

## Osteonecrosis of the head of femur in a Nigerian teaching hospital

\*Thanni L.O., Gbadegehin S.A., Adebajo A.A., Osundina B.A., Olushiyan B.F.

### Abstract

**Objective:** Osteonecrosis (ON) of the head of femur is not uncommon. The characteristics of affected patients and the associated aetiological factors in Nigeria are largely undocumented. To determine the epidemiological characteristics of patients with osteonecrosis of the head of femur, the radiological severity at presentation and associated aetiological risk factors

**Methods:** A retrospective study was done, of patients with femoral head ON seen between January 2013 and January 2019. Data on patients' characteristics, affected hips and radiological severity were entered onto a proforma and analysed.

**Results:** There were 29 patients with ON of the head of femur involving 32 hips. There were 55.2% females and 44.8% male patients. While 3 (10.3%) patients had bilateral affection, 26 (89.7%) had unilateral affection. Their mean age is 26.6years  $\pm$  13.3. The mean age of male and female patients are 29.3 years and 24.3 years respectively. The mean BMI is 21.9  $\pm$  5.2 and no significant difference in the BMI of both genders,  $p=0.74$ . Ninety percent of them presented with advanced radiographic stages. Factors found to be associated with ON are sickle cell disease (SCD) 44.8%, trauma 13.8%, CVA 3.4% and idiopathic cases 37.7%. There is no significant difference in the frequency of unilateral and bilateral occurrence in the groups with different hemoglobin genotypes.

**Conclusions:** Osteonecrosis of the head of femur occurs more often in young patients. They present late, with collapse of the head of femur. SCD, especially HbSS is the most common associated risk factor followed by idiopathic cases.

**Key words:** Osteonecrosis, avascular necrosis, head of femur, sickle cell disease, risk factors

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Received: February 27, 2020

Accepted: March 15, 2020

Published: March 31, 2020

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<http://dx.doi.org/10.4314/rejhs.v8i1.3>

## Ostéonécrose de la tête du fémur dans un hôpital universitaire Nigérian

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### Résumé

**Objectif:** L'ostéonécrose (ON) de la tête du fémur n'est pas rare. Les caractéristiques des patients affectés et les facteurs étiologiques associés au Nigeria sont largement non documentés. Déterminer les caractéristiques épidémiologiques des patients atteints d'ostéonécrose de la tête du fémur, la gravité radiologique à la présentation et les facteurs de risque étiologiques associés

**Méthodes :** Une étude rétrospective a été faite, des patients avec la tête fémorale observée entre janvier 2013 et janvier 2019 a été fait. Les données sur les caractéristiques des patients, les hanches affectées et la gravité radiologique ont été saisies sur un formulaire et analysées.

**Résultats :** Il y avait 29 patients avec ON de la tête du fémur impliquant 32 hanches. Il y avait 55,2% de femmes et 44,8% de patients masculins. Alors que 3 (10,3%) patients avaient une affectation bilatérale, 26 (89,7%) avaient une affectation unilatérale. Leur âge moyen est de  $26.6 \pm 13.3$  L'âge moyen des patients masculins et féminins est de 29,3 ans et 24,3 ans respectivement. L'IMC moyen est de  $21.9 \pm 5.2$  et aucune différence significative dans l'IMC des deux sexes,  $p = 0,74$ . Quatre - vingt dix pour cent d'entre eux a présenté au stade radiographique avancé. Les facteurs associés à l'ON sont la drépanocytose (SCD) 44,8%, traumatismes 13,8%, AVC 3,4% et cas idiopathiques 37,7%. Il n'y a pas de différence significative entre la fréquence d'occurrence unilatérale et bilatérale dans les groupes avec différents génotypes d'hémoglobine.

**Conclusion :** L'ostéonécrose de la tête du fémur survient plus souvent chez les jeunes patients. Ils se présentent tardivement, avec effondrement de la tête du fémur. La drépanocytose, en particulier l'HbSS, est le facteur de risque associé le plus courant, suivi des cas idiopathiques.

