CHARACTERISTICS &OUTCOME OF FEMUR NECK FRACTURE PATIENTS TREATED WITH HEMIARTHROPLASTY AT TIKUR ANBESSA SPECIALIZED HOSPITA

Principal investigator-Dr. Teklegiworgis Gebremedhin Zena (Final Year orthopedic Resident)

Advisor- prof. Biruk Lambisso**,** FCS (Orthopedic and traumatology surgery)

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Abbreviations

TASH- Tikur Anbessa Specialized hospital

HHS- Haris Hip score

PFF- Periprosthetic femoral fracture

WOMAC score- WESTERN ONTARIO and MCMASTER UNIVERSITIES OSTEOARTHRITIS INDEX

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assisting me in completing this project. I also want to thank the data collectors, the orthopedic clinic staff, and my colleagues for their contributions.

Abstract

Background: Femoral neck fractures are a common orthopedic injury, particularly in older adults. Hemiarthroplasty is a surgical procedure used to treat these fractures by replacing the

damaged femoral head. However, the outcomes and patient profile following hemiarthroplasty in Ethiopia have not been well-studied.

Objective: To assess the patient profile and outcomes following hemiarthroplasty for femoral neck fractures at Tikur Anbessa Hospital, Ethiopia.

Methods: A cross-sectional descriptive study was conducted from March to September 2024. Patients who underwent hemiarthroplasty for femoral neck fractures were included. Data were collected from medical records and patient interviews. Patient-reported outcomes, complications, and demographic characteristics were analyzed.

Results: Sixty patients were included. The mean age was 68.3 years (range: 43-91). Most patients were female (51.7%) and retired (66.7%). Common comorbidities included diabetes (25.4%), hypertension (11.9%), and smoking (9.8%). The most common mechanism of injury was falls (84.7%). Uncemented hemiarthroplasty (80.3%) and unipolar prosthetic design (85.2%) were most frequently used. Postoperative complications included superficial infection (8.2%) and deep vein thrombosis (8.2%). The mean Harris Hip Score was 71.2% (32-98.9%). Unsatisfactory Harris Hip scores were more common in older patients and those with delayed surgery.

Conclusion: Hemiarthroplasty is a common treatment for femoral neck fractures in Ethiopia. Patient outcomes were generally unfavorable, and postoperative complications and unsatisfactory functional outcomes were common, especially in older patients with delayed surgery. Further research is needed to improve outcomes and reduce complications.

1Introduction

Hip fractures are common and constitute 20% of the operative orthopedic trauma workload. Intracapsular femoral neck fractures account for over 50% of all hip fractures. The lifetime risk of sustaining a hip fracture is high and lies within the range of 40% to 50% in women and 13% to

22% in men. Life expectancy is increasing worldwide, and this demographic change can be expected to cause the number of hip fractures worldwide from 1.66 million in 1990 to 6.26 million in 2050 [1].

Displaced femur neck fracture in the elderly has become a worldwide concern. The total number of patients suffering from femur neck fractures is expected to rise to 6.26 million per year by 2050. Treatment choices for elderly patients with femur neck fractures are internal fixation, hemiarthroplasty, and total hip arthroplasty. Arthroplasty is the most used treatment option in elderly patients. This study aims to assess the outcome of hip hemiarthroplasty in Tikur Anbessa Hospital.[2].

The reoperation rate after hemiarthroplasty within two years interval ranges between 6% to 18%[3].

1.1 Statement of the problem

Current nationwide epidemiological data regarding hemiarthroplasty is scarce. Such information is important for better quantifying the mortality associated with such injuries, financial impact, and the implementation of preventative measures.[1].

This study aimed to evaluate functional and health-related quality of life (HRQL) outcomes after hip hemiarthroplasty and to detect some of their predictors and the overall complication rate.[1].

Research on the outcome of hip hemiarthroplasty in Ethiopia is scarce, so we are interested in studying the patient-reported outcomes of operatively treated femoral neck fractures and overall complications at Tikur Anbessa Hospital.[1].

2 Literature Review

A blood loss of < 500 ml during surgery occurred in 28 patients (97%) in the hemiarthroplasty group, and one (3%) in the hemiarthroplasty group had a blood loss of > 500 ml ($p < 0.0$). Duration of surgery was < 1hr in 50 % of cases, 1-1.5hrs in 46% of cases, and 1.5hrs in 4 of cases. The

dislocation and revision rates were zero at 12 years of follow-up. The mean HHS pain is 39.8 (SD-9.1), and the mean modified HHS is 70.3 (SD- 1.3) [4].

