

## THE PATTERN OF HIP FRACTURES OVER A TEN-YEAR PERIOD IN A MAJOR REFERRAL CENTRE IN GHANA

Baidoo PK<sup>1</sup>, Ocloo A<sup>1</sup>, Ansu V<sup>2</sup>

<sup>1</sup>Department of Surgery (Orthopaedic Unit), Korle Bu Teaching Hospital, Accra, Ghana; <sup>2</sup>School of Public Health, Indiana University, Bloomington, Indiana, USA

### Abstract

**Background:** The incidence of hip fractures is projected to increase worldwide and so are the associated morbidity, mortality, and cost of managing patients with hip fractures. There is, however, scarcity of data on trend and incidence of hip fractures in sub-Saharan Africa making planning and management difficult.

**Methods:** This is a retrospective study that involves all hip fractures seen and admitted to Korle-Bu Teaching Hospital in Accra, Ghana from 2007 to 2016. The demographic characteristic (sex and age), mechanism of injury, and the fracture type were documented. Association between age, sex, and mechanism of injury and type of fracture were determined by Chi-square, with p-value < 0.05 as the level of significance.

**Results:** Nine hundred and twenty-nine patients were admitted over the 10-year period. There were 492 (53%) females and 437 (47%) males, a ratio of 1.1:1.0. The mean age was 72.2 ± 14.4 years. Falls which

mostly were low energy constituted 726 (78.1%) of cases with 203 (21.9%) resulting from road traffic accidents (RTA). There was an increase in patients with hip fractures from 2007 to 2012 followed by a gradual decline. Approximately 490 (52.7%) and 439 (47.3%) of the cases were extracapsular and intracapsular respectively. There was strong association between age and mechanism of injury ( $X^2(2) = 492.10$ ,  $p < 0.001$ ,  $\Phi = 0.73$ ) and moderate association between sex and mechanism of injury ( $X^2(1) = 37.50$ ,  $p < 0.001$ ,  $\Phi = 0.21$ ). There was no significant association between sex or age and the type of fracture ( $p > 0.05$ ).

**Conclusions:** This study shows a 10-year trend of hip fractures in a major referral hospital in Ghana. It will serve as a baseline information for a nationwide study on the incidence rate of hip fracture in the country. It also has a great implication for future planning and management.

**Key Words:** Hip fracture, Ghana, trend, type of fracture, mechanism of injury

### INTRODUCTION

Hip fracture is a break in the continuity of the proximal portion of the femur which may be associated with soft tissue injuries around the hip. The incidence of hip fractures, as well as the treatment outcomes in Ghana, are not known as these have not been documented or published, though there are many centers in the country that manage these injuries on a daily basis.

However, the incidence of hip fractures worldwide is expected to exceed 6 million cases by 2050<sup>1</sup>. Data from the United States Agency for Healthcare Research and Quantity (AHRQ) indicated that a total of 310,000 persons were admitted in 2003 in the United States for hip fractures and that alone accounted for 30% of hospital admissions<sup>2</sup>. Approximately 10 to 15 billion dollars is spent annually treating these injuries<sup>3-6</sup>.

A study by Brauer et al<sup>7</sup> examined the trend and accompanying mortality following hip fractures over a 20 year period. They found a steady decline in the incidence rate between 1995 and 2005 after an initial rise in 1986 to 1995. They postulated that the increased awareness of bisphosphonates, calcium, and vitamin D supplementation among other reasons accounted for the decline. In most Asian countries, the incidence of hip fractures has doubled or tripled over the last 30 years. A result of an aging population with osteoporosis, which by 2050, may be the cause of over 50% of these fractures<sup>8,9</sup>.

There is a limited number of studies on the incidence and pattern of hip fractures from Africa<sup>10</sup>. Studies by Zebaze et al (57.1 per 100,000/year in females and 43.7 per 100,000/year in males over 35 years) in Cameroon and El Maghraoui et al (80 per 100,000/year for females and 50 per 100,000/year for men in Rabat, Morocco) from Morocco reported low rates of hip fractures. Dhanwal et al concluded that it was quite difficult to make a conclusive statement on the incidence of hip fractures based on these somewhat well-researched studies from Africa<sup>10</sup> and postulated however that among the black population in America, the rates of hip fractures is lower in the African population than in the western population.

