

# Total Hip Replacement for Management of Severe Osteoarthritis in a Developing Country: A 5-year Assessment of Functional Outcome in 72 Consecutive Hip

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## Abstract

**Background:** Outcome assessment of joint replacement procedures allows providers and patients to evaluate the quality of services delivered, thereby adding value to the services provided. **Objective:** The study is to describe the pattern of presentations of our patients with hip osteoarthritis who had undergone cementless total hip replacement (THR), assess the outcome using the Harris Hip Score (HHS), and identify any variables that affect the outcome. **Patients and Methods:** The study was carried out at Davidson and Judith Consultants Clinics, Enugu, Nigeria. A total of 72 THRs, in 62 patients, carried out between 2008 and 2013 were reviewed. These patients were assessed using preoperative HHS (pre op HHS) and postoperative (post op HHS) administered at 1 year and 5 years. **Results:** There were 62 patients and 72 cementless THRs. Ten (16.13%) patients had bilateral conditions; 25 (40.32%) patients had right THR, while 27 (43.55%) patients had left THR. Twenty (32.26%) patients were males and 42 (67.74%) were females. Male:female is 1:2.1 patients. The most common cause from the study is still primary osteoarthritis which accounts for 51.6%, while the least is avascular necrosis (AVN) of the head of femur seen in hemoglobinopathy (22.58%). Those following idiopathic AVN are slightly higher (22.58%), while posttraumatic is 25.81%. The comparison of means of HHS shows pre op HHS and post Op HHS at 1 year has  $P = 0.000$  ( $P < 0.05$ ). Pre op HHS and post op HHS at 5 years has  $P = 0.000$  ( $P < 0.05$ ). The comparison of HHS means for gender shows male pre op HHS and female pre op HHS at 1 year has  $P = 0.341$  ( $P > 0.05$ ). The comparison of HHS means for morbidity shows comorbidity post op HHS and no comorbidity post op HHS at 1 year had  $P = 0.320$  ( $P > 0.05$ ). **Conclusion:** Our patients presented at a younger age with secondary osteoarthritis secondary to hip joint affectations such as trauma and AVN and they benefited from our intervention with very low complication rate.

**Keywords:** Cementless, developing country, osteoarthritis, outcome, total hip replacement

## INTRODUCTION

Total hip replacement (THR) for treatment of disabling end-stage osteoarthritis of the hip has been accepted worldwide.<sup>[1]</sup> The procedure improves quality of life and functional disability significantly.<sup>[2-4]</sup> The past 10 years has witnessed an increase in the number of THR surgeries around the world over.<sup>[5-8]</sup> Despite this worldwide increase and the fact that the first THR in Nigeria was done in 1974,<sup>[9]</sup> arthroplasty procedures had remained in its infancy until recently as a result of infrastructural decay in public institutions due to prolonged military rule.<sup>[10]</sup> Gogia *et al.*<sup>[11]</sup> in a study showed an overall improvement of 56% at 3 months and 64% at 6 months after surgery. They demonstrated in a study that majority of their patients obtained “excellent” results with THR surgery and

follow-up physical therapy. They concluded from the results of their study that THR followed by physical therapy decreases joint pain and improves function in patients with osteoarthritis of the hip.

Liu *et al.*<sup>[12]</sup> in a cohort study of the epidemiology and surgical outcomes of patients undergoing primary THR on Asian patients demonstrated that the three most common etiologies

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for degenerative hip arthritis were inflammatory arthropathies, primary osteoarthritis, and avascular necrosis (AVN). They concluded in their study that the patient groups had comparable functional outcomes following THR regardless of the diagnosis.

Huotari *et al.*<sup>[13]</sup> in a study to determine the outcome in terms of two outcome variables, deep surgical site infections (SSIs) and mortality, carried out an analysis of surveillance data. They did a multivariate analysis and demonstrated that bilateral operations were not an independent risk factor for deep SSIs. They concluded in their study that mortality did not differ between bi- and unilateral total hip arthroplasty (THA) and that simultaneous bilateral surgery did not increase the risk of deep SSIs or death after THA. They further advised that bilateral operations may, however, require specific guidelines regarding antimicrobial prophylaxis.

