Journal of
Osteoporosis & Physical Activity

OPEN ACCESS Freely available online

Research Article

Cost of Osteoporosis-Related Hip Fractures in a Private Tertiary Hospital System

Alexander S. Ho*, Pablo J. Ilano III

Department of Orthopaedics, Chong Hua Hospital, Cebu, Philippines

ABSTRACT

Background: Osteoporotic fractures, especially of the hip, lead to great burden both for the patient and economy. Due to the paucity of burden of illness studies of osteoporosis in the Asian region, particularly the Philippines, it is difficult to allocate healthcare resources appropriately for fracture prevention. The availability of information on the financial burden of osteoporosis-related fractures, particularly in the local region, will create awareness of the size of the problem as well as assist healthcare authorities to initiate appropriate programs and strategies.

Objective: to determine the cost of osteoporosis-related hip fractures in a private tertiary hospital.

Methods: Data from the medical records of patients diagnosed with osteoporosis-related hip fractures who were hospitalized from January 1, 2017- December 31, 2019 were analyzed. The researcher recorded the patient's demographic data, type of hip fracture, type of treatment, duration of hospitalization, and medical costs. Descriptive statistics, t-test, chi-squared test, ANOVA with Tukey HSD test and regression analysis were employed to treat and analyze the different sets of data.

Results: Among the 150 patients, 44.6% were within the 80-year-old and above age group and majority (76%) were females. The most common type of osteoporotic hip fracture involved the femoral neck (52.7%) and most of the patients underwent partial hip replacement (66%). Patients 80 and above age group, those sustaining an intertrochanteric fracture and those who were treated with internal fixation had a longer length of stay in the hospital. There was note of a parallel increase in the direct medical cost as the patients age group got older. It was found that femoral neck fracture had significantly higher implant costs while the other costs (hospitalization, surgery, laboratories, and medications) were observed to be comparable between the two types of fracture.

Conclusions: The overall mean cost of osteoporotic hip fracture was 5227.78 USD. The implant used on average accounted for approximately 27% of the total direct medical costs. It was noted that 26% and 23% of the total cost was attributed to the cost of surgery and hospitalization respectively. Medication costs accounted for 11% while laboratory costs comprised 13% of total costs.

Keywords: Osteoporosis; Economic burden; Osteoporosis-related hip fractures; Geriatric hip fractures

INTRODUCTION

Background of the study

It is estimated that osteoporosis cause more than 8.9 million fractures annually worldwide [1]. As the country's population is ageing, a potential escalation of the incidence of osteoporosis as well as its economic burden is expected. [2].

Osteoporotic fractures, especially of the hip, lead to great burden both for the patient and economy. Several studies have demonstrated the heavy burden of osteoporotic fractures. In Asia, osteoporosis- related fractures are associated with a mortality rate of 10-20% while a third of these patients remain disabled [3].

Due to the paucity of burden of illness studies of osteoporosis in the Asian region, particularly the Philippines, it is difficult to allocate healthcare resources appropriately for fracture prevention. The availability of information on the financial burden of osteoporosis-related fractures, particularly in the local region, will create awareness on the size of the problem as well as assist healthcare authorities to initiate appropriate programs and strategies.

Significance of the study

The determination of the cost of treatment of osteoporosis-related hip fractures will provide essential information on the burden of this disease to individuals and the society. The information that will

***Correspondence to:** Alexander S. Ho, Department of Orthopaedics, Chong Hua Hospital, Cebu, Philippines, Tel: + +639173179213; E-mail: boneswillbemylife@gmail.com

Received: Feb 15, 2021; **Accepted:** Mar 15, 2021, **Published:** Mar 22, 2021

Citation: Ho AS, Ilano III PJ (2020) Cost of Osteoporosis-Related Hip Fractures in a Private Tertiary Hospital System. J Osteopor Phys Act. 9:240. doi: 10.35248/2329-9509.21.9.240

be gathered in this study could assist policy makers in establishing programs aimed at osteoporosis-related fracture prevention to effectively reduce the financial and the economic burden of disease.

Research question

What is the cost of osteoporosis-related hip fractures in a private tertiary hospital?

Research objectives

General objectives: To determine the cost of osteoporosis-related hip fractures in a private tertiary hospital.

Specific objectives:

1. To determine the patient's demographic data in terms of:

a) Age

b) sex

2. To determine the type of osteoporotic-related hip fracture as either:

a) Intertrochanteric fracture

b) Femoral neck fracture

3. To determine the type of hip fracture treatment as either:

a) Partial Hip Replacement

b) Total Hip Replacement

c) Internal Fixation

4. To determine the mean duration of hospitalization stay

5. To determine direct medical costs of:

a) Hospitalization

b) Surgery

c) Implants

d) Laboratories

e) Medications

6. To compare the relation of direct medical costs to:

a) Age

b) Duration of hospitalization

c) Types of hip fracture

d) Types of hip fracture treatment

Definition of terms

Osteoporosis: Related hip fracture/ osteoporotic hip fracture – a fracture of the proximal femur, either intertrochanteric fracture or femoral neck fracture, resulting from low level trauma or fall from a standing height or less.

