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Contents

Original Articles

SKELETAL INJURIES IN CHILDREN PRESENTING IN A TERTIARY HEALTH FACILITY IN LAGOS STATE, NIGERIA

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ABSTRACT

BACKGROUND: Injury remains a major health problem for children worldwide. Traumatic injuries cause substantial mortality and morbidity with temporary or permanent disability in children

METHODS: This was a prospective observational hospital based study conducted on all the patients aged 16 years and below who presented in the Accident and Emergency room and at the orthopaedic outpatient clinics in the Lagos University Teaching Hospital (LUTH) with musculoskeletal injuries over a period of fifteen months. All patients who met the inclusion criteria were recruited. Questionnaires were used for data collection. Thorough examination of the injured paediatric patient was done and finding documented in the questionnaire. Fractures of long bones were confirmed in all cases with radiographs. Data obtained was analyzed with Microsoft Excel Starter 2010 by Microsoft Corporation. Redmond, Washington.

RESULTS: The age ranged from 4 day (0.01 year) to 16 year with a mean age of6.35± 4.58. Male to Female ratio was 1.9:1. Road traffic accidents were the leading cause of skeletal injuries (49.2%), followed by falls (27.0%). Fractures associated with birth trauma accounted for 12.7%. Younger children were more prone to injuries from falls. The home environment was the second most common environment for children to sustain fractures, the first being the roads. Majority (58.7%) were from families within the lower socioeconomic class. Ninety five percent (95%) of the children who got injured were without adult supervision while crossing the road. Injuries from road traffic accidents peaked between 3pm and 6pm while injuries resulting from falls peaked between 12 noon and 3pm.The femur was the most commonly fractured bone (21.7%). Green stick fractures occurred in 7.9% of the patients seen. Open fractures were seen in 6.3% of the patients. Physeal injuries occurred in 4.8% of paediatric fractures. Some injured paediatric patients (12.3%) were taken to the traditional bone setters prior to presentation at LUTH with 3(4.7%) of them presenting with gangrene of the affected limb.

CONCLUSION: Road traffic accident remains the commonest cause of fractures in children. However, injuries sustained at the home environment were quite significant. Emphasis on increase supervision and safety practices at home are strongly recommended.

KEY WORDS: Paediatric fracture, limb gangrene, road traffic injuries, mechanism of injury, birth trauma

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INTRODUCTION

Injury remains a major health problem for children worldwide.[1] Traumatic injuries have resulted in substantial mortality or morbidity with temporary or permanent disability in children.[2] It is documented that injuries are common and are on the increase in most developing countries.[3]In sub-Saharan Africa, injuries ranked third behind diarrhoea and malaria as major causes of death in children.[4,5] It is estimated that up to 25% of children are injured every year with the musculoskeletal system being the most frequently injured following trauma.[6,7]Fractures account for up to 25% of childhood injuries with 15 –30% of these involving the growth plate.[8]

Four decades ago (1978) Ebong[9] reported falls as the commonest cause of paediatric musculoskeletal injuries but most of the recent studies reported otherwise. Road traffic accidents are now documented as the commonest cause of paediatric skeletal injuries in Nigeria.[5,6,7]However, falls are noted to be the leading cause of fractures among preschool children in Nigeria.[6]

This study aimed to describe the pattern of presentation of skeletal injuries as seen among the paediatric population presenting in Lagos University Teaching Hospital (LUTH)and the modalities of treatment.

PATIENTS AND METHODS

Study design

The study was a prospective descriptive

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hospital-based study conducted on paediatric patients (aged 16 years and below) with musculoskeletal injuries who presented in Accident and Emergency room and Orthopaedic outpatient clinics in Lagos University Teaching Hospital (LUTH). LUTH is a foremost institution in Nigeria and major referral centre in Lagos state. It is one of the major training, teaching and research centre in the country. It is a 760 bedded hospital with various out-patients clinics and two emergency rooms - Accident and Emergency room and Children Emergency room (CHER). Paediatric trauma patients are usually treated in the accident and emergency room, where this study was carried out. The duration of the study spanned 15 months i.e. from 1st August, 2011 to 31st October, 2012. All paediatric patients involved in trauma who presented within this period and met the inclusion criteria were recruited into the study. .