**Mots - clés :** Ostéonécrose, nécrose avasculaire, tête du fémur, drépanocytose, facteurs de risque

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Received: February 27, 2020

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## INTRODUCTION

Osteonecrosis, also referred to as avascular necrosis (AVN) and aseptic necrosis is a pathologic condition resulting from interruption of blood to bone and its marrow. Although this condition can affect various anatomic bone parts such as the condyles of the femur (knee), head of humerus (shoulder) and the talus (ankle), the most common site of affectation is the head of femur (1,2,3,4). The ischaemic insult that causes death of osteocytes, also activates osteoclasts to resorb affected subchondral bone (5). Evolution to collapse of the head of femur is therefore natural, leading to devastating consequences of functional impairment. This impairment is worse in patients with bilateral hip involvement (6). According to Osawa et al (6), patient-reported quality of life in patients with bilateral hip disease is worse compared with those who have unilateral affectation. Children with sickle cell disease and ON of the head of femur have been shown to have lower quality of life scores globally as well as in physical functioning and school functioning areas (7).

Preventing progression to collapse is an important major challenge to orthopaedic surgeons. To achieve this, there is a need to understand the characteristics of the affected patients and nature of the disease in our patients so that we can institute measures of early detection and prevention of progression to collapse where possible.

In Nigeria, epidemiological studies on osteonecrosis of the head of femur in general are not available. Therefore, the nature of the condition, patient characteristics and outcomes are largely unknown. The very few available studies are limited to patients who have sickle cell disease and a case report on association with systemic lupus erythematosus (SLE) (8,9,10). This study is intended to review existing records of patients who had AVN of the head of femur, describe their characteristics, radiological severity of the condition at presentation and associated aetiological risk factors.

## MATERIALS AND METHODS

This is a retrospective study of consecutive patients that were managed for osteonecrosis of the head of femur in a tertiary hospital. All patients with the diagnosis of osteonecrosis, avascular necrosis or aseptic necrosis of the head of femur were identified from the orthopaedic consultant outpatient clinic registers for the study period. Their personal

information, including hospital numbers were extracted and thereafter used to identify and retrieve their case files from the medical information department of the study centre.

Each case file was studied, and data extracted onto a proforma designed for the purpose. Information on personal data, history, diagnosis, imaging studies results, and laboratory investigations were extracted. No age group was exempted from the study.

During the study period, patients with known or suspected osteonecrosis were referred to the orthopaedic clinic. After clinical assessment, each patient had radiographic examination of both hips. Complete blood count and haemoglobin genotype were also done. Magnetic resonance imaging was not routinely available. All were given analgesics until diagnosis was confirmed when definitive treatment was offered.

Data was computerized and analysed using Epiinfo version 7 (Centers for Disease Control, USA), generating simple frequencies, averages and charts. Categorical variables were compared by Chi square test with level of significance at  $p < 0.05$ .

The study was approved by the scientific and ethics review committee of the study centre (OOUTH-HREC).

## RESULTS

During the study period (January 2013 to January 2019), twenty nine patients presented with osteonecrosis (ON) of the head of femur while 32 hips were affected. There were 16 females and 13 males (M:F = 1:1.2). As shown in table 1, their ages range from 9 years to 67 years. Their mean age is  $26.6\text{yrs} \pm 13.3$ . The mean age of the male patients is  $29.3\text{yrs} \pm 16.8$  while that of the female patients is  $24.3\text{yrs} \pm 9.7$ . The mean age of patients with SCD (HbSS and HbSC) is 17.5 years (range 9 – 28 years) while that of those with HbAA is 28.6 years (range 11 – 41 years). The mean body mass index (BMI) is  $21.9 \pm 5.2$  (range 14 – 31.6). There is no significant difference between the mean BMI of both genders (21.4 vs 22.3,  $p = 0.74$ ).