Direct medical cost: The amount paid for hospitalization, surgery, implant, laboratories, and medications. In this study, the Philippine currency (PHP) was used to determine the cost and was converted to United States Dollar (USD) with a conversion rate of 0.021 PHP per USD.

1. Hospitalization – in this study, it refers to the cost incurred from the miscellaneous supplies used in the care of the patient and from the room accommodation.
2. Surgery – in this study, it refers to the cost incurred from the blood bank, operating room and post anesthesia care unit.
3. Implant – in this study, this will be the cost of the implant used.
4. Laboratories – in this study, it refers to the cost incurred from the blood tests, Cardio Pulmonary clearance and further imaging of the affected extremity (Ct scan, MRI and X- rays).
5. Medications – in this study, it refers to the cost incurred from the pharmacy.

Direct nonmedical cost: Costs that are made for the patient which include transportation, home-care, equipment purchased and/or nutrition supplement.

Index admission: The patients first such hospitalization during the period of observation for the treatment of osteoporotic hip fracture.

Scope and limitation of study

This study is based on inpatient data only. It is not possible to separate hospital costs attributable to the treatment of co-morbidities or other conditions that might have been present or might have developed at the time of hospitalization for treatment of osteoporosis related hip fracture. Thus, fracture-related costs will undeniably include costs related to the treatment of other conditions, making the total burden of osteoporosis-related fractures overestimated to some degree. The patient's direct nonmedical cost is beyond the scope of this study.

Ethical considerations

This study was approved by the ethical review board of Chong Hua Hospital (IRB reference code: 1132-11) and followed the Declaration of Helsinki.

REVIEW OF RELATED LITERATURE

Osteoporosis is a disease in which the density and quality of bone are reduced [4]. Worldwide, osteoporosis causes more than 8.9 million fractures annually, resulting in an osteoporotic fracture every three seconds. The most common fractures associated with osteoporosis occur at the hip, spine and wrist, the likelihood of which increases with age in both women and men [1]. This annual incidence included 1.6 million cases of hip fractures. Hip fracture is known as a major osteoporotic fracture and account for significant morbidity. It has a high mortality rate of 16%-23% during the first year after fracture [5]. Hospitalization is always required for all hip fractures. Thus, making hip fractures as among the most expensive orthopedic procedures. The medical cost of hip fracture has become a great burden to the patients, their families, and to the medical system [6].

In 2017, A multicenter study conducted at 73 tertiary hospitals in China revealed that the hospitalization cost of hip fracture has become a great burden to families. This study included 27, 205 cases of hip fracture. It was found that the mean cost of hospitalization of all patients amounted to ¥53 440 equivalent to 8103.91 USD. This cost analysis study also revealed that the 60–69 years age group had a significantly higher cost compared with 80 years old and above group. Aside from that, it was found that the mean cost of femoral neck fractures was lower than that of the patients with intertrochanteric fractures and the mean cost of hip

replacement was higher than that of internal fixation. This showed that there is a correlation between the surgical approaches to the cost of hospitalization [6]. Furthermore, a systematic review on the economic burden of osteoporosis-related hip fracture in Asia revealed that hospitalization, surgical procedures, and implants consumed a higher proportion of total hospitalization cost [7].

The Asian Federation of Osteoporosis Societies conducted a hip fracture projection study last 2018. This study took place in nine Asian countries namely: China, Hong Kong, Japan, India, Korea, Malaysia, Singapore, Taiwan, and Thailand. It was projected that there will be a 2.28-fold increase in cases of hip fracture in Asia, ranging from 1,124,060 cases in 2018 to 2,563,488 cases by 2050. Thus, it is expected that there will be a steady increase of the economic burden brought about by the expensive cost of hip fracture hospital treatment [8].

As projected, osteoporotic hip fractures will rise due to the ageing population [5]. In the Philippines, it is estimated that 17 million people are currently aged 50 years old and above [9]. Given the large elderly population in our country, osteoporosis is and will be a major health problem in the coming years [10]. Several studies in Asia on the economic burden of hip fracture have been conducted. Unfortunately, there is paucity of burden of illness studies on osteoporosis in the Philippines, thus the need for further investigation.

RESEARCH METHODOLOGY

Study design

This is a retrospective descriptive chart review study.

Data source

The hospitalization data from the medical records section of Chong Hua Hospital of patients diagnosed with osteoporosis-related hip fractures who were admitted and discharged within January 1, 2017- December 31, 2019 was analyzed.

Study population

Inclusion criteria:

1. All patients diagnosed with osteoporotic hip fracture who had their index admission from January 1, 2017- December 31, 2019.
2. All patients >50 years of age who sustained an osteoporotic hip fracture.

Exclusion criteria:

1. Patients who sustained high energy trauma.
2. Patients who sustained other fractures aside from osteoporotic hip fracture.
3. Patients with tumor or pathologic fracture (except for osteoporotic fracture).
4. All patients who expired during in hospital treatment.

Data collection

The conduct of the study was implemented once the protocol was approved by the Chong Hua Hospital Institutional Review Board (IRB). Once with IRB approval, permission from the Medical Records Section was sought to access patient's hospital records. All cases of osteoporotic hip fracture were screened to meet the inclusion and exclusion criteria accordingly. The researcher recorded the patient's demographic data, location of hip fracture, type of treatment, duration of hospital stays, and medical cost.