Inclusion Criteria

1. Any patient aged 16 years and below with skeletal injuries to the limbs and limb girdles presenting in LUTH within 1st August, 2011 and 31st October, 2012.
2. All children aged 16 years and below with skeletal injuries confirmed with X-ray.

Exclusion Criteria

1. Patient who presented with skeletal injuries in LUTH but whose parents discharged against medical advice before the definitive diagnosis could be reached.
2. Those who refuse to give consent.

Sample size

Available data on trauma -related attendance in the emergency room in South-western Nigeria is 10.6%.[10] Using the formula for simple random sampling, the sample size is thus:

$N = t^2 \times P(1-P)/M^2$

N = Sample size=number of patients required for the study

Where t = confidence level at 95% (standard value = 1.96)

P = Estimated prevalence of trauma related paediatric injury in South-West Nigeria = 10.6%

M = Margin of error at 5% (standard value = 0.05)

$N = 1.962 \times 0.106(1-0.106)/ (0.05)^2$

N = 145 Patients.

However, only 25% of injured paediatric patients sustained skeletal injuries.[8,10]

Therefore, minimum number of patients to be recruited for the study will be

25/100* 145 = 36.25

Approximately = 37 patients

However, Sixty three patients who met the inclusion criteria were recruited into the study.

Approval was obtained from the Research and Ethic Committee of the Lagos University Teaching Hospital before the commencement of the study. Details of the study were explained to the parents/ guardian of the patients involved and consent was obtained before any patient was enrolled into the study. Questionnaires were used to obtain data.

The patients recruited were clerked and examined with findings documented in the questionnaires. Detailed history was taken, noting the biodata, time of injury, nature and place of injury, time of presentation and if time of presentation was above 6 hours post-injury, the place where the initial treatment was received was recorded. Both the occupations and the educational levels of the parents/guardian were noted. Thorough physical examinations were performed. It included general examination and examination of the injured limb with particular attention to swelling, deformity and neurovascular status. Associated injuries were also noted. Diagnosis of fractures was confirmed in all cases with 2 views (anteroposterior and lateral views) of plain radiographs of the injured limbs. Patients who presented at the emergency room were resuscitated using the Advanced Trauma Life Support (ATLS) protocol.

The definitive treatment options were determined by the bone fractured, age of the patients, clinical classification of the fracture (either open or closed fracture), the fracture pattern and other associated injuries. The definitive treatment options were either conservative (non-operative) management or operative management.

Data analysis and presentation

- Data were collated and analyzed using Microsoft Excel Starter 2010 (by Microsoft Corporation. Redmond,Washington).
- Frequency distribution tables and diagrams were used for the descriptive data.
- The mean and standard deviation were calculated for qualitative variables.
- The F test was used to compare the mean calculated
- chi-square test was used to examine the statistical significance between any two categories of variables.
- All statistical tests were two tailed carried out at 5% level of significance
- The level of statistical significance was determined using standard chi-square test with $p < 0.05$ using Graphpad software 'Quickcalcs' from http://graphpad.com/quickcalcs/Pvalue1.cfm retrieved and calculated online on 19th January, 2013.

RESULTS

Overall, Sixty three patients were studied. Age ranged from 4 days (0.01 year) to 16 years. The mean age was 6.35± 4.58 years and the median age was 6 years. Mean age for children with fractures from road traffic accidents was 8.66 ± 4.25 years while mean age for children with fractures falls was 4.64 ± 2.87 years.(F test = 0.642, p value = 0.0577). Fifteen out of 17 patients (88.2%) who sustained fractures from falls were within the age range 1 to 8 years. (Table 1)The male: female ratio was 1.86:1

Thirty-one patients (49.2%) sustained fractures from road accidents, 17 (27%) from falls and 8 (12.7%) following birth injuries. Other causes included; 3(4.8%) children with heavy objects falling on their lower limbs (parked motorcycle, building blocks and wardrobe drawer), one was hit by a swing at the playground and another child sustained clavicular fracture after been hit by curtains' railing. (Figure 1)

Most injuries occurred on the road in 31 patients (49.2%), followed by the home environment in 14 (21%) patients. Fifty three percent (53%) of falls that resulted in skeletal fractures occurred within home environment. The peak of injuries sustained from the road traffic accidents occurred between 3pm and 6pm, and for falls, it was between 12 noon and 3pm.