**Corresponding Author:** Dr. Paa Kwesi Baidoo, MD  
Department of Surgery (Orthopaedic Unit), Korle Bu Teaching Hospital, Accra, Ghana  
**Email Address:** [pakvandal@gmail.com](mailto:pakvandal@gmail.com)  
**Tel:** +233206300668  
**ORCID iD:** 0000-0003-4028-1911  
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This study, therefore, is aimed at establishing the pattern of hip fractures in a major referral hospital in Ghana that serves a population of over four million people. The findings of this study will enable planning and better management of these injuries in the various medical centers in the country.

**Materials and Methods**

This is a retrospective study of patients with hip fractures admitted to the Korle-Bu Teaching Hospital, Accra, Ghana, and a major referral center in the country over a period of ten years (2007-2016) following permission from the hospital. Hip fractures in adults aged 18 years and above, resulting from trauma, fragility and pathological mechanisms were included in the study. The medical records of 929 patients with a definitive diagnosis of hip fractures were obtained from the record office of the Orthopaedics unit.

The review documented from these records, the age, sex, mechanism of injury (either from a fall and from road traffic accidents involving pedestrian versus motor vehicle, pedestrian versus motor bicycle), and the type of hip fracture (either intracapsular or extracapsular hip fractures) confirmed radiologically by use of a pelvic x-ray.

The data were analyzed using the Statistical Package for Social Sciences (SPSS version 24). Analyses explored the strength of the association between sex; age, mechanism of injury and type of hip fracture and also looked at the trends over the ten-year period and the results presented using tables, figures, and graphs. Association between outcome variables (hip fractures across age and sex groups) were determined using Chi-squared test with significance determined at p-value < 0.05.

**Results**

There were 492 (53%) females and 437 (47%) males during the study period with a female to male ratio of 1.13:1.0. The ages ranged from 20 to 105 years with an overall mean ( $\pm$  SD) age of 72.2 ( $\pm$ 14.4) years. The age groups, frequency, and percentages are presented in Table 1

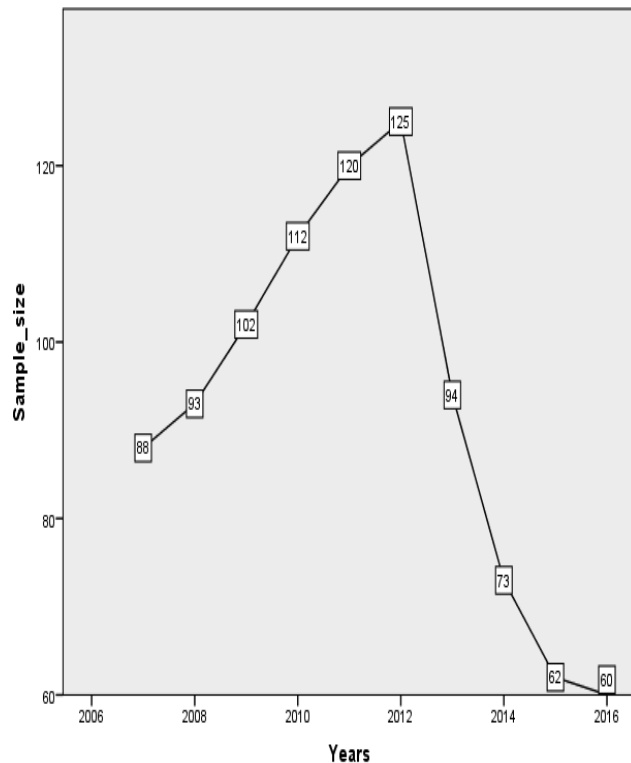
It was found that about 92% of the hip fractures occurred in patients 50 years and above. The annual trend of hip fractures from 2007 to 2016 irrespective of the age and sex is shown in Fig.1. There was an increase in the total number of cases from 2007, peaking around 2012 (125 cases) and this was followed by a gradual reduction from 2013 (94 cases) and 2016 (60 cases).

Table 2 shows a cross-tabulations of age (grouped into below 50, 50-69 and above 70 years) and sex versus fracture type and mechanism of injury to determine any association among these parameters. There was a highly significant association between age and mechanism of injury ( $X^2 = 492.10$ ,  $p < 0.001$ ,  $\Phi = 0.73$ ) and moderately significant association between sex and mechanism of injury ( $X^2 = 39.50$ ,  $p < 0.001$ ,  $\Phi = 0.21$ ). There was no

significant association between age or sex and the type of hip fractures in this study.