Data management

Descriptive statistics was employed to treat and analyze the data using the MS Excel (or MiniTab). Frequency count and percentages was determined and computed respectively. Patient characteristics (age, diagnosis, and treatment) was shown as a percentage for categorical variables and for continuous variables by using the mean and SD in relation to length of stay and medical costs accordingly. The comparison of two population means and population proportions are done using t-test for two independent samples and "n-1" chi- squared, respectively. The comparison of multiples means is done through one-way ANOVA with Tukey HSD test. While for multiple proportions, test for multiple proportions is done. Regression analysis is also done determine the association of age and duration of hospitalization to medical costs. A statistic with p-value less than 0.05 is considered significant.

RESULTS

A total of 150 patients were enrolled in the study from January 1, 2017 to December 31, 2019. Among the 150 patients, 44.67% were within the 80-year-old and above age group and majority (76%) were females (Table 1) (Figure 1).

Table 2 shows that femoral neck fracture (52.67%) was the more common type of osteoporotic fracture. The type of hip fracture treatment was further analyzed. The result showed that most of the patients underwent partial hip replacement, comprising 66% of the cases (Table 3) (Figures 2 and 3).

The duration of hospital stay among study participants were recorded and analyzed in relation to age, diagnosis, and treatment. Results showed that the 80 and above age group had a longer length of stay with mean of 11.58 days as compared to the younger age group. Patient's with intertrochanteric fracture were admitted longer (11.65 days) than those with femoral neck fractures. This study also showed that patients treated with internal fixation had longer stay in the hospital at 11.39 days (Table 4).

The direct medical cost in relation to age was analyzed and showed increasing mean cost with the increasing age group. Table 5 shows that patients with age 80 years old and above had a higher mean cost of hospitalization 1441.27 USD, surgery 1463.25 USD, laboratories 791.32 USD, and medications 33461.07 USD. However, it was found out that implant cost was higher in the 60-69 years old age group 1653.87 USD (Table 5) (Figure 4).

The direct medical cost in relation to the type of fracture was further analyzed (Table 6). This study showed that patients who sustained a femoral neck fracture had a higher mean cost of the following: surgery 1381.50 USD, implants 1667.22 USD and medications 594.97 USD. On the other hand, patients who had an intertrochanteric fracture had a higher cost in hospitalization 1283.46 USD and laboratories 758.47 USD.

The direct medical cost in relation to the type of treatment was analyzed as well (Table 7). It was found out that hospitalization 1263.49 USD and medications 635.96 USD cost were higher with partial hip replacement while surgery 1401.37 USD and implant 3037.08 USD cost were more expensive with total hip replacement. Laboratory cost 811.26 USD was more expensive in the internal fixation group.

Table 1: The demographic profile of the patients with osteoporotic hip fracture, n = 150.

Age	Male		Female		Total	
	frequency	Percentage(%)	frequency	Percentage (%)	frequency	Percentage (%)
80 andabove	16	10.67	51	34.00	67	44.67
70-79	8	5.33	36	24.00	44	29.33
60-69	4	2.67	19	12.67	23	15.33
50-59	8	5.33	8	5.33	16	10.67
Total	**36**	**24.00**	**114**	**76.00**	**150**	**100.00**

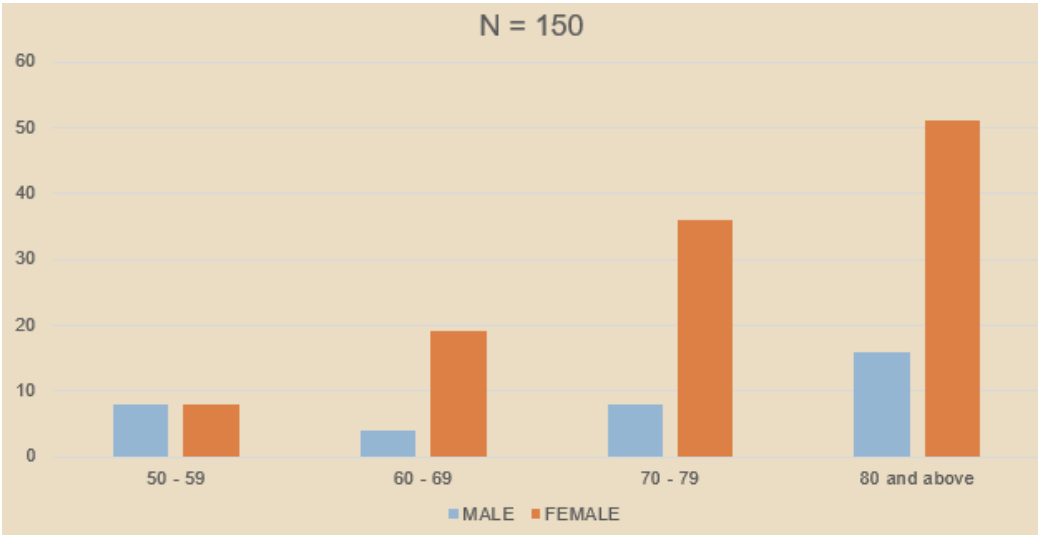

Figure 1: The demographic profile of the patients with osteoporotic hip fracture.