The socio-economic status of the parents/guardians was computed using the revised Kuppuswamy's socioeconomic status scale by Ravi Kumar et al.[11] Most of the injured children (58.7%) were from the lower socioeconomic status (SES) group.

Pedestrian – car accident (61.3%) was the commonest mechanism causing injuries on the road followed by pedestrian – motorcycle accident (22.6%). (Table 2)Among the 31 patients who sustained skeletal injuries following road accidents, more children 21 (67.7%) were injured while crossing the road, 6 were by the road side while 3 were occupants of vehicles. Twenty children (95.2%) out of the 21 injured while crossing the roads were neither accompanied by adults nor had an adult supervision at the time of the accident.

Most falls 14 (82.4%) occurred at ground level and at height up to 1 metre which included falls from bed, benches, pavement and falls into shallow gutters. In most of the falls that resulted in fractures, 11(64.7%) there were no adult supervisions prior to the falls. (Table 3)

Twenty four (24) patients presented within 6 hours of injury, of which Eighteen (18) patients (75%) had sustained injuries from road traffic accidents. (Table 4) Twenty eight patients (49.1%) had first aid in peripheral

hospitals before referral while ten (10) of the patients (9.5%) presented late because they were misdiagnosed and their fractures were missed at the peripheral hospitals. Seven patients (11.1%) visited the traditional bone setters prior to presentation. Three patients (4.8%) presented with gangrene of the limbs. Pain and swelling were the major presenting complaints in 92% and 82.5% of cases respectively.

The femur (21.7%) was the most commonly fractured bone, followed by the humerus (17.3%). Upper limb fractures occurred more commonly following falls than road traffic accidents (23.9% vs. 13%)(p = 0.4739) while lower limbs fractures were more common following road traffic accidents than falls (41.3% vs. 4.3%).p = 0.0287.The femur was the commonly fractured bone associated with birth injuries. This is followed by the clavicle. (Table 5)

Green stick fractures occurred in 7.9% of the patients seen. Open fractures seen in 6.3% of the patients. Physeal injuries were noted in 4.8% of the patients. Skin abrasions and lacerations accounted for 72.1% of the associated injuries occurring with skeletal injuries.Seventeen patients (19.8%) had associated head injuries. Associated injuries occurred more in patients who were involved in road traffic accidents (88.4%). (Table 6)

More than two-thirds (65.1%) of the patients were treated non-operatively with various methods including Plaster of Paris (POP) casting, broad arm slings, skin traction and gallows traction. Operative procedures were performed on 23.8% patients, while 11.1% patients discharged against medical advice. (Table 7) Four of the parents of the children who discharged against medical advice (DAMA) gave financial constraints as the reason for the decisions (Table 8) Amputation was done in 3 patients who presented with gangrene of their limbs. Open reduction and internal fixation with either Kirshner wires or plate and screws were done in 6 (9.5%) patients. Other surgicalprocedures done included wound debridement and application of external fixators in 2 patients with open fracture, fasciotomy for a patient with compartment syndrome, insertion of wire for skeletal traction in a patient and a fasciocutaneous flap covering and skin grafting for a patient. Malunion was the commonest complication seen in 11(17.4%) of the patients. other complications noted were knee stiffness in 3 patients and elbow stiffness in 1 patient.. The range of joint motion in those joints improved after physiotherapy

DISCUSSION

The mean age obtained from this study was similar to that documented by Nwadinigwe et al[12] but slightly higher than the value documented by Adewole et al.[13]It was also noted from this study that was disparity between mean ages for children who sustained skeletal injuries following road traffic accidents and those following falls (8.7 ± 4.3 years and 4.6 ± 2.9 years respectively (p = 0.0577). Though not statistically significant, younger children are more prone to sustaining fractures from falls. All age group are predisposed to injuries from road traffic accidents when crossing roads, more so when without supervision. In this study, ninety five percent (95%) of children who sustained fractures while crossing roads were without adult supervision. A little above than four-fifths (83.3%) of those who were injured while standing or walking besides the roads were not accompanied by an adult nor had adult supervision at the time of injury. It therefore, means that increased and effective adult supervision is necessary for children crossing roads or walking beside roads.