Twenty six patients (89.7%) presented with unilateral ON while 3 (10.3%) had bilateral affectation (table 2). Record of haemoglobin genotype was available for 20 of the patients. As shown in table 3, most of them, 9, have HbSS. Seven others have HbAA, 2 HbAS and 2 HbSC. There is no significant difference in the frequency of hip pain and the bilaterality in the different haemoglobin genotype groups. When bilaterality

is compared in the group with HbAA and the other genotypes, there is also insignificant difference,  $p=0.64$ . All the patients with bilateral affection were in the atraumatic group. Also, gender did not affect bilaterality,  $p=0.7$ .

The most common radiographic stage of the ON at presentation is Ficat and Arlet stage 3. This was seen in 20 of the affected 32 hips (62.5%). Nine hips (28.1%) were at stage 4, 2 hips (6.3%) were stage 2 and only one hip (3.1%) was stage 1. Figure 1. That is, 90.6% of the patients at presentation, had severe radiographic ON (stages 3 and 4) while 19.4% had moderate presentation.

The duration of hip pain at presentation was 1 to 120 months (mean 23.9months  $\pm$  30.6). The modal duration of presentation is 6 months. The risk factors for ON in this cohort of patients are abnormal genotype ( $n = 13$ ; 44.8%) cerebrovascular accident (CVA) in 1 (3.4%) patient and trauma in 4 patients (13.8%), Figure 2. Trauma was due to fall and being knocked down by a motor vehicle (VPA) in 2 patients each. Eleven patients (37.7%) had idiopathic ON.

## DISCUSSION

Osteonecrosis is commonly described affecting the head of femur in patients with sickle cell disease. There are no population studies of the prevalence of this condition and epidemiological characteristics of the condition has not been described for the Nigerian patients in general.

The age group of presentation that is often reported is 30 to 60 years (1,3,11). From India, Vardhan et al reported a mean age of 34.7 years, range 14-70 (12). From Japan, Kubo et al reported mean ages of 30s and 40s for male and female patients (13). Lamb et al (11) reported a mean age 58years at presentation in the UK. However, Adesina *et al* (14) reported a mean age of 27years for SCD patients in California.

The mean age at presentation in this report, 26.6 years, is similar to that in the report of Adesina *et al* but younger than the mean age reported from Indian patients, 34.7years (12) and 30 to 40 years in Japanese series (13). From Nigeria, Akinyoola had reported a mean age of 23.7years from a series of patients with sickle cell disease (9). Iwegbu and Fleming in 1989 reported a series of 29 patients with sickle cell disease and 34 affected hips (15). The patients were as young as in our report, with an age range of 6years to 15years. In a series of 24 patients with SCD and ON from Brazil, described by Matos et al (7), 8years was the youngest age of their patients.

While 17% of their patients (Iwegbu and Fleming) had bilateral hip affection, this was seen in 10.3% of our patients. This contrasts sharply with 86.7% bilaterality from a series of SCD patients from Brazil (4). Young patients are generally affected most often but these patients are even younger in areas like Nigeria and Brazil where the prevalence of sickle cell disease is high. The affected patients from Nigeria are younger, probably because of haemoglobinopathy (9) being the most common associated factor as shown in this report. As we observed in this report also, it is possible that patients with SCD develop ON at a younger age (adolescence) compared to others who tend to develop this condition in early adulthood.

Male preponderance is usually reported for ON of the head of femur (5). The report from India indicated five times more prevalence in males than females but a M:F ratio of 5:4 in Japan. There is no significant difference in the affection of the genders in our patients although a slight female preponderance exists at M:F 1:1.2. There is a slight preponderance of females being affected from Nigeria. A M:F of 1:1.2 in our report and 1:1.6 from the report of Iwegbu and Fleming. There may be a reason for this observation that is still unclear.