**Table 1** Age, frequency and percentage of study population from 2007 to 2016

Age group (years)	Frequency	Percentages (%)
20-29	9	1.0
30-39	23	2.5
40-49	44	4.7
50-59	87	9.4
60-69	157	16.9
70-79	288	31.0
80-89	245	26.4
90-99	71	7.6
Above 100	5	0.5
Total	929	100



**Fig 1.** Annual trend of hip fractures from 2007 to 2016

*Mechanism of injury*

Majority of the patients (78.1%, n=726) sustained their injury as a result of a fall with 203 (21.9 %) resulting from road traffic accidents. The accidents were mainly due to passengers in motor vehicles, persons versus cars and persons versus motor bicycle.

Fig. 2 shows the annual sex pattern of the mechanism of injury over the 10-year period. For both sexes, the fall rates were higher than hip fractures resulting from road traffic injuries. Between 2014 and 2016, almost all the cases in the sexes (95.4% of females and 88.4% of males) were fall related.

A cross-tabulation of age and sex versus mechanism of injury was obtained and it was observed that a statistically strong association existed between age and mechanism of injury ( $X^2 = 492.10, p < 0.00, \Phi = 0.73$ ) and also, between sex and mechanism of injury ( $X^2 = 37.50, p < 0.00, \Phi = 0.21$ ), (see Table 2). Road traffic related injuries were higher among patients below 50 years whereas falls were higher in patients above 50 years.

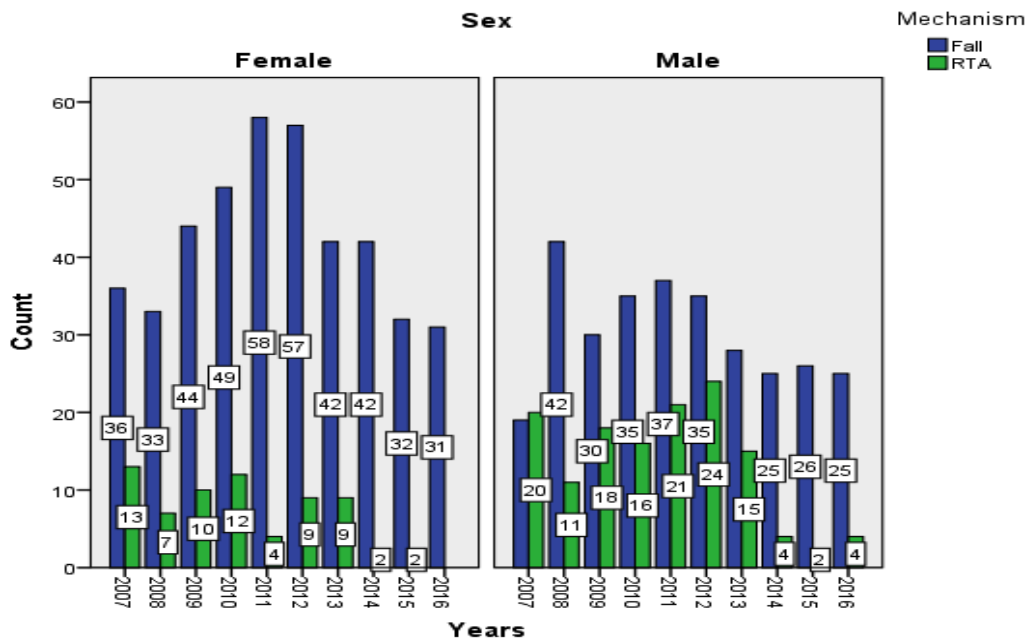
*Types of hip fractures*

Four hundred and ninety (52.7%) and 439 (47.3%) of the cases were extracapsular and intracapsular types of hip fractures respectively as shown in Fig. 3.

Fig. 4 shows the sex pattern of the different types of hip fractures during the period of this study. Majority of females had the predominantly extracapsular type of fracture except for 2012 and 2014 when the cases were almost the same. However, males had almost equal numbers of both fracture types over the 10-year period. The ratio of females to males with intracapsular hip fractures was 1.1:1.0 and that of extracapsular hip fractures was 1.2:1.0 respectively. The female to male ratio of the combined fracture types was 1.1:1.0. We did not find any significant association between age ( $X^2 = 4.97, p = 0.84, \Phi = 0.07$ ) or sex ( $X^2 = 1.25, p = 0.26, \Phi = 0.04$ ) and types of hip fractures (see Table 2).