Road traffic accident remains the commonest cause of skeletal injuries in children in our environment (49.2%) as found in this study. This is similar to a study done by Archibong et al[14] and Nwadinigwe et al[12] who documented RTA causing 50% and 51% of fractures in children respectively. This study revealed a

ratio of road traffic accidents to falls as a cause of skeletal injuries in children as 1.8:1, a similar finding with other studies in this environment.[12,14] In our study, the home environment was the second most common environment where fractures occurred in children, after roads. Emphasis should be on safety practices at homes. Increase supervision by adults should also be encouraged. Most (64.7%) of the falls that resulted in fractures occurred when there were no adult supervision.

Injuries sustained from road traffic accidents peaked between 3pm and 6pm. The closing time of most schools in Lagos falls around this period. Most children return home around this period, thereby causing an increase in number of children on the road and also, the number of children crossing the road, sometimes unsupervised. This may expose these children to road traffic accidents. The commercial buses and motorcycles, in a bid to make brisk business during this period may not obey the speed limits, and possibly drive recklessly to avoid the ensuing hold ups that usually occur around this period. Furthermore, most of the drivers have the potential to ignore traffic rules and regulations during this rush hour, which may further lead to possibility of pedestrian - vehicular road traffic accidents

Overall, thirty seven (58.7%) of the injured children were from the lower socioeconomic class group. Twenty three (62.2%) of the 37 children in the lower socioeconomic class group had been involved in road traffic accidents. Studies have shown that children from lower socioeconomic class are more prone to sustain injuries,[15,16] but there are divergent conclusions on the socioeconomic status as a factor in the increased tendency for fractures to occur in children.[16] Lyons et al[17] concluded from their study that the rate of fractures were similar in both the affluent and deprived groups but the causes of fractures differ. However, Stark et al[18] reported that children living in deprived areas in had higher fracture rates than those in the affluent areas. Though more children of the lower socioeconomic status were treated for fractures in this study, consideration should be given to the geographical location of the hospital where this study was conducted. It is located at the periphery of Mushin and Idi araba, suburbs in Lagos which houses lower socioeconomic class people. However, this cannot undermine the fact that the children of the lower socioeconomic class may be vulnerable to injuries. They live in highly dense neighbourhood with more traffic and may be vulnerable to road traffic accidents. They are also more likely trek to school, walk beside the road and cross roads without adult supervision. The lower socioeconomic class group is known to be poorly informed about safety practices.[19] Thefinding from this study has shown the vulnerability of the children from this group. Government should therefore develop intervention programmes and enlightening campaigns to be directed to this vulnerable group. Faelker et al[15] suggested the need for injury prevention efforts to be directed towards the children from economically disadvantaged group.

Initial treatment at other hospitals accounted for most of the delay in presentation at LUTH. Almost half (49.1%) of patients received treatment at various hospitals before presentation at LUTH. However, 10 patients (17.5%) presented late due to a missed diagnosis, misdiagnosis or misinformation at the private hospital where they first presented. These children later presented at our centre when the symptoms persisted. Though no mortality resulted from these actions, such misdiagnosis must be avoided. A misdiagnosed fracture is a potential for loss of limb or even life. It is therefore important that constant update of the knowledge of attending doctors in the private hospitals be made compulsory. Injured patients should be investigated appropriately with radiographs. The injured patient should be referred to the specialist promptly. The dangers of

assumption should be clearly communicated to these doctors. Seven patients (11.1%) had visited traditional bone setters (TBS) before their presentation. Among these patients were 3 (4.8%) who presented with gangrene of their limbs. The dangers of patronizing traditional bone setters had been clearly documented.[20,21]

