them and analysed. The data was analysed for different injury types separately and the results compared with each other, using summary statistics viz totals and percentages, range, means and standard deviations. The differences in the duration of hospitalization for the different injury types were analysed using chi-squared test and taking $p<0.05$ as the level of statistical significance. In addition, the families were allocated into social classes, based on the fathers' occupations that were grouped as previously described.[10]

Results

One thousand, two hundred and eighty patients were listed, but 51 case notes could not be retrieved; the results shown relate to the 1229 whose notes were available. They comprised 754 males and 475 females; a M:F ratio of 1.6:1. The male to female predominance was seen with every type of injury. One thousand, two hundred and forty nine main injuries were seen in the 1229 patients and these are shown in Table I.

Locations where injuries were sustained

Nine hundred and forty (75.2 percent) of the injuries were sustained in Ilesa township, 92 (7.4 percent) in other Ijesa towns, 141(11.3 percent) in Ijesa villages and hamlets and 76(6.1 percent) in other towns outside the Ijesa area. Thus, 88.7 and 11.3 percent of the injuries occurred in urban and rural settings, respectively.

Social classes of patients in relation to injuries

These are shown in Table II. Six hundred and two (82.5 percent) of 730 injuries for which social classes could be computed, were sustained by patients from the lower social classes III to V; this same pattern held roughly true for the various injury types.

Yearly and monthly admissions

Table III shows the total yearly admissions for the various injuries and the percentages which they constituted, of the total yearly paediatric admissions. It can be seen that these percentages show no consistent trend. Also shown, are the yearly total

Table I

Main Injuries According to Sex

Injury	*Number of Injuries*			
	Male	*Female*	*Total*	*Percentage of 1249*
Fractures	298	158	456	36.5
Burns	169	123	292	23.4
Poisoning	103	63	166	13.3
Soft tissue Injury	96	57	153	12.2
Head Injuries	74	58	132	10.6
Bites and Stings	25	11	36	2.9
Others	08	06	14	1.1
Total*	773	476	1249*	100.0

*The total of 1249 injuries exceed the number of patients because of instances of multiple injuries in some patients.

Table II

Social Classes of Patients with 730 Injuries

	No of Injuries Sustained by Patients in the Various Social Classes					
Injury Type	I	II	III	IV	V	*Total*
Fractures	9	27	86	30	48	200
Burns	16	38	102	30	43	229
Poisoning	5	16	63	18	30	132
Soft tissue injury	1	4	31	8	34	78
Head injury	4	7	28	8	15	62
Bites and Stings	0	0	9	3	8	20
Others	0	1	3	2	3	9
Total	35	93	322	99	181	730*

The social classes are in Roman numerals.
*The fathers' occupations were available for use in deriving social classes in 730 instances

Table III

Yearly Total Paediatric, All Injuries, and Vehicular Accident Related Admissions

Year	*No of Total Paediatric Admissions*	*No of Total Injury Admissions (Percentage of Total Paediatric Admissions)*	*No of Total Vehicular Accident Related Admissions *(Percentage of Total Injury Admissions)*
1984	1386	93 (6.7)	52 (55.9)
1985	2110	86 (4.1)	51 (59.3)
1986	1604	70 (4.4)	29 (41.4)
1987	1825	81 (4.4)	37 (45.7)
1988	1955	115 (5.9)	75 (65.2)
1989	1919	118 (6.1)	69 (58.5)
1990	2054	115 (5.6)	70 (60.9)
1991	1846	82 (4.4)	48 (58.5)
1992	1726	122 (7.1)	72 (59.0)
1993	1247	73 (5.9)	45 (61.6)
1994	1143	51 (4.5)	30 (58.8)
1995	1428	69 (4.8)	47 (68.1)
1996	1422	41 (2.9)	21 (51.2)
1997	1377	62 (4.5)	44 (71.0)
1998	1419	71 (5.0)	51 (71.8)
Total	24461	1249 (5.1)	741 (59.3)

*This is the sum total of fractures, soft tissue and head injuries.

numbers of vehicle-related injuries (fractures, as well as soft tissue and head injuries) and the percentages which they constitute, of total injuries. These latter percentages rose in 1988 and remained relatively high, even rising above 70 in the last two years of the review.