**Table 2.** Results of Chi-square Test and Descriptive Statistics for Mechanism and fracture type by Sex and Age

	Fracture Type		$X^2$ (p-value)	Mechanism		$X^2$ (p-value)
	Extracapsular	Intracapsular		Fall	RTA	
Sex						
Male	222(50.8%)	215(49.2%)	1.25 (p=0.26) Df=1 $\Phi = 0.07$	302(69.1%)	135(30.9%)	39.50 (p<0.001*) Df=1 $\Phi = 0.21$
Female	268(54.5%)	224(45.5%)		424(86.2%)	68(13.8%)	
Age						
Below 50	49 (64.5%)	27 (35.5%)	4.97 (p=0.84) Df= 2 $\Phi = 0.07$	2 (2.6%)	74(97.4%)	492.10 (p<0.001*) Df=2 $\Phi = 0.73$
50-69	122(50%)	122 (50%)		127 (52%)	117 (48%)	
Above 70	319 (52.4%)	290 (47.6%)		597(98%)	12 (2%)	



**Fig. 2** Sex pattern of the mechanism of injury from 2007 to 2016

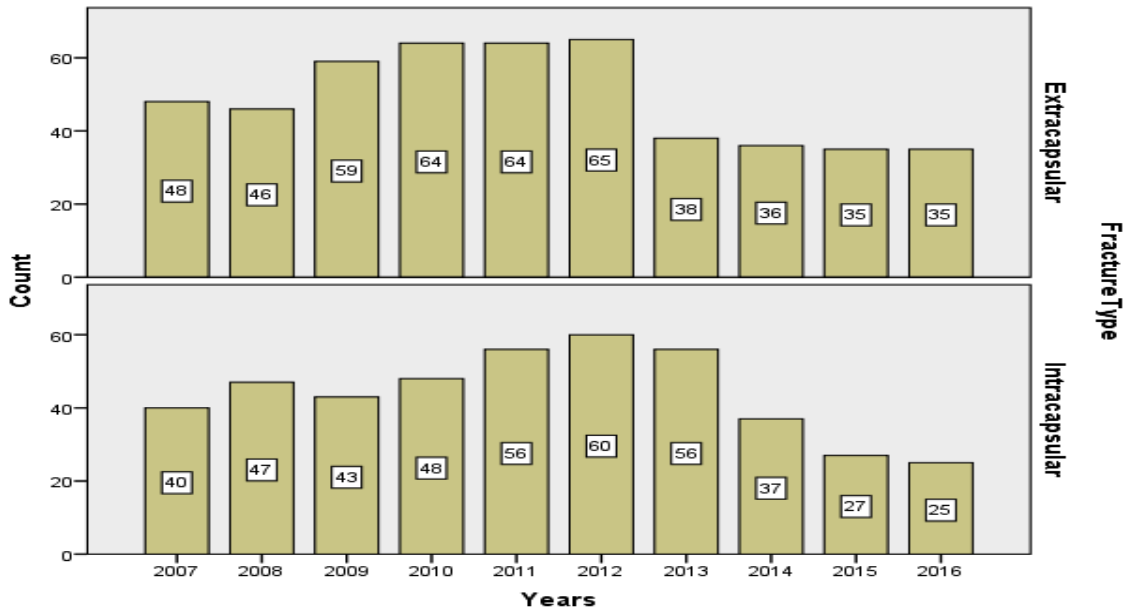


Fig. 3 Annual cases of extracapsular and intracapsular hip fractures from 2007 to 2016