Table 2: the type of osteoporotic hip fracture, n = 150.

Location	Frequency	Percentage (%)
Intertrochanteric Fracture	71	47.33
Femoral Neck Fracture	79	52.67

Table 3: The type of osteoporotic hip fracture treatment, n = 150.

Location	Frequency	Percentage (%)
Partial Hip Replacement	99	66
Total Hip Replacement	23	15.33
Internal Fixation	28	18.67

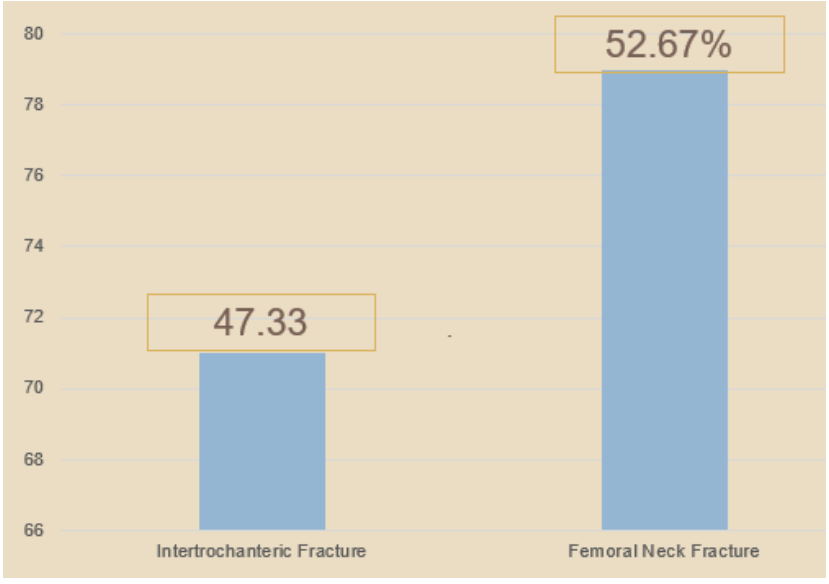

Figure 2: Type of osteoporotic hip fracture.

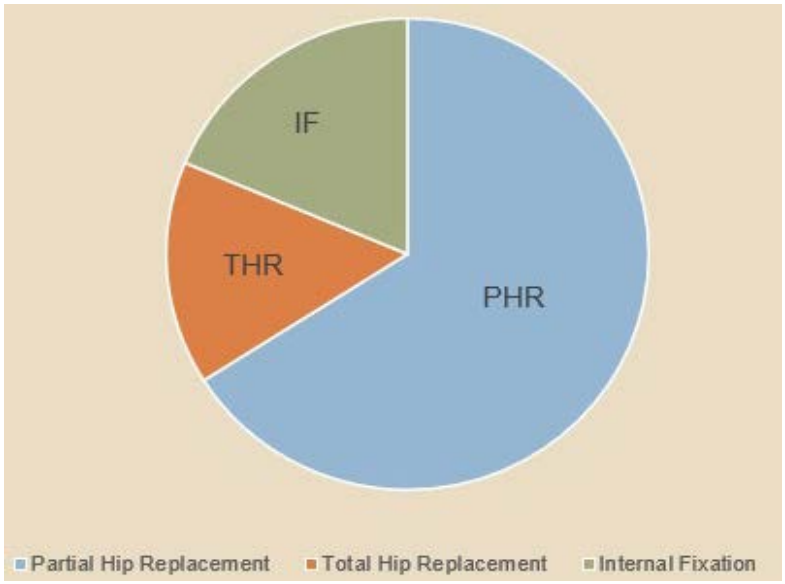

Figure 3: Type of hip fracture treatment.

Table 4: The duration of hospital stay of patients with osteoporotic hip fracture, n = 150.

Characteristics	Length of Hospital Stay (in day)	
	Mean	Standard Deviation
Age	**10.44**	**4.84**
80 and above	11.58	4.51
70-79	10.41	5.61
60-69	8.52	3.63
50-59	8.5	4.29
Diagnosis		
Intertrochanteric	11.65	4.9
fracture		
Femoral Neck fracture	9.35	4.55
Treatment		
Partial Hip Replacement	10.96	4.36
Total Hip Replacement	7.04	3.31
Internal Fixation	11.39	6.31

Table 5: The direct medical cost in relation to age, n = 150.

Direct Medical Cost (in USD)	Age							
	50-59		60-69		70-79		80 and above	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Hospitalization	903.92	429.26	861.43	520.30	1075.55	745.90	1441.27	863.46
Surgery	1034.93	352.78	1439.19	1166.24	1272.21	794.02	1463.25	924.42
Implants	1262.24	1089.64	1653.87	1064.90	1520.37	875.34	1316.35	478.39
Laboratories	586.41	365.95	501.58	298.43	643.62	441.58	791.32	523.45
Medications	467.74	497.36	366.80	222.25	548.78	426.40	696.68	672.43

Note: SD means Standard Deviation.

A summary of the direct medical cost of osteoporotic hip fracture in relation to age, diagnosis, and treatment is shown in Table 8. The findings show that there is an increasing trend of the mean total cost with a higher age group. Patients who had a diagnosis of femoral neck fracture spent more during their hospitalization compared with the intertrochanteric fracture group. Those who underwent total hip replacement had higher cost compared to the partial hip replacement and internal fixation group. Overall, the mean cost of osteoporotic hip fracture in this study is 5227.78 USD.