Regarding the optimal surgical approach, two recent meta-analyses have found that posterior approaches are associated with higher dislocation rates compared to lateral and anterior approaches and higher re-operation rates compared to lateral approaches. Cochrane review has found that while unipolar hemiarthroplasty can be associated with increased rates of acetabular erosion at short-term follow-up (up to 1 year), there is no significant difference between the unipolar hemiarthroplasty and bipolar hemiarthroplasty for the surgical outcome, complication profile, functional outcome, and acetabular erosion rates at longer-term follow-up (2 to 4 years). With regards to the optimal femoral stem insertion technique, three recent meta-analyses and one Cochrane Review have found that, while cemented hip hemiarthroplasties are associated with a longer operative time compared to uncemented Hip Hemi-arthroplasties, cemented prostheses have lower rates of implant-related complications (particularly peri-prosthetic femoral fracture) and improved postoperative outcome regarding residual thigh pain and mobility. With no significant difference between the two techniques for medical complications and mortality, cemented hip hemiarthroplasty would appear superior. [5].

One-year mortality following hip hemiarthroplasty was 27.5% (63/229). Twelve patients in the hemiarthroplasty group required secondary procedures and 15 reoperations in total. Seven were revised to total hip replacement (THR) for loosening. [6]

The average pre-op HHS was 67.2 (58-87), and post-op HHS was 98(70-100). Groin pain has occurred in 16.4% (10/61) of cases and thigh pain in 11.5% (7/61) of cases following hip hemiarthroplasty [7].

Concerning walking ability (measured in meters), we concluded that it improved if a modular hemiarthroplasty was used after both fractures ($p<0.05$) and that worse functional outcomes were observed when different kinds of hemiarthroplasties were used in the same patient in cases of bilaterality. [8].

There was a significant association between the surgeon's experience and the deep infection rate. Secondly, hematoma, re-operation, and shorter and longer operating times were associated with an increased risk of deep infection after hemiarthroplasty. No association was found between deep infection and the anatomical approach, the time when surgery was undertaken, and the use of a drain. [9].

Disease, diabetes, moderate to severe renal disease, cancer without metastasis, and metastatic solid tumors were associated with increasing PJI risk following HA for hip fracture.[10]

The cumulative incidence of PFF at four years was 1.1% in elderly patients following cemented PTS hemiarthroplasty for a hip fracture. Perioperative delirium was independently associated with a PFF. However, reoperation for PPF was not independently associated with patient mortality after adjusting for patient-specific factors. Perioperative delirium, male sex, older age, higher ASA grade, and pre-fracture residential status were independently associated with increased mortality risk following hemiarthroplasty ($p < 0.001$) [11].

A total of 24 months after HA, the total WOMAC score and its subcomponents showed no statistically significant difference between the unipolar and bipolar groups. Similarly, no statistically considerable difference was found in the PCS and MCS scores of the SF-12

questionnaire. In participants aged 70 years and younger, no difference was found in any of the functional outcomes. From the results of this study, the use of bipolar HA over unipolar design does not provide superior functional outcomes at 24 months postoperatively. The theoretical advantage of reduced acetabular wear with bipolar designs does not appear to influence functional outcomes in the first two years postoperatively.[12]

The Thompson's stem demonstrates very low rates of complications requiring reoperation and revision up to ten years after the index procedure. Fewer than one in ten patients live for ten years after fracture. This study supports using a cemented Thompson implant as a cost-effective option for frail hip fracture patients. [13]

3 Significance of the Study

Tikur Anbessa Specialized Hospital is a pioneer institution nationwide for treating femur neck fractures with arthroplasty. Femur neck fracture accounts for a significant amount of adult lower limb fractures; therefore, as an institution serving numerous numbers of this study, it will be necessary to know the final profile of patients with hemiarthroplasty done for femoral neck fracture.

Rationale

The findings of this study are expected to contribute to a better understanding of the patient profile and outcomes following hemiarthroplasty for femoral neck fractures in Ethiopia. The study provides valuable insights for healthcare providers, policymakers, and researchers.

