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Research Article

Falls from Storey Buildings in Onitsha, South East Nigeria: A Single Center Experience -

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ABSTRACT

Background: falls from storey buildings are mainly accidental. The numerous storey buildings with or without adequate protective rails on their balconies are important risk factors for these falls. The falls are usually associated with severe injuries and many are life threatening. The aim of this report is to determine the scope of these injuries in the commercial city of Onitsha Southeast, Nigeria from a specialist hospital perspective.

Study design and setting: This is a retrospective study analyzing the medical records of all the patients with major injuries including falls from storey buildings seen in a level II surgical facility over a period of 8 years.

Results: a total of 24 patients fell from storey buildings and they consisted 1.3% of all the major injuries seen within the period under review. Majority of the patients were children aged 6-15 years, n=17(71%) and there was no gender predilection. Nineteen patients (79%) were accidental falls from the balconies of mainly 3rd floor and above, n=17(71%). All of the patients sustained fractures, majority involved the long bones n= 22 (92%) and were also multiple n=17(71%). Operative management was carried out on twenty nine fractures in sixteen patients (67%). Two patients (8%) who had head injuries in addition to their fractures died.

Conclusion: inadequate rail guards in the balconies of storey buildings is an avoidable health hazard. Home accidental fall injuries which result from this hazard though not very common could be serious and they can be avoided by strict adherence to the building plan.

Keywords: Falls; Storey Building; Long Bone Fracture; Poly-Trauma

INTRODUCTION

Falls from storey buildings cause various degrees of injuries and this is not unusual in a commercial city with many storey buildings. Accidental falls from heights is the second common cause of severe injuries after traffic accidents [1,2]. Suicidal jumps from heights have been recorded in the literature [3]. Falls from palm tree and seasonal fruit bearing trees leading to spinal cord injuries have also been reported in our sub-region [4,5,6]. Work place fall accidents are possible amongst carpenters and bricklayers working in uncompleted storey buildings especially when they do not wear harnesses. Elderly people with gait abnormality recovering from stroke or suffering from Parkinsonism or foot drop can slip and fall off balconies [7]. In situations where protective rails on balconies are low and are constructed in such a way that the parallel bars could be used as steps by children to climb over, they constitute risks for falls. Landing on concreted ground usually causes a variety of injuries ranging from head injury to splenic rupture to almost always fractures of long bones [3,8]. Sometimes, there is associated severe poly trauma with injury severity score of 16 or more [8].

Fall from storey building arising from an avoidable health hazard of insecure balcony can be severe or fatal. Adequate guarding of the balconies with high strong rails will prevent many falls. This study aims to determine the scope of fall injuries from storey buildings as presented in a level II surgical facility over a period of 8 years.

PATIENTS AND METHODS

Ethical approval: this study was approved by the ethics committee of the hospital in accordance with the rules guiding human research

Study design and setting: This is a retrospective study between January 2009 and December 2016 in a surgical facility located in the commercial city of Onitsha, South East, Nigeria.

Data collection: the medical files of all the patients who had major injuries and who were admitted and treated within the period under review were retrieved from the records department and the patients that fell from storey buildings were particularly analyzed. Information on bio data, circumstances of the fall, nature of the protective rail especially the approximate heights, injuries sustained, conditions on admission, treatment carried out, duration of stay and outcomes were documented.

Technical intervention: majority of the patients were identified on presentation to be in varying degrees of hemodynamic instability and therefore were urgently resuscitated with intravenous infusions and in some cases, additional blood transfusion. Those who had more life threatening conditions in addition to their fractures were identified and were preferentially treated while temporarily splinting their fractures. The definitive fracture treatments for most patients were operative.

Statistical analysis: the data were subjected to analysis using the Statistical Package for Social Sciences Software (SPSS) by International Business Machine (IBM) version 20 Armork NY, USA 2011. Statistical significance was taken when the p value is less than 0.05.