Late presentation is seen in this report where 90.6% of the patients presented with radiographic stages 3 and 4. This is similar to the observation of Akinyoola et al in a series of ON in patients with sickle cell disease where 81.8% presented with stages 3 and 4, Ficat & Arlet (10). Symptoms and clinical signs of ON are not specific, hence making the diagnosis early is difficult. A high index of suspicion is required to make the diagnosis early. A deliberate policy of early MRI screening of the hips, even though relatively very expensive, is required to make early diagnosis so as to be able to institute treatment aimed at preventing progression to collapse of the head of femur. An obvious challenge to achieving this is late presentation. The average duration of symptoms of hip pain at presentation in our patients is 2years. Strategies for early diagnosis is needed especially in patients with sickle cell disease.

In reports from Europe, North America and Asia, the most common associated factors are chronic alcoholism and use of steroids (5,12,13). Rates of 35% to 51% are reported for steroid use while 20% to 31% are reported for alcohol abuse. This is unlike in Nigeria where sickle cell disease appears to be the most common cause. This also explains the younger age of our patients who are



born with abnormal haemoglobin genotype especially HbSS and HbSC. The Sickle cell trait is most common in Nigeria, present in 25% of the population (16), and sickle cell disease affects 1 – 3 percent of the population (17). This explains the preponderance of haemoglobinopathy as the cause in our patients. It is possible that alcohol abuse and steroid use are not as common in our patients as in Asians and Caucasians. There may be no significant difference in the clinical features of the disease in patients with HbSS and HbSC (4).

Endothelial dysfunction, leading to cardiovascular and cerebrovascular events is an important, although uncommon cause of ON (18). Only one case, of cerebrovascular accident, was found in our patients.

## CONCLUSIONS

Osteonecrosis of the head of femur occurs more often in young patients. The disease is more often unilateral, and majority of patients presents late, with collapse of the head of femur. Abnormal haemoglobin genotype, especially HbSS is the most common associated risk factor followed by idiopathic cases.

**Conflict of interest:** All authors declare that they have no conflict of interest

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**Table 1. Characteristics of 29 patients with hip osteonecrosis**

Variable	Frequency		
Sex	Female	16	55.2%
	Male	13	44.8% M:F=1:1.2
Age	Mean	26.6 ± 13.3 years	
	Range	9 – 67 years	
BMI	Mean	21.9 ± 5.2	
	Range	14 – 31.6	
Duration of hip pain	Mean	25.1 ± months	
	Range	1 – 120 months	
	Mode	6 months	
Affected side	Unilateral	26 patients	
	Bilateral	3 patients	

**Table 2. Comparison of gender for affected sides and body mass index**

Variable	Male	Female	Total		
Affected side	Unilateral	12	14	26	p=0.68
	Bilateral	1	2	3	
Body mass index	Mean	21.4	22.3		p=0.74

**Table 3. Frequency of genotype, affected side and hip pain in 20 patients**

Genotype	Affected side		p=0.89	Left Hip Pain		Right Hip Pain		p=0.97
	Bilateral	Unilateral		No	Yes	No	Yes	
AA	1	6		2	5	4	3	
AS	0	2		1	1	1	1	
SC	0	2		1	1	1	1	
SS	1	8		1	8	4	5	
Total	2	18		8	12	10	10	