The monthly total injury admissions ranged from 92 to 119 with a mean of 104.1 (SD ± 9.9).

Ages of patients

These are shown in Table IV. There was no age group

Table IV

Ages when Injuries were Sustained

Age Intervals	*No of Injuries Sustained at Various Age Intervals*							
	Fractures	*Burns*	*Poisoning*	*Soft Tissue Injuries*	*Head Injuries*	*Bites and Stings*	*Others*	*Total No of Injuries*
Birth – 5yrs	181	195	149	33	51	6	11	626
Over 5 - 10yrs	185	67	11	71	56	16	2	408
Over 10–16yrs	90	30	6	49	25	14	1	215
Total	456	292	166	153	132	36	14	1249

Table V

Duration of Hospital Stay

Duration of Stay (Days)	*Types and Nos of Injuries*							
	Fractures	*Burns*	*Poisoning*	*Soft Tissue Injuries*	*Head Injuries*	*Bites and Stings*	*Others*	*Total*
1 – 14	268	196	164	118	113	34	10	903
15 – 28	83	71	2	26	13	1	3	199
29 – 42	61	10	0	3	2	0	0	76
43 – 56	25	5	0	2	1	0	0	33
57 – 70	15	6	0	3	1	0	0	25
Over 70	4	4	0	1	2	1	1	13
Total	456	292	166	153	132	36	14	1249

predilection for fractures, soft tissue and other categories of injuries. However, 30 (83.3 percent) cases of animal bites and stings occurred in the school age group of over five to 16 years and 68 (51.5 percent) of the 132 cases of head injuries were sustained in the first eight years of life. On the other hand, 195 (66.8 percent) of burn injuries and 149 (89.6 percent) of poisonings occurred in the preschool age period.

Length of hospital stay

Table V shows the duration of hospital stay. Fractures resulted in more hospitalisation days compared with any of the other injury categories. Thus, 188 (41.2 percent) of the 456 fractures required more than 14 hospitalisation days each, compared with 96 (32.9 percent) for burns [$X^2 = 5.3$, $p<0.05$], 35 (22.9 percent) for soft tissue injury [$X^2 = 16.6$, $p<0.001$], 19 (14.4 percent) for head injury [$X^2 = 32.3$, $p<0.00$], two (5.6 percent) for bites and stings [$X^2 = 17.9$, $p<0.001$], and two (1.2 percent) for poisoning [$X^2 = 91.9$, $p<0.001$].

Details of the Injuries

Bones and Joints

There were 456 fractures; single bones were involved in 398, and multiple bones in 58. The distribution was as follows: 209 (45.8 percent) femur, 86 (18.9 percent) humerus, 21 (4.6 percent) radius, 30 (6.6 percent) radius plus ulna, 28 (6.1 percent) tibia and fibula, 27 (5.9 percent) tibia, 24 (5.3 percent) clavicle, 12 (2.6 percent) skull, and 19 (4.2 percent) of various other bones. There were also five cases of hip and four of shoulder dislocations. Sprains involved two ankles, one neck and one wrist.

Burns

The sites of the 292 burns were the trunk in 151 (51.7 percent) cases, upper limbs in 110 (37.7 percent), lower limbs in 92 (31.5 percent), head and neck area in 64 (21.9 percent) cases, and buttocks and perineum in 40 (13.7 percent). The burns were assessed to be superficial partial thickness in 133 (45.5 percent) cases, deep dermal partial thickness in 79 (27.1 percent) and full thickness in nine (3.1 percent) cases; the thickness was not assessed in the remaining cases. The body surface areas involved were between one and ten percent in 128 (43.8 percent) cases, between ten and 20 percent in 72 (24.7 percent) cases, 20–30 percent in 27 (9.2 percent) cases and over 30 percent in 23 (7.9 percent) cases. The percentage body surface area involved was not recorded in the remaining 42 (14.4 percent) cases.