Patient-based self-report questionnaires are an accepted method of evaluating patient outcomes and quality of life.<sup>[14]</sup> The HHS is the most widely used physician-assessed measure of hip function after THA. The HHS evaluates similar domains as the Western Ontario McMaster Osteoarthritis Index, including patient hip pain and function although it was empirically derived.<sup>[15]</sup> Outcome assessment of joint replacement procedures allows providers and patients to evaluate the quality of services delivered, thereby adding value to the services provided.

To our knowledge, outcome study of a large series of THR like ours has not been published in our environment. Therefore, the aim of this study is to describe the pattern of presentations of our patients with hip OA who have undergone cementless THR, assess the outcome, and identify any variables that affect the outcome.

## PATIENTS AND METHODS

Between November 2008 and November 2013, 72 THR in 62 patients were carried out by the authors at Davidson and Judith Consultants Clinics Enugu, Nigeria.

We developed a protocol for the clinic for the selection of patients for surgery and postmanagement [Figure 1].

Based on the above protocol, preoperative assessment was carried out which included radiological and laboratory to rule out infection. Only patients with an erythrocyte sedimentation rate <20 mg/dl and C-reactive protein (CRP) <10 mg/dl were operated upon. Hips that required acetabular reconstruction with antiprotrusio cage were excluded from this study. All patients had a preoperative X-rays of the affected hip which include anterior-posterior, lateral, and Judet's view [Figure 2]. Where there was doubt on the information concerning the integrity of the acetabular walls, computerized tomography scan was requested to assess the configuration of the acetabular walls. The preoperative Harris Hip Scores (Pre op HHSs) were assessed and the average pre op HHS was  $44.65 \pm 5.86$ , with a range of

36–59. The average preoperative packed cell volume was 38.24. The average blood transfusion rate was 2 units, with a range of 0–2 units. The surgeries were carried out under general and regional anesthesia after consideration of the general condition and associated morbidity of the patients. We used anterior lateral approach in all the patients. The Corail stem (J&J, Depuy) was used for the replacement of femoral head and neck, while the Duraloc (J&J, Depuy) as acetabular component. Fixation of the components was achieved primarily by press-fit technique using screws for additional acetabular fixation of the cup where necessary. There was no remarkable blood loss and the average loss was 814 ml. The average postup transfusion was <2 units of blood. Patients had our physiotherapist protocol of rehabilitation; hip muscles strengthening exercise while on bed, sitting out, walking with Zimmer frame, walking with crutches, and discharged in 2 weeks after removal of staples/sutures. Patient had initial postoperative radiographs within 24 h [Figure 2] and subsequent ones taken at the time of assessment of the functional outcome. The postoperative HHSs (post op HHSs) were done at 6 weeks, 3 months, 6 months, 12 months, 24 months, 36 months, 48 months, and at 5 years.

## Statistical analysis

We used the IBM SPSS package (IBM Corp., IBM SPSS Statistics for Windows, Version 25.0, Armonk, NY, USA), developed by International Business Machines Corporation (IBM) to analyze our data. Descriptive statistics were calculated for all variables of interest. Categorical measures were summarized as counts and percentages, and continuous measures were summarized as means, standard deviations, and medians. The *P* values for comparing means of continuous variables such as HHS were determined and we compared the following HHS means [Table 3] using the paired *t*-test: Pre op HHS and post op HHS at 1 year, pre op HHS, and post op HHS at 5 years, post op HHS at 1 year, and post op HHS at 5 year.