RESULTS

A total of 1688 patients with major injuries to the limbs with or without other organ system damage were seen within the 8 years under review. Twenty four patients (1.3%) fell from storey buildings. Majority of them were aged 6-15 years, n=17 (71%) and there was no sex predilection as shown in (table 1). Accidental falls from balconies were the main cause of injuries in 19 patients (79%) (table 2). The average height of the rails was 1.1 meters and in 3 cases, the rails were unstable. Five patients had a single bone fractures while seventeen had multiple long bones fractures and three had head injuries and one had splenic rupture and another had paraplegia in addition (table 3 and 4). Most patients fell from the third floor and above and these were the patients that had severe injuries and this is statistically significant, P value is < 0.05 (table 1). The definitive fracture treatment was

Table 1 showing the age and sex distribution of the patients and height of fall.

Age (yrs)	No (%)	sex		Height of storey				
		M	F	1	2	3	4	5
0-5	2	1	1	1	1	-	-	-
6-10	11(46)	6	5	-	**2**	4	2	3
11-15	6 (25)	2	4	-	1	3	2	-
16-20	2	2	0	-	-	-	2	-
21-25	1	1	0	-	-	-	1	-
>25	2	1	1	1	**1**	-	-	-
total	24(100)	13	11	2	5	7	7	3

mainly operative especially for the long bones. The range of hospital stay was 2-3 weeks in many patients, n=15 (68%). Two mortality (8%) involved the patients who had head injuries in addition to bilateral femoral and tibia fractures.

Most of the patients had a least two long bone fractures and plating was the main definitive form of treatment, p value < 0.05. Very few fractures were treated by rigid Intramedullary Nailing (IMN) and these were in adult patients. However many patients with only tibia fractures were treated conservatively. The patients with bilateral femoral and tibia fractures also had head injuries and not all the fractures in them were plated (table 4).

DISCUSSION

Fall from storey building is a common cause of serious injuries. World Health Organization study groups on Global Burden of Diseases stated that it is the second common cause of major injuries after traffic accidents in developed world and the number is on the increase [1,2] . The height of the storey and the hardness of the impact surface on landing determine the severity of the injuries [9]. Landing freely without structures on the way to break the fall is associated with greater damage. Furthermore, landing with the head is almost always fatal [3], especially if the height of fall is five floors or above [9].

Table 2 Distribution of patients according to cause of fall.

Cause of fall	Number of patients
Home accident	19
Child abuse	--
Suicide/depression	2
Assault	1
Workplace accident	2

The major cause of fall was accidental and this is statistically significant, p value < 0.05

Table 3: Cross tabulation of major injuries sustained according to height of fall.

Injury sustained	No of patients	Height of fall (floor)				
		1	2	3	4	5
Single long bone fracture	5	2	3	--	--	--
Multiple long bone fractures	17	--	--	5	7	5
Calcaneal fracture	2	1	1	--	--	--
total	24	3	4	5	7	5
Splenic rupture (additional)	1	--	--	--	1	--
Paraplegia (additional)	1	--	--	1	--	--
Head injuries (additional)	3	--	--	--	2	1

The higher the height of fall, the more the severity of the injury. Those who fell from higher floors sustained multiple long bones fracture as well as head and abdominal injuries unlike those that fell from lower floors.

Home accidental falls are more common in children because they often come out to the balconies to play. A low rail guard does not offer protection to these children who sometimes climb over the rail without realizing the danger. Rusty unstable rails could also cause fall when they give way as the unsuspecting persons lean on them. This was the case with three of our patients. The nature of landing also determine the injuries sustained. An intentional escape jump from a height usually means that the jumper lands on the feet and could also attempt to break the fall therefore limiting the amount of energy transfer through the feet to the ankles and knees which could have gone up to the pelvis and spine [7]. Falls from storey buildings or seasonal trees with landing on the back, usually results in spinal cord injuries [4,5]. In children, abuse and defenestration should be ruled out by assessing the patient for the physical and radiological telltale signs [7,10]. On the other hand, attempted suicides from falls should be ruled out when an adult presents with such injuries. Whatever is the circumstance, the building plans of these storey buildings which must necessarily incorporate protective rails should be obeyed and inspected by the appropriate authority before habitation especially when such storey buildings are for commercial purposes.