A total of 92 fractures were recorded in 63 patients with one or multiple fractures. This study showed that fractures of the upper limb bones were more common following falls while that of the lower limbs were more common following road traffic accidents when compared with falls. This partly explains the disparity in the various studies which documented different bones as the most affected following skeletal injuries in children. In climes where falls are the leading cause, the upper limb bones were documented as the most fractured bones [22] as the upper limbs are usually stretched to break falls thereby resulting in energy transfer into the bone causing fractures. Overall, the femur was the most injured bone (21.8%). This is similar to findings in several other studies in our environment.[6, 12, 14]This is followed by the humerus (17.3%) and then the tibia (16.3%). Supracondylar fractures occurred in 5.4% of patients seen in contrast to the study by Nwadinigwe et al [12] where it was 17.3%. Also, greenstick fractures occurred in 7.9.% of the patients. This is in contrast to the study done in south eastern Nigeria by Archibong et al [14] where it was 56.8%. All the open fractures seen were of the tibia. The subcutaneous nature of the tibia predisposes the bone to open fracture.

Non-operative management was the mainstay treatment. This corroborate with other documented findings in our environment.[12,13,14] This form was treatment was applied in 65.1% of patients which differs from the report documented by Adewole et al[13] where non operative were used in 98.8% of patients.

CONCLUSION

From this study, road traffic accident is the commonest cause of fractures in children. Younger children are more prone to injuries from falls while older children are more prone to injuries from both falls and road traffic accidents. The femur is the commonest fractured bone. Non-operative method of treatment would suffice for most fractures in children. Safety practices at homes must be taught and encouraged. Parents are to be enlightened on the dangers of exposing young children to perils such as crossing busy roads unsupervised. Parents are to be enlightened on the need to provide increased and effective supervision for their children when playing.