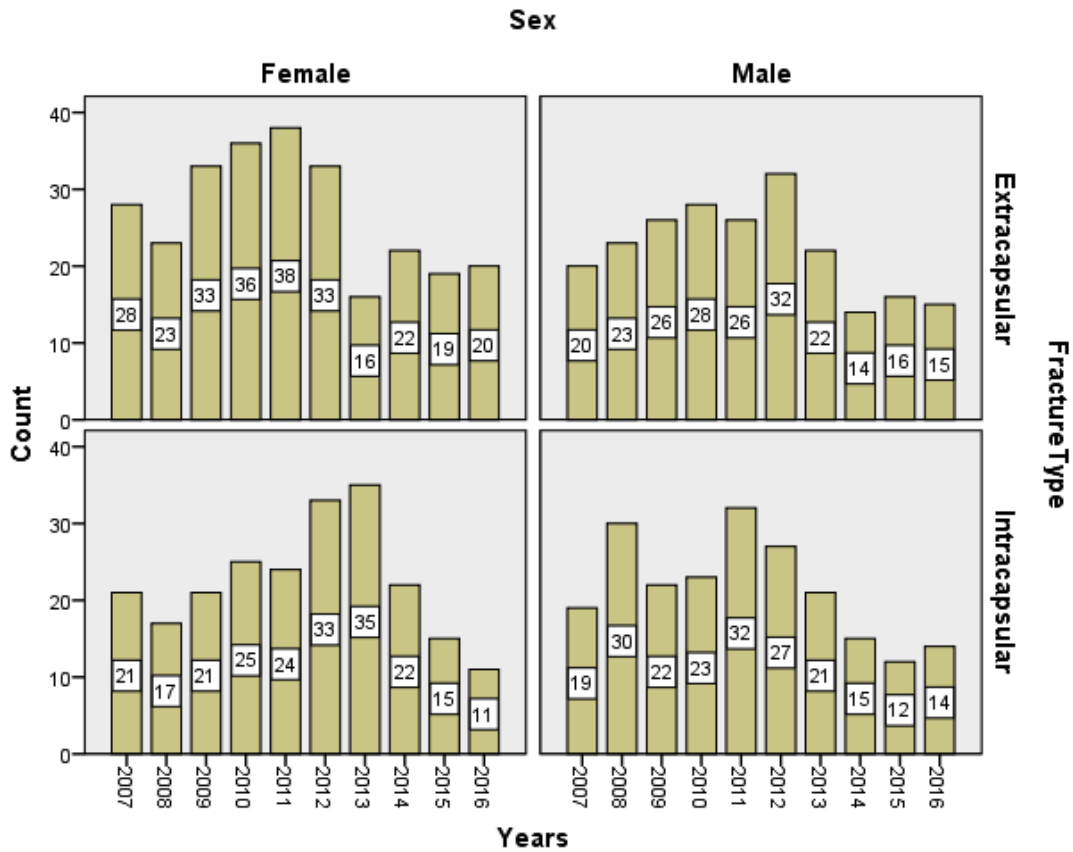


Fig. 4 Sex pattern of extracapsular and intracapsular hip fractures from 2007 to 2016

## Discussion

Hip fractures have become a major public health issue in the United States and most parts of the world and are associated with significant socioeconomic implications<sup>11-13</sup>. These fractures are classified as either intracapsular (femoral neck fracture) or extracapsular (comprising of intertrochanteric and subtrochanteric)<sup>14</sup>.

This differentiation is of prognostic value as the intracapsular fractures are prone to complications such as avascular necrosis from the disruption of the blood supply to the head of the femur, malunion and nonunion as the femoral head provides poor anchor for fixation devices as a result of the fragile cancellous bone it contains<sup>15,16</sup>. However, extracapsular hip fractures especially intertrochanteric type occurs in a well vascularized and is thus not associated with the complications of the intracapsular fractures, as they do not interfere with the blood supply<sup>17</sup>. They, however, are prone to shortening and malunion due to the deforming forces and the quality of bone in this region of the femur as one age<sup>14</sup>.

Our study found about 91.8% of hip fractures occurred in patients older than 50 years. This finding may be associated with osteoporosis as one grows older especially in postmenopausal women<sup>(18, 19)</sup>. The general belief is that hip fractures especially those that are due to fragility mainly occur in women<sup>20, 21</sup>. We, however, found almost an equal number of cases in females and males. This is contrary to the high incidence in males (59.5%) than females (40.5%) found by Tsabasvi et al from Tanzania<sup>22</sup>. It, however, agrees with the suggestion by Dhanwal et al that the sex incidence of hip fractures vary from one geographical area to another<sup>23</sup>. The observed variations may also be due to factors other than sex such as environmental (diet, alcohol, smoking, and lack of exercise) as well as genetic factors<sup>24</sup>.

### The Trend of hip fractures

There is a scarcity of data that analyzes the trend of fragility fractures in Africa<sup>22</sup>. Tsabasvi et al found an increase in the number of cases of hip fractures in their Tanzanian hospital over a 5 year period<sup>22</sup>. This study found an increase in the number of cases from 2007 to 2012 followed by a gradual reduction between 2013 and 2016. As of 2012, Korle Bu Teaching Hospital used to be the main facility in the city that managed hip fractures. After this period, two other hospitals started managing these injuries in the city with an increasing number of orthopaedic surgeons being available in the Country. There was also an increased awareness creation on road safety, increasingly good road networks and education on fall prevention and this could account for the observed trend.