The implant used on average accounted for approximately 27% of the total direct medical costs. It was noted that 26% and 23% of the total cost was attributed to the cost of surgery and hospitalization respectively. Medication costs accounted for 11% while laboratory costs comprised 13% of total costs (Table 9) (Figure 5).

Table 10 shows that age is significantly associated to the total medical cost. It can be said that a year of increase in patient's age corresponds to an increase of medical cost to around 52.05 USD.

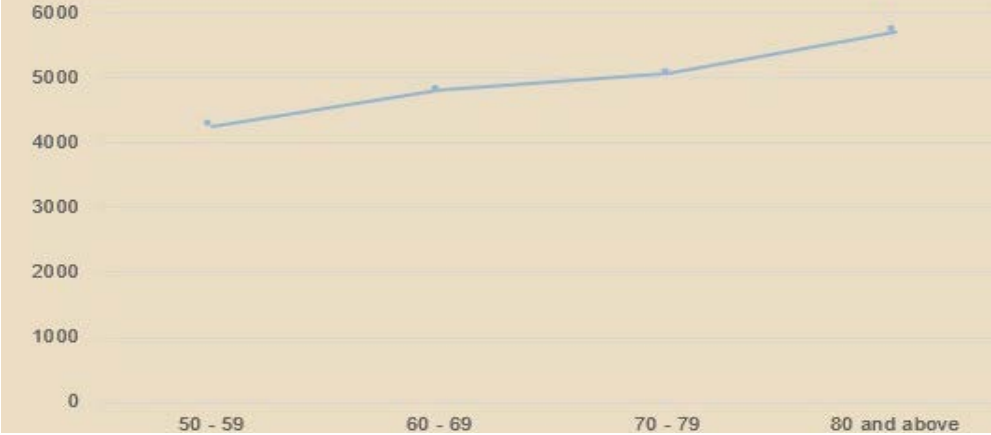

Figure 4: Descriptive statistics of direct medical cost.

Table 6: The Direct Medical Cost in Relation to type of Hip Fracture, n = 150.

Direct Medical Cost (in USD)	Diagnosis			
	Intertrochanteric Fracture		Femoral Neck Fracture	
	Mean	SD	Mean	SD
Hospitalization	1283.46	852.01	1101.76	701.64
Surgery	1331.51	750.22	1381.50	1004.45
Implants	1149.53	650.50	1667.22	831.95
Laboratories	758.47	507.84	612.73	413.70
Medications	559.73	511.59	594.97	580.59

Note: SD means Standard Deviation.

Table 7: The direct medical cost in relation to type of treatment.

Direct Medical Cost (in USD)	Treatment					
	Partial hip		Total hip		Internal Fixation	
	Mean	SD	Mean	SD	Mean	SD
Hospitalization	1263.49	773.14	826.20	455.62	1217.01	936.97
Surgery	1363.75	966.69	1401.37	699.82	1301.16	762.48
Implants	1307.07	146.64	3037.08	510.63	502.67	173.99
Laboratories	705.58	389.08	421.27	314.28	811.26	696.62
Medications	635.96	596.28	439.74	410.01	488.21	435.44

Note: SD means Standard Deviation.

Table 8: Descriptive statistics of the direct medical cost of patients with hip fracture, n = 150.

Characteristics	Direct Medical Cost (USD)		
	Mean	SD	95% Confidence Interval
Age			
80 and above	5708.87	1926.35	(5238.99, 6178.74)
70-79	5060.53	1840.70	(4500.90, 5620.15)
60-69	4822.89	1499.56	(4174.43, 5471.35)
50-59	4255.24	1487.73	(3462.48, 5048.00)
Diagnosis			
Intertrochanteric fracture	5082.69	2019.66	(4604.65, 5560.74)
Femoral Neck fracture	5358.18	1681.54	(4981.54, 5734.83)
Treatment			
Partial Hip Replacement	5275.84	1745.57	(4927.69, 5623.99)
Total Hip Replacement	6125.67	1276.11	(5573.84, 6677.51)
Internal Fixation	4320.31	2216.59	(3460.81, 5179.82)
Overall	5227.78	1848.13	(4929.61, 5525.96)

Note: SD means Standard Deviation.

But when the cost is broken down into 5 components (namely hospitalization, surgery, implants, laboratories, and medications), the age is only significantly associated with cost related to hospitalization, laboratories, and medications. As the age of the patient increases, the costs on hospitalization, laboratories, and medications also increase. Among these three medical cost components, hospitalization has the greatest amount of increase as the age of the patient increases. On the other hand, age is not significantly associated with cost related to surgery and implants.

The Table 11 shows that there is a significant association between duration of hospitalization to the total medical cost. It can be said that an additional day of hospitalization of the patient corresponds to an increase of medical cost to approximately 187.38 USD.

But when the cost is broken down into 5 components (namely hospitalization, surgery, implants, laboratories, and medications), the duration of hospitalization is only significantly associated with cost related to hospitalization, implants, laboratories, and medications. As the number of hospital day increases, the costs on hospitalization, laboratories, and medications also increase. Among these four medical cost components, hospitalization has the greatest amount of increase as the number of hospital stay of the patient increases. On the other hand, duration of hospital stay is not significantly associated with cost related to surgery.