Figure 1 : Key preventive and control methods in low resource clinical setting

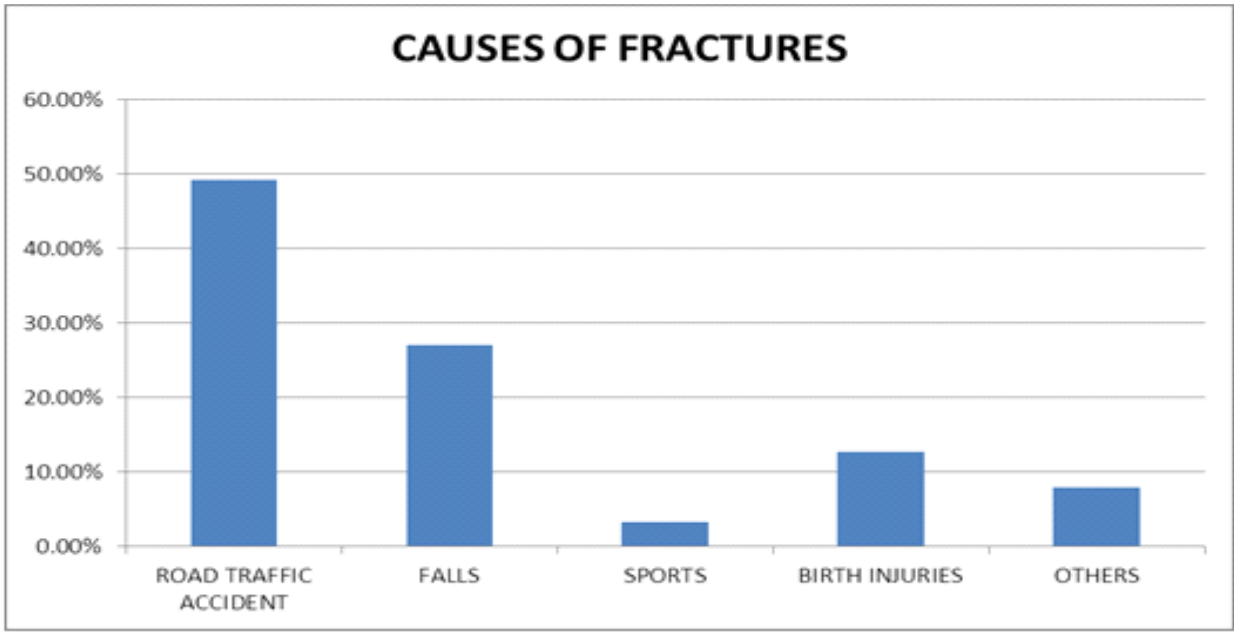

Table 1: Aetiology of fractures and age distribution

Cause of Fracture	<1 Year	1-4 Years	5-8 Years	9-13Years	13-16 Years	TOTAL(%)
Rta	1	7	8	8	7	31 (49.2)
Fall	1	7	8	1	-	17 (26.9)
Sports	-	-	-	1	1	2 (3.2)
Birth injury	8	-	-	-	-	8 (12.7)
Others	-	2	3	-	-	5 (7.9)
Total	**10**	**16**	**19**	**10**	**8**	**63 (100)**

Table 2: Mechanisms causing skeletal injury on the road

Road traffic Accident	Frequency	Percentage (%)
Pedestrian-car	19	61.3
Pedestrian-Motorcycle	7	22.6
Pedestrian-Articulated vehicle	1	3.2
Occupants inVehicles	3	9.7
Passenger on Motorcycle	1	3.2
Total	**31**	**100.0**

Table 3: Heights of falls

Heights	Adult supervision	No adult supervision	Total (%)
Ground level	2	5	7 (41.2)
<1 metre	3	4	7 (41.2)
1-3 metre	1	1	2 (11.8)
3-5 meter	-	1	1 (5.8)
>5 metre	-	-	-
Total	**6**	**11**	**17 (100)**

Table 4 -Time of presentation

Time interval	RTA	Fall	Sport injury	Birth	Others	Total (%)
0 − 1 HOUR	6	-	-	-	-	6 (9.5)
>1 – <6 HOURS	12	5	-	-	1	18 (28.6)
>6- <24 HOURS	6	1	-	-	-	7 (11.1)
>24 HOURS - < 1 WEEK	6	7	2	2	2	19 (30.2)
>1 WEEK	1	4	-	6	2	13(20.6)
TOTAL	**31**	**17**	**2**	**8**	**5**	**63 (100)**

Table 5: Bones affected

Bones affected	RTA	Fall	Sports	Birth injury	Others	Total (%)
Clavicle	1	3	-	3	1	8 (8.7)
Humerus	6	8	1	1	-	16 (17.3)
Radius	2	6	-	-	-	8 (8.7)
Ulna	2	5	-	-	-	7 (7.6)
Metacarpal	1	-	-	-	-	1(1.1)
Pelvis	1	-	-	-	-	1(1.1)
Femur	14	1	-	4	1	20(21.7)
Tibia	12	1	-	-	2	15(16.3)
Fibula	11	1	-	-	1	13(14.1)
Metatarsal	-	1	1	-	1	3(3.3)
Total	**50**	**26**	**2**	**8**	**6**	**92(100)**

Table 6: Associated injuries

Associated Injuries	RTA	Fall	Sports	Birth injury	Others	Total (%)
Skin abrasion	44	3	-	-	1	48(55.8.)
Eye injury	2	-	-	-	-	2 (2.4)
Lacerations	14	-	-	-	-	14 (16.3)
Head injury	15	2	-	-	-	17 (19.8)
Chest injury	1	-	-	-	-	1 (1.2)
Abdominal Injury	1	-	-	-	-	1 (1.2)
Genitourinary injury	1	-	-	-	-	1 (1.2)
Joint Dislocations	-	2	-	-	-	2 (2.4)
Total	**76**	**12**	**-**	**-**	**1**	**86 (100)**

Table 7: Methods of Treatment

Treatment	Frequency	Total
Non – operative	41	65.1%
Operative	15	23.8%
Not treated	7	11.1%
Total	**63**	**100%**

Table 8: Reasons For Discharge Against Medical Advice (Dama)

Reasons for DAMA	Frequency	Percentage (%)
Financial constraints	4	57.1
Father believes the child is well	1	14.3
Cultural belief	1	14.3
To seek treatment elsewhere	1	14.3
Total	**7**	**100**

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