Interestingly, Brauer et al found a similar trend, however, they assigned the increased use of bisphosphonates, vitamin D, and calcium supplementation, decreased alcohol intake, fall

awareness, and exercise as the reasons for their observed trend<sup>7</sup>.

### Mechanism of injury

It was apparent from this study that the major cause of hip fractures in our environment was fall (78.1%) and these are low energy injuries occurring in the elderly population with osteoporosis. Fall is common among the elderly and every year about a third of elderly people living independently fall out of which about 10% sustain hip fractures<sup>25</sup>. It is a significant cause of morbidity and mortality<sup>26, 27</sup>, with an annual mortality rate of 12% to 37%<sup>(26, 28)</sup>.

The other factor (21.9%) was because of road traffic-related injuries. These are high impact energy resulting from accidents involving passengers in vehicles, person versus vehicles and person versus motor bicycles. Ghana, like most developing countries around the world, lacks good public transport system. The use of motor bicycles as commercial entities for ferrying people is on the rise. There is poor road network system, poorly maintained vehicles and recklessness on our roads involving drivers, passengers and pedestrians have led to increased accidents on our roads and with this an increased rate of road traffic-related injuries of which hip fractures are part. Similar reasons were adduced by Solagberu et al in Nigeria<sup>29</sup>.

It was also found that there was a statistically significant association between the mechanism of injury and sex ( $X^2 = 39.5$ ,  $p < 0.001$ ,  $\Phi = 0.21$ ). Younger males and females usually sustained their injury from high-energy trauma. This finding agrees with three other studies from Africa<sup>22, 30, 31</sup>.

### Type of hip fracture

There was almost an equal number of extracapsular and intracapsular types of hip fractures over the 10-year period. Among females, the extracapsular fractures especially intertrochanteric type was predominant. In males, however, no difference existed between the two types. This study wholly agrees with that of Bjorgul et al<sup>32</sup> and partly agree with Karagas et al<sup>33</sup>, who found an increased number of hip fractures among white women but not white men or blacks of either gender.

The female to male ratio for both extracapsular (1.2:1.0) and intracapsular (1.1:1.0) hip fractures were also almost equal. The reason for this similarity is not apparent but could represent a similarity in the rate and type of bone loss among both sexes in Ghana. This is contrary to the findings in the study by Brunner et al<sup>34</sup> which indicated that the intracapsular type was about 3 times more common in women and the intertrochanteric extracapsular type had a female to male ratio of 3:1.

There was no significant association between the sex and the fracture type or between age and fracture type ( $X^2$  as indicated in Table 2). These findings were consistent with that of Tsabasvi et al<sup>22</sup>.

In addition, the analysis did not find any significant association between age and sex of patients who

sustained hip fractures. According to a study done by Mayhew et al<sup>35</sup>, there is substantial thinning of the already thin cortical zone of the superior aspect of the femoral neck. This happens more in females and to a significantly lesser extent in males and this affects independent of osteoporosis, the ability of the femur to absorb energy. This could probably account for our observation.

### Strength and limitations of this study

One of the strengths of this study is that it adds to the limited studies done in the field of hip fractures in Africa. To the best of our knowledge, this is the first study to look at the trend of hip fractures over a ten-year period in Ghana. It will contribute to understanding the main causes of hip fractures in the country and beyond. It will also help with the formulation of policies towards prevention and management of patients with these injuries.

The limitations of the study are that it was a single center study and it may not represent the national trend. We did not also look at the incidence and treatment outcomes of these fractures. There is the need therefore to conduct further studies that involve all hospitals with orthopedic care services to ascertain the national trend.

### Conclusions

This study shows that hip fractures are common in both males and females and falls constituted the major risk factor especially in patients above 50 years. There was an increase in the total number of hip fractures from 2007 to 2012 followed by a gradual fall from 2013 to 2016 and this could be due to the creation of awareness on the risk factors around that period. It was observed that a significant association existed between age, sex; and mechanism of injury. These findings would help in the planning and management of patients with hip fractures, as the associated morbidity and mortality are high. It is recommended that a nationwide analysis is done to ascertain the real national incidence.

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