Soft tissue injuries

There were 153 injuries in this category; 90 (58.8 percent) of them were lacerations, 36 (23.5 percent) abrasions, 22 (14.4 percent) abdominal organ injuries (e.g. splenic rupture), 11 (7.2 percent) bruises, and five (3.3 percent) consisted of severe haemorrhages from open wounds.

Head injuries

Of 132 head injuries, 101 (76.5 percent) were simply recorded as such, without further specification while 19 (14.4 percent) were classified as concussions, five (3.8 percent) as contusions, five as intracranial birth trauma, and two as intracranial bleeding.

Poisonings

There were 166 cases of poisonings. The agents involved were kerosene in 61 (36.7 percent) cases, traditional drug mixtures in 41 (24.7 percent), prescribeable drugs, consisting mainly of aspirin, sedatives and tranquillisers, in 15 (9 percent), gammalin-20 in 14 (8.4 percent), caustic soda in 11 (6.6 percent), and other substances (mushrooms, cassava tubers and household agents) in seven cases.

Other injuries

There were five cases of hypothermia (four in neonates due to exposure and one, in a one-and-a-half year-old child who fell into a well), two other children were abandoned, one was drowned in bath water, one 12-year old was electrocuted, two children swallowed foreign bodies, two inserted them into the ears, while one child had aspiration pneumonia following forced feeding.

Circumstances surrounding or causing the injuries

A majority of fractures, soft tissue and head injuries were due to motor vehicle accidents and falls. Thus, 351 (47.4 percent) of a total of 741 injuries in these three categories were due to motor vehicle accidents. In 322 of the 351 cases, the children were hit directly by the vehicles, the types of which were taxicabs in 78 (24.2 percent) cases, private cars in 73 (22.7 percent), lorries and buses in 32 (9.9 percent), motor cycles in 51 (15.8 percent) cases and unspecified types of vehicles in the remaining 88 (27.3 percent) cases. Most of the children were hit while crossing the road, while the remaining 29 of the 351 accidents were sustained as passengers in the vehicles.

Concerning the 333 injuries following falls, 210 (63.1 percent) children tripped while playing in the fields or on pavements, 48 (14.4 percent) fell from low level heights e.g. benches and beds, 19 (5.7 percent) from stairs, 12 (3.6 percent) from trees and housetops, eight from moving vehicles, and five from swings. This information was not available in 31 cases. The other moving objects which caused injuries included blocks, walls, and ceilings. The category of others included 17 cases of birth trauma, 11 of injuries due to grinding mills, 10 of gunshot wounds, and two with wounds inflicted by cutlasses. There was one case of non-accidental injury.

Burns

Out of a total of 292 burn injuries, 152 (52.1 percent) were due to hot water, 39 (13.4 percent) to open fire, 32 (11 percent) to kerosene, 30 (10.3 percent) to hot food, 16 (5.5 percent) were caused by stove and lantern explosions due to adulterated kerosene, and 13 (4.5 percent) were due to hot oil. Ten were caused by other agents namely: petrol, diesel, electrical and chemical agents. Most of the burns took place in the kitchen area.

Poisoning

The traditional drugs that caused poisoning were usually those administered to prevent or stop convulsions and in the cases of kerosene poisoning, the fuel was usually being kept carelessly in water or soft drink containers. There were four cases of suicidal attempts with gammalin-20, *Esidrex*, diazepam and salicylates by three boys aged 13, 15 and 16 years and one girl aged 16 years, respectively.

Animal bites and stings

There were 33 cases of snake bites, two of dog bites and one of bee sting. Six each, of the snakes were

described as green, black and brown, two other snakes were identified as vipers, while no further description of the rest was documented. Nineteen of the bites were in the lower limbs, and four in the hands; 13 took place on the farm, four around the house and four while hunting for rats.