Table 9: Distribution of total hospital costs for treatment of osteoporosis-related fracture, by component of care, n = 150.

Components of care	Distribution of Total Hospital Costs (USD)	
	Mean	Percentage
Total Mean Cost	5227.78	100%
Hospitalization	1187.76	23%
Surgery	1357.83	26%
Implant	1422.18	27%
Laboratories	681.71	13%
Medications	578.29	11%

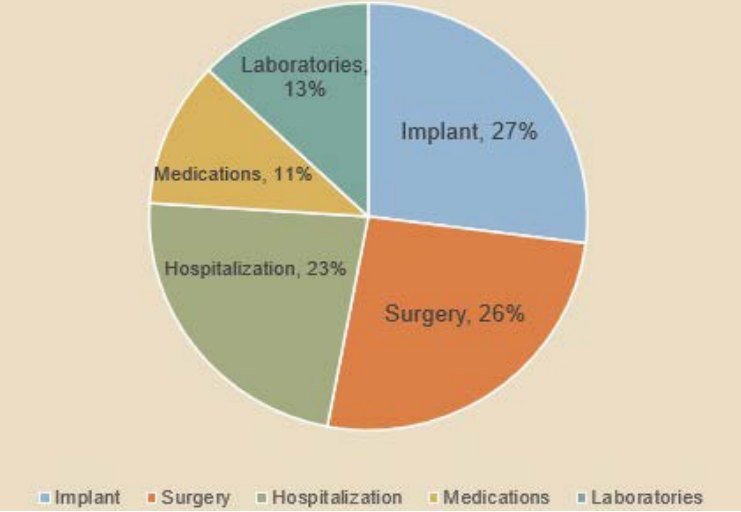

Figure 5: Distribution of costs by component of care.

Table 10: Regression analysis of age and medical cost, n = 150.

Predictor	Coefficient	SE Coefficient	T-Value	P-Value
Total Cost				
Age	2493.7	629.6	3.96	<0.001**
Hospitalization Cost				
Age	1100	264.1	4.17	<0.001**
Surgery Cost				
Age	601.5	315.2	1.91	0.058
Implants Cost				
Age	-170.6	283.6	-0.6	0.549
Laboratories Cost				
Age	427.3	162.8	2.62	0.010**
Medications Cost				
Age	535.5	191.1	2.8	0.006**

Note: Significant at 0.05

A comparative analysis of the direct medical cost between the two types of hip fracture was done. Table 12 shows that the total costs are not significantly different between the two types of hip fracture. But when the cost is broken down into 5 components (namely hospitalization, surgery, implants, laboratories, and medications), costs on implants are significantly different between the two types of fracture. It appears that femoral neck fracture has significantly higher cost in this component. While the other costs are observed to be comparable between the two types of fracture.

A comparative analysis was done between the direct medical cost of the types of surgical procedure. The table shows that the total costs are significantly different among the three types of treatment. The post hoc analysis tells that partial hip and total hip are comparably costly compared to internal fixation.

When the cost is broken down into 5 components (namely hospitalization, surgery, implants, laboratories, and medications), the findings show that costs on implants and laboratories are significantly different among the three types of treatment. The post hoc analysis tells that total hip is the costliest while internal fixation is the least costly in terms of implants. While in the cost related to laboratory, partial hip and internal fixation are comparably costly compared to total hip. While the other costs are observed to be comparable among the three types of treatment (Table 13).

Table 11: Regression analysis of duration of hospitalization and medical cost, n = 150.

Predictor	Coefficient	SE Coefficient	T-Value	P-Value
Total Cost				
Duration of Hospitalization	9108	1308	6.96	<0.001**
Hospitalization Cost				
Duration of Hospitalization	4315.6	527	8.19	<0.001**
Surgery Cost				
Duration of Hospitalization	1230.6	719.1	1.71	0.089
Implants Cost				
Duration of Hospitalization	-1800.8	629.2	-2.86	0.005**
Laboratories Cost				
Duration of Hospitalization	2994.6	288.2	10.39	<0.001**
Medications Cost				
Duration of Hospitalization	2367.7	401.8	5.89	<0.001**

Note: Significant at 0.05

Table 12: The comparative analysis of the direct medical cost between the types of hip fracture, n = 150.

Direct Medical Cost (in USD)	Diagnosis				Test Statistic (P-Value)
	Intertrochanteric Fracture		Femoral Neck Fracture		
	Mean	SD	Mean	SD	
Total Cost	5082.69	2019.66	5358.18	1681.54	-0.90 (0.369)
Hospitalization	1283.46	852.01	1101.76	701.64	1.42 (0.159)
Surgery	1331.51	750.22	1381.5	1004.45	-0.35 (0.729)
Implants	1149.53	650.5	1667.22	831.95	-4.27 (<0.001) **
Laboratories	758.47	507.84	612.73	413.7	1.91 (0.058)
Medications	559.73	511.59	594.97	580.59	-0.40 (0.693)

Note: SD means Standard Deviation; ** Significant at 0.05

Table 13: The comparative analysis of the direct medical cost between the types of treatment.