Conceptual framework

4 Objective of the study

General objective- To assess the patient profile with hemiarthroplasty done for femur neck fracture

Specific Objective- assess patient-reported outcomes and complication rate

5 Methodology

5.1 Study Area

Tikur Anbessa Hospital is the highest health institution in Ethiopia and East Africa. It is located in the capital city of Ethiopia, Addis Ababa. It serves hundreds of thousands of clients per year. The Orthopedics and Trauma Surgery unit in Tikur Anbessa Hospital is the mother department of orthopedics, which now has more than seven children in the country.

5.2 Study period

March to September 2024

5.3 Study design

Cross-sectional descriptive study

5.4 Source population

- All femur neck fracture patients undergoing hip hemiarthroplasty

5.5 Study populations

- All femur neck fracture patients undergoing hip hemiarthroplasty which fulfill the inclusion criteria in the study period

5.6 Inclusion criteria

- All femur neck fracture patients undergoing hip hemiarthroplasty

5.7 Exclusion criteria

- Follow up less than one year

- Patients having associated injuries

-Patient with hemiparesis and malignancy

5.7 Sample Size Determination

All eligible patients were included in the study, so sample size calculation was unnecessary.

Sampling technique

All femur neck fracture patients undergoing hip hemiarthroplasty in the study period

5.8 Data collection

- Data will be collected from the OR logbook, patient cards, computer follow-up, and X-rays of patients in the computer system.

- Patients will be interviewed with a phone call

- Patients will be evaluated at OPD, and data will be collected with a stratified questionnaire, including Harris's hip score.

5.9 Data analysis

Data will be manually entered into an Excel sheet and imported into SPSS.

Data will be analyzed using the computerized statistical program SPSS version 26. Then, frequencies will be calculated for descriptive analysis of socio-demographic variables (age, sex, marital status, educational status, occupation, and residence area….).

5.9.1 Data Quality Control

Principal investigators will carry out continuous evaluation and tallying of the collected data.

5.9.1.2 Ethical Consideration

Ethical clearance will be obtained from the research and ethical review committee of TASH, Addis Ababa University College of Health Science. An official letter of permission from the department will be submitted to the TASH Orthopedic Department to conduct the research. All the collected data will be kept confidential, and no one except the research team members will have access to the collected information. All study papers and computer records will be secured under lock, and the name and other personal information will not be mentioned in any report.

5.9.1.3 Dissemination plan

The final result from the study will be submitted to the Department of Orthopedics and Traumatology, Tikur Anbessa Hospital, Addis Ababa University, as a written report. It will be presented to the concerned bodies.

6 Result

Sociodemographic

Of the 100 patients, 60 were interviewed, and their chart was reviewed. The mean age of the patients was 68.3. 31 patients (51.7%) are age less than 60,24(40%) were in the age of 60-80. whereas 31 patients (51.7%) are females and 29(48.3%) are males. Most studied patients are Retired or have no job; 40 (66.7%) and 13(21.7%) are farmers.

Table 1- sociodemographic distribution of the study participants

Variables	Frequency	Percentage
Age		
<60	31	51.7
60-80	24	40

>80	5	8.3
Sex		
Male	29	48.3
Female	31	51.7
occupation		
Retired/No	40	66.7
Farmer	13	21.7
Government	4	5
Private	3	6.7