Outcome

Sixty-seven (5.4 percent) of the 1249 injuries resulted in deaths. These consisted of 21 (12.7 percent) of the 166 poisoning injuries, 27 (9.2 percent) of the 292 burns, six (4.5 percent) of the 132 head injuries, five (3.3 percent) of the 153 soft tissue injuries, five (1.1 percent) of the 456 fractures and three (21.4 percent) of the 14 other injuries. Traditional drug mixtures and burns caused 15 and 24 deaths respectively, and were responsible for 39 (81.3 percent) of the 48 deaths due to burns and poisonings. Twenty six children were discharged against medical advice, 11 transferred to other hospitals while the rest improved, and were discharged home.

Discussion

Injuries were reported in one study to constitute nine percent of all childhood emergency admissions in Nigeria[11] compared with 5.1 percent of total paediatric admissions obtained in the present study. However, hospital-based studies may not reflect the true incidence of injuries in the community. In a community-based study of childhood injuries conducted over a three-month period at Ibadan in 1988, a total of 1286 minor injuries were recorded among 463 children aged, 0–19 years.[12] The present report however, concerns severe injuries requiring hospitalisation. Findings such as in the Ibadan study[12] support the statement that for every fatal accident, there are 45 lesions requiring hospitalisation, 1,300 requiring ambulatory medical treatment in emergency rooms and almost 2,500 lesions of which the health services are not notified.[13]

Since an earlier study[14] in our area had shown that 65 percent of hospitalised children belonged to social classes III to V and 35 percent to I to II, it may be inferred that the finding of 82.5 percent of injuries among social classes III to V indicates a real and not spurious association of injuries with the lower social classes. This suggests the need to concentrate preventive measures on families in these lower classes. Our results have confirmed vehicular accidents and falls as the commonest causes of fractures, soft tissue and head injuries, a pattern previously reported in other studies.[13,15] Concerning motor vehicle accidents, certain factors are noteworthy. Among such factors are the large numbers of motorized vehicles compared with the small number of motorable roads, the state of disrepair of roads and vehicles, the use of motorcycles for commercial purposes and street trading involving children. Other factors include the poor education of drivers and children on the use of roads, inadequate provision and/or use of road safety facilities like traffic lights and wardens, zebra crossings, crash helmets and seat belts in relevant vehicles and poor observation of traffic regulations. Any realistic efforts to reduce childhood morbidity and mortality from road traffic accidents must address these factors. Increases in accident rates have previously been reported in Nigeria,[16] and it is noteworthy that the percentage of total injuries due to motor vehicle related causes rose above 70 in the last two years of our review.

The findings on burns with respect to hot water and foods, flammable liquids and open fire as the main causes and also regarding its depth, surface area and anatomical sites are consistent with those in other studies.[6,15,17] Similarly, our present findings of kerosene and traditional drugs as the main poisons ingested, are largely confirmatory of previous studies.[5,18] That preschool age children have predilection for burns and poisoning injuries and that kerosene is an important cause of both, were striking in this series. Lack of physical and mental maturity and imperfect control of impulses and emotions in young children are among the factors which have been identified as those that trigger accidents.[19] Therefore, education of parents and other child care-givers about the psychomotor and other aspects of the development and behaviour of preschool age children is necessary. This will encourage them to invest in injury preventive actions and facilities appropriate for controlling injuries; for example, careful handling of kerosene.

Ever since 1964 when Atalabi [20] highlighted the dangers of cow's urine poisoning, health education has been identified as the best means of discouraging mothers from using the mixtures for their children. Tradition dies hard however, and cow's urine together with other traditional mixtures have continued to be significant causes of admissions and deaths. There is therefore, a need to change the methods of health education to make parents and child care-givers recognize these traditional mixtures as potential killers. Appropriate health education and counselling may also help to avoid snakebites resulting from acts of misadventure like those of the four children bitten when hunting for rats and another child, while retrieving the cutlass he had earlier thrown at a snake. Other simple measures like keeping the house environments safe and free of bushes and wearing of shoes and carrying torchlights when it is dark, should also be helpful.

Acknowledgements

We wish to thank the staff of the Medical Records Department, Wesley Guild Hospital, Ilesa, Mrs. PF Olubanjo and Mr. Adesina Akinyemi, for their assistance.

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