Direct Medical Cost (in USD)	Treatment						Test Statistic (P-Value)
	Partial Hip		Total Hip		Internal Fixation		
	Mean	SD	Mean	SD	Mean	SD	
Overall Cost	^{A}5275.84	1745.57	^{A}6125.67	1276.11	^{B}4320.31	2216.59	6.58 (0.002) **
Hospitalization	1263.49	773.14	826.2	455.62	1217.01	936.97	3.43 (0.051)
Surgery	1363.75	966.69	1401.37	699.82	1301.16	762.48	0.09 (0.918)
Implants	^{B}1307.07	146.64	^{A}3037.08	510.63	^{C}502.67	173.99	721.08 (<0.001) **
Laboratories	^{A}705.58	389.08	^{B}421.27	314.28	^{A}811.26	696.62	5.09 (0.007) **
Medications	635.96	596.28	439.74	410.01	488.21	435.44	1.68 (0.190)

Note: SD means Standard Deviation; ** Significant at 0.05; ^{A,B,C} indicate the significant differences using Turkey HSD test (post hoc analysis), A indicates the highest mean and C indicates the lowest mean.

DISCUSSION

Osteoporotic hip fractures are common injuries seen among elderly patients in the emergency setting. Hip fractures lead to threatening joint complications if without prompt diagnosis and management [11,12]. Thus, surgical management and physical rehabilitation is imperative in the management of osteoporotic hip fracture to restore function and mobility [12]. Another significant consequence of osteoporotic hip fracture is its burden on society and the health care system [13]. It is said that the economic burden of hip fracture in the United States is amongst the top 20 expensive diagnoses, with approximately 20 billion dollars spent on the management of this injury [11].

The incidence of hip fractures increases exponentially with an increasingly elderly population. Not only because older patients have weaker bones, they are also more likely to fall due to poor balance as well as difficulty steering around environmental hazards [14]. In 2018, a multicenter study conducted by Wang, et al. found that patients 80 years old and older had the highest number of hip fracture. This explains the fact that osteoporosis becomes more severe as the patient grew older [6]. Furthermore, it was found that females are more likely to develop osteoporosis than men. According to the National Osteoporosis Foundation of America, approximately one in two women over age 50 will break a bone because of osteoporosis [15]. Accordingly, this study has also found that the incidence of osteoporotic fracture was highest amongst female patients 80 years old and above with incidence of 44.67% among a study population of 150.

Several studies on the epidemiology of fractures of the femur among elderly patients have showed that the proportions between the subtypes of fracture are not uniform among different studies [16]. A recent cross-sectional analysis on the influence of ageing on the incidence and site of trauma revealed that fracture of the femoral neck was the more common fracture site [17]. Similar to the findings of this study, it was found that femoral neck fracture was the more common type of osteoporotic fracture comprising 53% of the study population of which majority underwent partial hip replacement (66%).

Recent hospital cost analysis studies on osteoporotic hip fracture revealed that the mean duration of admission was 10 hospital days [18]. In the 2009 Asian Audit Epidemiology Journal, where the costs and burden of osteoporosis in Asia was emphasized, it was found that the duration of hospital stay ranged from 7 nights for uncomplicated cases to 48 days [3]. Comparable to the findings of this research, it was found that the mean duration of hospital stay was 10 days with the older age group having a longer length of stay of 11.58 days compared to the younger age group. Moreover, patient's with intertrochanteric fracture were admitted longer than those with femoral neck fractures. This study also showed that patients treated with internal fixation had longer stay in the hospital. Similarly, a study comparing intertrochanteric and femoral neck fractures conducted in the United States revealed that patients with intertrochanteric fractures were older and sicker on hospital admission thus corresponded to longer hospital stays [19].

A study on the cost and burden of osteoporosis in Asia revealed that the direct hospital cost of osteoporotic hip fracture treatment ranged from 1,756 USD to 7,600 USD, equivalent to 91,000 to 395,000 Php respectively. Moreover, direct hospital cost of osteoporotic hip fracture treatment in the Philippines ranged from 2,000 USD to 6,500 USD (100,000 Php to 338,000 Php) [3]. A population-based study on the impact of hip fracture among hospital care costs showed that costs were positively associated with age with the average age of 81 years as positively related to higher total costs of hip fracture care [20,21]. A study in China found that the mean cost of all patients admitted for hip fracture was ¥53 440 (8103.91 USD) in which the 60-69 years age group had a significantly higher cost compared with 80 years and above age group. In contrast to these findings, this study has found that there was an increasing mean cost with the increasing age group. Overall mean cost for this study was 5227.78 USD with patients in the 80 years old and above age group having the highest mean cost of hospitalization, surgery, laboratories, implant, and medications amounting to 5708.87 USD.

The implant used on average accounted for approximately 27% of the total direct medical costs. It was noted that 26% and 23% of the total cost was attributed to the cost of surgery and hospitalization respectively. Medication costs accounted for 11% while laboratory costs comprised 13% of total costs

A retrospective cohort study analyzing cost of direct hospitalization of hip fractures in Europe show that the greatest part of the burden of hip fractures was incurred by people above 65-years of age, and costs for individuals aged 85 years and older accounted for one-third of all direct hospital costs [22]. Similarly, this study shows that age is significantly associated to the total medical cost. As the age of the patient increases, the costs on hospitalization, laboratories, and medications also increase.