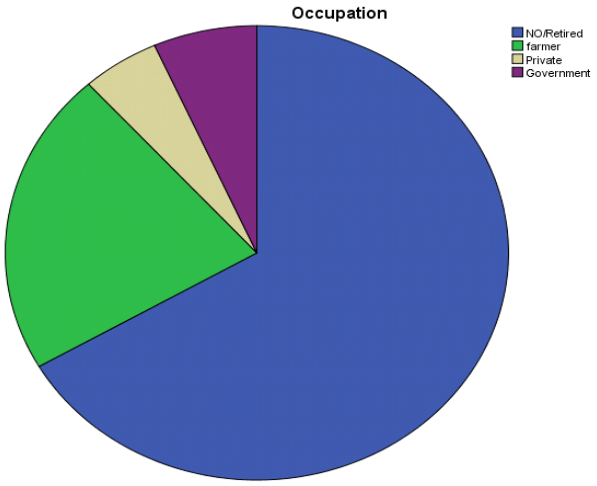


Figure-1

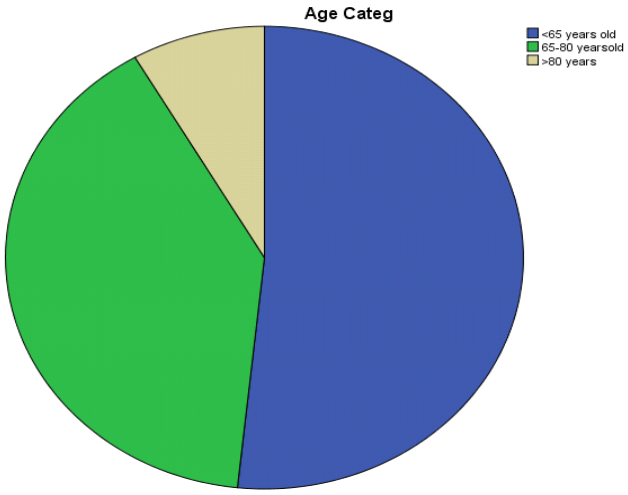


Figure-2

From age <65, 38.7% were male and 61.3% were female; from the age groups of 60-80, 58.3% were male and 41.7% female.

Table 2 – patient profile

Variables			Age Category		
			<65 years old	65-80 years old	>80 years
Sex	Male	Count	12	14	3
		%	38.7%	58.3%	60.0%
	Female	Count	19	10	2
		%	61.3%	41.7%	40.0%

From patients with comorbidities, 15(25.4%) have Diabetes Mellites, 7(11.9%) have Hypertension, and 9(15.3%) of patients have both. From 6o study participants 61.7%, 20%, and 18.3% are ASA Class-1, Class-2 and Class-3 respectively. The common Mechanism of Injury is FDA 53.3%. FDA is the comments cause of injury, accounting for 70.9% for ages <65.

Table3- comorbidities

Variables	Frequency	Percentage
Comorbidity		
Diabetes	15	25.4
Hypertension	7	11.9
Both	9	15.3
Neither	28	47.5
smoking		
Yes	6	9.8
No	54	89.2
ASA-classification		
CLASS-1	37	61.7

CLASS-2	12	20
CLASS-3	11	18.3
Mechanism of Injury		
FDA	50	84.7
RTA	10	15.3

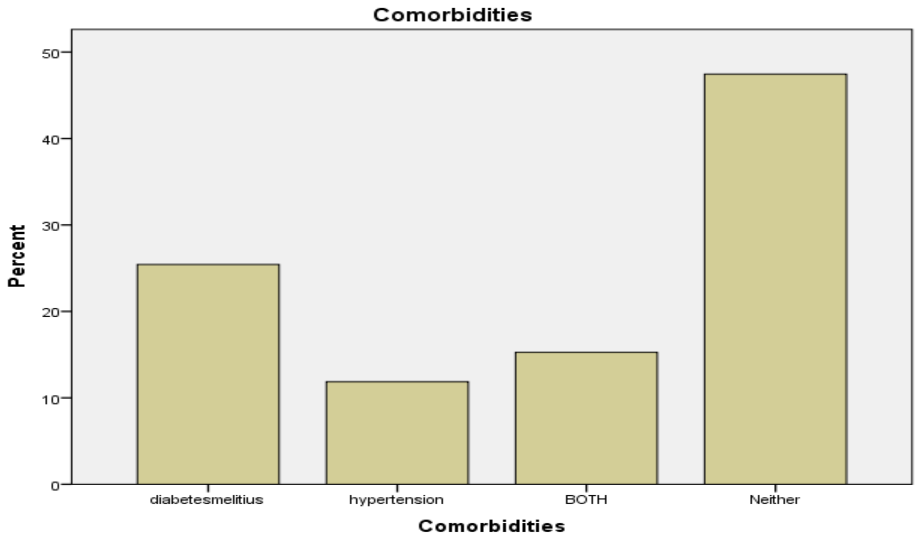
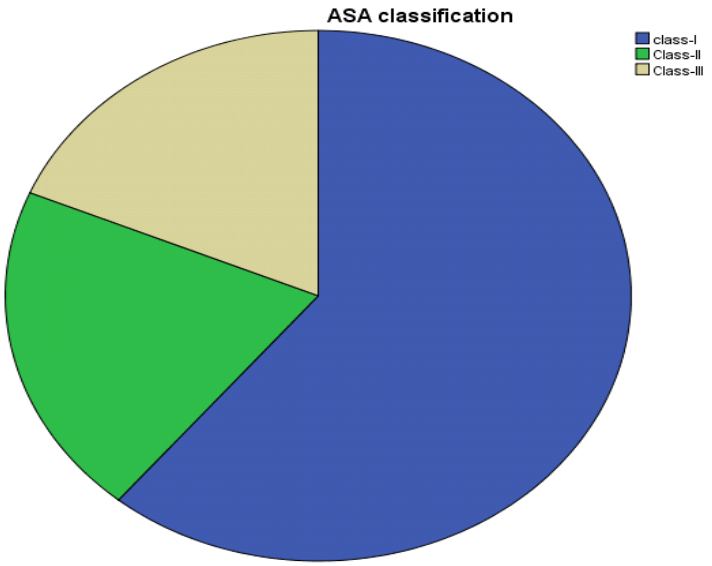