We compared the following HHS means for gender [Table 4] using the independent *t*-test to compare the following means:



Figure 1: Preoperative X-rays of an indexed patient

**Table 1: Demographics of primary total hip replacement in Nigerian patients at Davidson and Judith Consultants Clinics Enugu Nigeria from 2008 to 2013**

Characteristics	Value
Number of patients	62
Number of hips	72
Right side	25 (40.32)
Left side (%)	27 (43.55)
Male (%)	20 (32.26)
Female (%)	42 (67.74)
Male:female	1:2.1
Comorbidity (%)	32 (46.4)
Noncomorbidity (%)	30 (43.5)
Mean age±SD	42.2±13.87
Age range (years)	17-72
Minimum follow-up period	5
The mean preoperative HHS	44.65±5.86
Mean postoperative HHS (1 year)	88.52±5.56 ( $P < 0.05$ )
Mean postoperative HHS (5 years)	89.11±5.23 ( $P < 0.05$ )
Regional anesthesia (%)	58 (93.50)
General anesthesia (%)	5 (8.06)

HHS: Harris Hip Score, SD: Standard deviation

**Table 2: Etiology of the osteoarthritis**

Etiology	n (%)
AVN secondary to SCD	14 (22.58)
Post-traumatic osteoarthritis (fractures: Head of femur with dislocation, acetabulum)	16 (25.81)
Primary OA	32 (51.61)
Total	62 (100)

AVN: Avascular necrosis, SCD: Sickle cell disorder

male pre op HHS and female pre op HHS at 1 year and male post op HHS and female post op HHS at 5 years.

We compared the following HHS means for comorbidity [Table 5] using the independent *t*-test to compare the following means: Comorbidity post op HHS and no comorbidity post op HHS at 1 year, comorbidity post op HHS, and no comorbidity post op HHS at 5 years.

## RESULTS

There were 62 patients and 72 Hips. Ten (16.13%) patients had bilateral conditions; 25 (40.32%) patients had right cementless THR, while 27 (43.55%) patients had left THR. Twenty (32.26%) patients were males and 42 (67.74%) were females with male:female of 1:2.1 patients [Table 1]. The most common cause from the study is still primary osteoarthritis which accounts for 51.6%, while the least is AVN of the head of femur seen in hemoglobinopathy (22.58%). Those following idiopathic AVN are slightly higher (22.58%), while posttraumatic is (25.81%) [Table 2].

The comparison of means of HHS shows pre op HHS and post op HHS at 1 year has  $P = 0.000$  ( $P < 0.05$ ). Pre op HHS and



**Figure 2: Immediate postoperative X-ray of the indexed patient**

post op HHS at 5 years have  $P = 0.000$  ( $P < 0.05$ ). Post op HHS at 1 year and post op HHS at 5 years have a  $P = 0.393$  ( $P > 0.05$ ) [Table 3].

The comparison of HHS means for gender shows male pre op HHS and female pre op HHS at 1 year has a  $P = 0.341$  ( $P > 0.05$ ). Male post op HHS and female post op HHS at 5 years has  $P = 0.735$  ( $P > 0.05$ ) [Table 4].

The comparison of HHS means for morbidity shows comorbidity post op HHS and no Comorbidity post op HHS at 1 year had  $P = 0.320$  ( $P > 0.05$ ) and comorbidity post op HHS and no comorbidity post op HHS at 5 years had a  $P = 0.85$  ( $P > 0.05$ ) [Table 5].

## Radiological evaluation

None of our patients had any radiological evidence of aseptic loosening.

## Complications

We had a complication rate of 4.83% which are distributed as follows: dislocation – 1 (1.61%), limb length discrepancy – 1 (1.61%), and pulmonary embolism – 1 (1.61%).

## DISCUSSION

The pattern of presentation of our patients showed that 48.39% of them had secondary osteoarthritis due to osteonecrosis as against 51.61% of them that presented as primary osteoarthritis. This is at variance with the Swedish annual report for arthroplasty register, which showed that 83% of their patients presented with primary osteoarthritis of the hip.<sup>[7]</sup> Our findings are in consonance with the findings of Pachore *et al.*<sup>[16]</sup> and Singh *et al.*,<sup>[17]</sup> who found the incidence of AVN of 49% and 42% in Indian and Singapore patients, respectively. Our study showed the underlying causes of AVN in our patients to be 53.33% for trauma and 46.67% for sickle cell disorder.