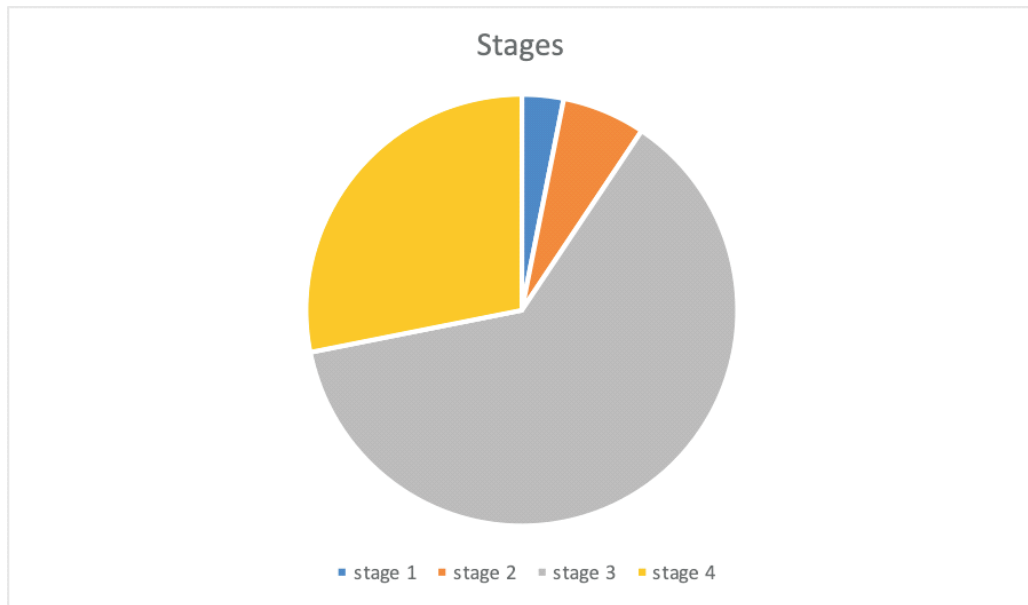


Figure 1. Ficat and Arlet radiographic stages of affected hips

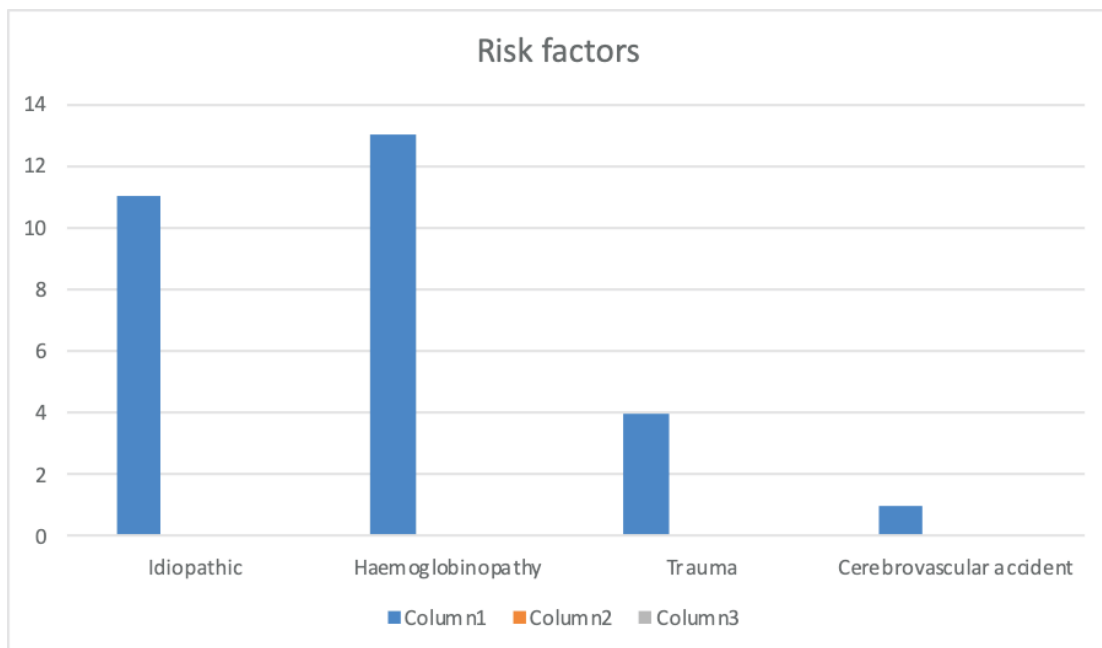


Figure 2. Associated risk factors for osteonecrosis of the head of femur