Table 3- mechanism of injury

	Age Category

		<65 years old	65-80 years old	>80 years
		Count	Count	Count
Mechanism of Injury	RTA	9	0	0
	FDA	22	23	5



Operative profile

Intra-op blood in 70.5% of patients was less than 500ml; for 73.8% of patients, the duration of surgery was >1.5hr. The arthroplasty type used was uncemented for 80.3% of patients, and unipolar was the most common prosthetic design for 85.2% of patients. 8.2% of patients developed superficial surgical site infection and DVT post-operatively. 55.7% of patients complain of groin pain post-operatively. 45(73.8%) of our study participants have a surgery timeline of less than one month.

Table 5- operative profiles

Variables	Frequency	Percentage
Intra-op blood loss		
<500ml	43	70.5
>500	17	27.9
Duration of surgery		
<1hr	2	3.3
1-1.5hr	13	21.3
>1.5hr	45	73.8
Hemiarthroplasty type		
Cemented	11	18.3
Uncemented	49	80.3
Prosthesis design		
Unipolar	52	85.2
Bipolar	8	13.1
Post-op infection		
Superficial	5	8.2
Deep	0	
No	55	98.4
DVT		

Yes	5	8.2
No	55	91.8
Groin pain		
Yes	34	55.7
No	26	42.6

Time b/n surgery and trauma		
Within one month	15	24.6
After one month	45	73.8

From the table, for all patients who developed post-op infection, the duration of surgery was >1 hour, at which 60% had>1.5hr and 40% 1-1.5hr.

Table 6- post-op infection by duration of surgery

Variables		Postop infection					
		superficial		Deep		No	
		Count	Column N %	Count	Column N %	Count	Column N %
Duration of Surgery	< 1 hour	0	0.0%	0	0.0%	2	3.6%
	1 - 1.5 hour	2	40.0%	0	0.0%	11	20.0%
	> 1.5 hour	3	60.0%	0	0.0%	42	76.4%

Of patients with Unsatisfactory Hip score, 6(13.6%) of them are smokers, but only 1(20%) of patients with post-op infection are smokers

Table 7 The profile of patients' HARIS HIP score

		Harris Hip Score			
		Unsatisfactory		Satisfactory	
		Count	Column N %	Count	Column N %
Smoking	Yes	6	13.6%	0	0.0%
	No	38	86.4%	16	100.0%

		Postop infection					
		Superficial		deep		No	
		Count	Column N %	Count	Column N %	Count	Column N %
Smoking	Yes	1	20.0%	0	0.0%	5	9.1%
	No	4	80.0%	0	0.0%	50	90.9%

		Frequency	Percent
Valid	Unsatisfactory	44	73.8
	Satisfactory	16	26.2
	Total	60	100

Most of our study participants have unsatisfactory Harris Hip scores, 73.8%, and 26.2% have satisfactory scores. The Mean Harris score is 71.2%, ranging from 32 to 98.9%

From the table below the Haris hip score in general, the Haris hip score was low in the old age groups both for males (13%) and females (9.5%); 0% was satisfactory in males and females in the age group of 60-80 and females in the age group of <60 years were unsatisfactory.