This is in contrast with the findings of Chan *et al.*,<sup>[18]</sup> who demonstrated alcohol to be the most underlying factor in their group of Hong Kong patients. Nearly 67.74% of our patients

**Table 3: Comparison of means-paired test**

Comparison of means		Paired samples statistics			
		Mean	n	SD	SEM
Pair 1					
	Pre-operative HHS	44.6452	62	5.90942	0.75050
	Post-operative HHS 1 year	88.5161	62	5.55964	0.70607
Pair 2					
	Pre-operative HHS	44.6452	62	5.90942	0.75050
	Post-operative HHS 5 years	89.1129	62	5.27632	0.67009
Pair 3					
	Post-operative HHS 1 year	88.5161	62	5.55964	0.70607
	Post-operative HHS 5 years	89.1129	62	5.27632	0.67009

  

Comparison of means		Paired differences				t	df	Significant (two-tailed)	
		Mean	SD	SEM	95% CI of the difference				
					Lower				Upper
Pair 1									
	Pre-operative HHS - postoperative HHS 1 year	-43.87097	7.58662	0.96350	-45.79761	-41.94433	-45.533	61	0.000
Pair 2									
	Pre-operative HHS - postoperative HHS 5 years	-44.46774	7.77284	0.98715	-46.44167	-42.49381	-45.047	61	0.000
Pair 3									
	Post-operative HHS 1 year - postoperative HHS 5 years	-0.59677	5.46362	0.69388	-1.98427	0.79073	-0.860	61	0.393

SD: Standard deviation, SEM: Standard error of mean, CI: Confidence interval, HHS: Harris hip score

**Table 4: Comparison of means based on gender**

		Group statistics (gender)				
		Gender	n	Mean	SD	SEM
Pre-operative HHS	Male	21	42.6667	5.30409	1.15745	
	Female	41	45.6585	6.00670	0.93809	

  

		Independent samples test								
		Levene's test for equality of variances		t-test for equality of means						
		F	Significant	t	df	Significant (two-tailed)	Mean difference	SEM	95% CI of the difference	
									Lower	Upper
Pre-operative HHS	Equal variances assumed	0.922	0.341	-1.928	60	0.059	-2.99187	1.55157	-6.09547	0.11174
	Equal variances not assumed			-2.008	45.162	0.051	-2.99187	1.48986	-5.99231	0.00857

  

		Group statistics				
		Gender	n	Mean	SD	SEM
Post-operative HHS 5 years	Male	21	88.1905	5.36301	1.17031	
	Female	41	89.5854	5.23438	0.81747	

Contd...

**Table 4: Contd...**

	Independent samples test								
	Levene's test for equality of variances		t-test for equality of means						
	F	Significant	t	df	Significant (two-tailed)	Mean difference	SEM	95% CI of the difference	
								Lower	Upper
Post-operative HHS 5 years									
Equal variances assumed	0.116	0.735	-0.985	60	0.329	-1.39489	1.41622	-4.22776	1.43798
Equal variances not assumed			-0.977	39.568	0.334	-1.39489	1.42754	-4.28104	1.49126

SD: Standard deviation, SEM: Standard error of mean, CI: Confidence interval, HHS: Harris hip score

**Table 5: Comparison of means based on morbidity**

	Group statistics								
	Co_morbidity	n	Mean	SD	SEM				
	Post-operative HHS 5 years	No Morbidity	30	90.4333	5.01503	0.91562			
	Comorbidity	32	87.8750	5.28998	0.93514				

  

	Independent samples test								
	Levene's test for equality of variances		t-test for equality of means						
	F	Significant	t	df	Significant (two-tailed)	Mean difference	SEM	95% CI of the difference	
								Lower	Upper
Post-operative HHS 5 years									
Equal variances assumed	0.036	0.850	1.951	60	0.056	2.55833	1.31105	-0.06416	5.18082
Equal variances not assumed			1.955	59.991	0.055	2.55833	1.30876	-0.05958	5.17625