The musculoskeletal system is often injured and bones are fractured because they are dense and they absorb the transferred energy maximally. The more elastic structures like the skin are less affected. Majority of our patients have close fracture and similar study reported higher number of close fractures than open fractures [3]. The energy transfer was enormous in many of our patients who fell from above the 3rd floor and this was the reason why most of them had multiple long bone fractures. This is similar to findings by Barlow et al [9]. Our experience was skewed towards patients who had fractures and this is because many of them following their falls were referred to our orthopedic facility. Therefore, this may not be a true representation of the prevalence of fall from storey buildings in this commercial city and a multicenter study may provide a more accurate pattern.

Recovery of the patients with severe injuries following falls was dependent on adequacy of emergency care which included resuscitation with fluids and where necessary blood transfusion. These took precedence over management of the fractures. Also more life threatening conditions like splenic rupture and head injuries were given attention first. Majority of our patients' long bone fractures were managed by surgical fixations and some authors had reported that patients with multiple long bone fracture fare better and their mobilization is faster when managed surgically than when managed conservatively [11]. However, when the patient is not very stable to undergo a longer lasting definitive operation, a temporary long span external fixator could be applied to hold ipsilateral femoral and

Table 4 Distribution of fractures sustained according to long bone/s involved and treatment carried out.

Fracture sustained	Bone involved						Definitive treatment		
	femur	Tibia/fibular	Humerus	Radio-ulnar	Total no. of long bones fractured	Total no. of patients	Plating	/IMN /	Cast
Single long bone	2	2	1	--	5	5	2	1	2
Bilateral femur	12	--	--	--	12	6	10	2	--
Bilateral tibia/fibula	--	10	--	--	10	5	2	--	8
Ipsilateral femur and tibia	4	4	--	--	8	4	8	--	--
Bilateral femur and bilateral tibia	4	4	--	--	8	2	4	--	--
total	22	20	1	--	43	22	26	3	10

tibia fractures but converted to internal fixation as soon as patient is stabilized [12]. In our patients, temporal splinting were done in the head injured patients but with casts and the delay in treating some of their fractures was because of their poor general conditions. Multiple long bone fractures could be complicated by fat embolism and this may worsen with intramedullary reaming which fortunately may not significantly increase the risk of compartment syndrome [13], and these are situations that should be avoided in these severely traumatized patients. To prevent these complications and where the facilities for interlocking nailing are available, non-reamed single knee approach for simultaneous fixation of ipsilateral femoral and tibia fractures could be carried out. However, this use of retrograde femoral nailing and ante-grade tibia nailing depends on the site of the fracture and absence of intra-articular involvement [14]. Similarly, injuries to the physeal plates in children can be avoided by using titanium elastic nailing system and the metaphysis is the choice site of entry [15].

In a poor resource setting like ours, plating which has also been reported to provide good results in children and adolescents [16], was our predominant method of fixation of multiple fractures. Union in this group of patients is better and devoid of such complications like pressure sores and deep vein thrombosis and this must have accounted for the overall good outcome in our study. The patients who died had head injuries in addition to bilateral femoral and tibia fractures having fallen from 3rd floor and above. This is similar to reports which showed that most deaths resulting from falls from higher floors were associated with head injuries [3,9].

CONCLUSION

Falls from storey building is not very common judging from this single center study but the injuries resulting from falls are often very severe especially if the falls are from higher floors. Legislation on strong and high protective rails on the balconies should be strictly enforced as this will prevent many accidental falls from storey buildings.

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