Table 8 - Harris hip scores by age and sex

				Harris Hip Score			
				Unsatisfactory		Satisfactory	
				Count	%	Count	%
Sex	Male	Age	<60 years old	9	39.1%	3	50.0%
			60-80 years old	11	47.8%	3	50.0%
			>80 years	3	13.0%	0	0.0%
	Female	Age	<60 years old	12	57.1%	7	70.0%
			60-80 years old	7	33.3%	3	30.0%
			>80 years	2	9.5%	0	0.0%

Of 44 patients who had surgery after one month of injury, 33(73.3%) had an unsatisfactory Harris Hip score. Still, 11(73.3%) patients who had surgery within one month are unsatisfactory.

Table 9- Harris Hip score by Time between trauma and surgery

		Time b/n trauma and surgery			
		after one month		with one month	
		Count	%	Count	%
Harris Hip Score	Unsatisfactory	33	73.3%	11	73.3%
	Satisfactory	12	26.7%	4	26.7%

Of 44 patients with unsatisfactory Harris scores, 37(84.1%) patients had unipolar prosthetic design; similarly, of those who had Bipolar design, 7(15.9%) had an unsatisfactory score.

Table 10- Harris Hip score by prosthetic design

		Harris Hip Score			
		Unsatisfactory		Satisfactory	
		Count	%	Count	%
Prosthesis Design	Unipolar	37	84.1%	15	93.8%
	Bipolar	7	15.9%	1	6.3%

Of patients with an Unsatisfactory Harris hip score (39), 86.6% had uncemented arthroplasty, and 10(62.5%) patients with satisfactory scores had cemented arthroplasty**.**

Table 11 - Harris Hip score by hemiarthroplasty type

		Hemiarthroplasty type			
		Cemented		Uncemented	
		Count	%	Count	%
Harris Hip Score	Unsatisfactory	5	11.4%	39	88.6%
	Satisfactory	6	37.5	10	62.5%

From the table (27), 87.1% of patients with age <60 had uncemented arthroplasty, and only 4(12.9%) had cemented. In the age group >80 years, all are uncemented.

Table 12- arthroplasty type by age category

			Age Category		
			<60 years old	60-80 years old	>80 years
Hemiarthroplasty type	Cemented	Count	4	7	0
		%	12.9%	29.2%	0.0%
	Uncemented	Count	27	17	5
		%	87.1%	70.8%	100.0%

7 Discussion

This institution-based cross-sectional study was conducted to determine the profile of patients with hemiarthroplasty done for femur neck fracture at Black Lion Hospital, Ethiopia, from 2013-2022GC.

The mean age of patients in our study was 68.3 with an age range of 43-91, similar to a prospective study done in Nigeria among 25 patients with a mean age of 71.68 because of the population's similarity. (3) The age category in our study was 51.7% for the age group of <60 years; similarly, a study done in Nigeria was 56% for ages <60. The number of females in our study was 51.7%, which coincides with the study done in Pakistan among 62 patients, of which females account for 53.22%. [14] This differs from the study done in Nigeria, in which males are the predominant. (3) The occupational distribution in our study showed 66.7% are retired/No job. Similarly, in a study from Nigeria, the commonest occupation distribution is dependent on 32% and 20% retired.

32(52.5%) patients have comorbidity, 25.4% of them have Diabetes, and 11.9% have Hypertension, with 15.3% of them having both DM and HTN. A study done in India among 57 cases also showed that 46 cases (80.7%) of patients have comorbidities like DM, HTN, COPD, Stroke, and MI. In both studies, the number of patients with comorbidity is very high because of the population's old-age nature.[3]

Most patients' Mechanisms of injury are FDA for 50(84.7%) of patients, which is the sole mechanism of injury for the age groups 60-8 and those above 80. The reason behind this is the lower bone quality of the old patients. For age <60, RTA is the mechanism of injury in 9 patients.

In our study, 49(80.3%) of patients have uncemented hemiarthroplasty, and 18.3% have cemented; a retrospective cohort study done in the USA among 686 showed similar rates of cemented (55%) and cementless (45%) fixation, which is different from our research that explained by the low socioeconomic and availability issue of cement.[15]. 52(85.2%) patients in our study have a unipolar prosthetic design, and 8(4.8%) have a bipolar design; similarly, a study in the USA showed a larger portion of patients who underwent HA surgery used unipolar femoral head (531/686, 77%) and bipolar femoral head in (156/686, 23%) that explained by cost issue, availability, and surgeon preference.

In our study, 45(73.8%) of patients were operated on after one month of the surgery, and 15(26.2%) of patients were operated on after one month, which can be explained by the lack of accessibility of setups in the country that provide the procedure in the country and availability of implants for the operation.