	Group statistics								
	Co_morbidity	n	Mean	SD	SEM				
	Post-operative HHS 1 year	No Morbidity	30	89.5000	5.69180	1.03918			
	Comorbidity	32	87.5938	5.35729	0.94704				

	Independent samples test								
	Levene's test for equality of variances		t-test for equality of means						
	F	Significant	t	df	Significant (two-tailed)	Mean difference	SEM	95% CI of the difference	
								Lower	Upper
Post-operative HHS 1 year									
Equal variances assumed	1.005	0.320	1.359	60	0.179	1.90625	1.40319	-0.90055	4.71305
Equal variances not assumed			1.356	59.063	0.180	1.90625	1.40598	-0.90705	4.71955

SD: Standard deviation, SEM: Standard error of mean, CI: Confidence interval, HHS: Harris Hip Score

are females. This is in contrast with findings of Wapabeti,<sup>[19]</sup> who had 35.5% of female presentation. Our findings are in concurrence with the findings of Trudelle-Jackson *et al.*,<sup>[20]</sup> who had a female population of 73.33%.

The multimorbidity prevalence has increased worldwide;<sup>[21,22]</sup> hence, we find an increase in the number of patients (65%) undergoing total joint arthroplasty with multiple comorbidities in the past two decades.<sup>[23,24]</sup> Almost 48.39% of our patients had comorbidity such as sickle cell disorder, hypertension, and diabetes. The reason for our lower percentage may be due to the fact that our patients are younger. Our patients mean age was  $42.2 \pm 13.87$  as against the findings of Larsen *et al.*<sup>[25]</sup> and Vesterby *et al.*,<sup>[26]</sup> who recorded  $67 \pm 9.8$  and  $64 \pm 4.8$ , respectively. Our age group is in keeping with the postulation that demographics of patients for THR have become younger.<sup>[27]</sup> We used the HHS in assessing the outcome of our THR for the following reasons: first, apart from being a patient self-report, its performance is also comparable to that of a physician administered. Second, a self-report format offers several advantages over a physician-administered format;<sup>[14]</sup> hence, we gave HHS a greater consideration in its use in evaluating the outcomes of our THR series.

Comparison of preoperative and 1 year post op HHS showed a significant difference ( $P < 0.05$ ) though there was no significance difference between the 1-year and 5-year post op HHS.

The comorbidity did not affect the post op HHS ( $P > 0.05$ ). The reason for this may be attributed to our protocol which inevitably produced a particular cohort of patients whose conditions were adequately attended to before surgery. For instance, every patient of ours was reviewed by a team of medical experts comprised of a cardiologist, endocrinologist, and the anesthesiologist who certified the patients fit for THR, based on the benefit risks ratio.

Gender did not play any role in the outcome of our intervention. A comparison of post op HHS did not show any gender bias ( $P > 0.05$ ). Liu *et al.*<sup>[28]</sup> have investigated the gender-specific risk factors and outcomes and found differences in THA, especially with the location of the femoral head center, size and shape of the femoral canal, and trabecular patterns. Although some studies<sup>[29]</sup> suggested a higher perioperative complication and failure rates in men, some other studies have found similar failure rates and functional outcomes among men and women.<sup>[30]</sup>

At the time of review, none of our patients' radiological assessment showed aseptic loosening. We believe that the reason for this is the timing of our review, as aseptic loosening due to osteolysis occurs 10–20 years after total joint replacement.<sup>[31]</sup>

We had a complication rate of 4.8%, which included limb length discrepancy, pulmonary embolism, and a dislocation that we managed by closed reduction.

## CONCLUSION

Our patients presented at a younger age and most of them had osteoarthritis secondary to hip joint affectations by trauma and

AVN. Our outcome assessment showed patients benefitted from our intervention with very low complication rate. We, therefore, recommend THR for patients with disabling severe OA in our environment.

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## Conflicts of interest

There are no conflicts of interest.

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