In our study, an unsatisfactory Harris Hip score accounts for 73.8%, and 26.2% have a satisfactory score; a study from Pakistan showed the overall result by HHS was excellent or good in 32.6% of cases, while it was fair in 39.5% of cases and 25% have poor HHS, which is similar with our Harris hip score, that explained by delay of surgery, long duration after surgery and lack of revision.

In our study, 47.8% of males in the age group of 60-80 and 57.1% of females in the age group of 60 have unsatisfactory scores, which is almost similar in both sexes; a study from Pakistan showed for both sex average Harris Hip score of 72.8 and 70.6 respectively which is fair score the finding is comparable with our study. All patients above the age of 80 years have unsatisfactory Harris scores. From a survey of surgery done after one month of trauma, 73.3% of the patients had unsatisfactory Harris Hip score; a similar outcome from a 12 years prospective

study done in Indonesia among 12 patients showed there was a significant correlation between time of surgery and trauma by Salvati Wilson pain score, that the weak muscles can explain function.[16]

The rate of infection in our study shows 5(8.2%) patients have superficial surgical site infection but no Deep infections; a retrospective cohort study done in the USA among 6169 for risk factors of SSI showed the overall rate to be 1.3%, which lower than our study, that explained by our patients' old age and comorbidity.[16].

Strengths and limitations of the study

To our knowledge, this is the first study done in Ethiopia that characterized hip hemiarthroplasty patients and overall postoperative complications.

The small sample size and the fact that it is only done in a single center makes it difficult to generalize the results for the general population. The authors recommended replicating this study in a prospective multicenter study.

Conclusion -Hemiarthroplasty is a common treatment for femoral neck fractures in Ethiopia. Patient outcomes were generally unfavorable, and postoperative complications and unsatisfactory functional outcomes were common, especially in older patients with delayed surgery. Further research is needed to improve outcomes and reduce complications.

Recommendations

For physicians

Revision arthroplasty is recommended since most patients have functional limitations, as evidenced by low HHS.

For the institution,

since patient data is lost, strengthening documentation protocol is important.

For the Ethiopian orthopedics and traumatology association

Deciding on the cut-of-age for doing hemiarthroplasty would be beneficial since most of the patients are below and are not doing well after hemiarthroplasty

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9 Anenex1- Questionnaire

Questioner on outcome of operative treatment of femoral neck fractures and overall complication rate-

- Are you willing to participate in this study?
  - Yes

- No
- Name of the pt
- Card number-
- Date of interview

- Sociodemographic status of the participants
- Sex
  - Male
  - Female
- Age -
- Residence
  - Addis Ababa
  - Out of Adis Ababa
- Educational Status
- Occupation

- Comorbidities
- Comorbidities
  - Yes
  - No
- Diabetes Mellitus
  - Yes
  - No
- Hypertension
  - Yes
  - No
- Malignancy
  - Yes
  - No
- Other comorbidities
- Alcohol use
  - Yes

- No
- Smoking
  - Yes
  - No

- Patient characteristics
  - Mechanism of injury
    - FDA
    - RTA
    - Others
  - Date of Surgery
  - Time between trauma and Surgery: Within a day
    - Within 1 months
    - After 1 months
  - Fracture Side
    - Right
    - Left
  - ASA classification
    - Class-I
    - Class-II
    - Class III
    - Class-IV
  - Surgical Approach used
    - Posterior
    - Anterior
    - Lateral
    - Anterolateral
  - Intra-operative blood loss
    - <500 ml
    - >500 ml

- Duration of operation
    - <1 hr
    - 1-1.5hrs
    - >1.5hrs
- Presence of intra OP complications
    - Yes
    - No
- If yes, type of intra-op complication
    - ---------
- Types of hemiarthroplasties
    - Cemented
    - Uncemented
- Types of prosthesis used
    - Austin Moor
    - Thompson
    - Other
- Design of prosthesis
    - Unipolar
    - Bipolar
- Post-operative infection
    - Yes
    - Mo
- If present
    - Superficial
    - Deep
- Developed DVT
    - Yes
    - No
- Groin Pain
    - Yes

        - No
- Outcome
    - Dislocation
        - Yes
        - No
    - Revision/ conversion to THR
        - Yes
        - No
    - Harris Hip score pre- vs. post-op