A multicenter study on the cost analysis on hip fracture in China revealed that the mean hospitalization cost of intertrochanteric fractures was significantly higher than that of femoral neck fractures. The reason might be the use of more expensive proximal femoral nail anti-rotation instruments in internal fixation surgery of the intertrochanteric fractures compared with dynamic hip screw of femoral neck fracture [6]. However, in this study, it was found that the patients who sustained a femoral neck fracture had a higher mean cost of surgery and implants due to the more cases of total hip replacement done while patients who had an intertrochanteric fracture had a higher cost in hospitalization due to the longer duration of stay.

Studies on the direct medical cost in relation to the type of hip fracture treatment showed that the cost of hip replacement was higher than that of internal fixation. This shows a strong effect of the surgical approach to the total fee of hospitalization [6]. A European study demonstrated that the highest overall mean cost of hospital stay was found in cases of arthroplasty, in which the cost reached an average of 2419.44 EUR or 141,208 Php. As compared to the cost of surgery for internal fixation amounting to an average of 2348.15 EUR or 137,047 Php [22]. Similarly, this study found that cost for surgery was higher with partial hip replacement and total hip replacement as compared to internal fixation, with a mean overall cost of 273,804.65 Php or 4731.29 EUR.

The findings of a population-based cohort study found that hospitalization costs and length of stay were highly correlated [20]. Likewise, this study has found that that there is also a significant association between duration of hospitalization to the total medical cost.

CONCLUSION

On the basis of this study, it was found that among the 150 patients, 44.6% were within the 80-year-old and above age group

and majorities (76%) were females. The most common type of osteoporotic hip fracture involved the femoral neck (52.7%) and most of the patients underwent partial hip replacement (66%). Patients 80 and above age group, those sustaining an intertrochanteric fracture and those who were treated with internal fixation had a longer length of stay in the hospital. There was note of a parallel increase in the direct medical cost as the patients age group got older. It was found that femoral neck fracture had significantly higher implant costs while the other costs (hospitalization, surgery, laboratories, and medications) were observed to be comparable between the two types of fracture.

The overall mean cost of osteoporotic hip fracture was 5227.78 USD. The implant used on average accounted for approximately 27% of the total direct medical costs. It was noted that 26% and 23% of the total cost was attributed to the cost of surgery and hospitalization respectively. Medication costs accounted for 11% while laboratory costs comprised 13% of total costs.

REFERENCES

1. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int. 2006;17(12):1726-33.
2. Mithal A, Bansal B, Kyer CS, Ebeling P. The Asia-Pacific regional audit-epidemiology, costs, and burden of osteoporosis in India 2013: A report of International Osteoporosis Foundation. Indian J Endocrinol Metab. 2014;18(4):449-54.
3. Mithal A, Dhingra V. Lau E. The asian audit: Epidemiology, costs and burden of osteoporosis in Asia 2009. International Osteoporosis Foundation (IOF) publication. 2009.
4. About Osteoporosis [Internet]. Iofbonehealth.org. Available from: https://www.iofbonehealth.org/wat-is-osteoporosis
5. Maghbooli Z, Hossien-nezhad A, Jafarpour M, Noursaadat S, Ramezani M, Hashemian R, et al. Direct costs of osteoporosis-related hip fractures: protocol for a cross-sectional analysis of a national database. BMJ Open. 2017;7(4):e014898.
6. Wang Y, Cui H, Zhang D, Zhang P. Hospitalisation cost analysis on hip fracture in China: A multicentre study among 73 tertiary hospitals. BMJ Open. 2018;8(4):e019147.
7. Mohd-Tahir N-A, Li S-C. Economic burden of osteoporosis-related hip fracture in Asia: A systematic review. Osteoporos Int. 2017;28(7):2035-44.
8. Cheung C-L, Ang SB, Chadha M, Chow ES-L, Chung Y-S, Hew FL, et al. An updated hip fracture projection in Asia: The Asian Federation of Osteoporosis Societies study. Osteoporos Sarcopenia. 2018;4(1):16-21.
9. Population Projection Statistics [Internet]. Gov.ph. Available from: https://psa.gov.ph/statistics/census/projected-population
10. Lau E. The Epidemiology of Osteoporosis in Asia. International Bone and Mineral Society boneKEy. 2009;6(5):190-193.
11. Kazley J, Bagchi K. Femoral Neck Fractures. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2020.
12. Xie Z, Burge R, Yang Y, Du F, Lu T, Huang Q, et al. Posthospital discharge medical care costs and family burden associated with osteoporotic fracture patients in China from 2011 to 2013. J Osteoporos. 2015;2015:258089.
13. Pike C, Birnbaum H, Schiller M, Sharma H, Burge R, Edgell ET. Direct and indirect costs of non- vertebral fracture patients with osteoporosis in the US. Pharmacoeconomics. 2010;28(5):395-409.
14. Adeyemi A, Delhougne G. Incidence and economic burden of intertrochanteric fracture: A medicare claims database analysis. JB JS Open Access. 2019;4(1):e0045.
15. What women need to know [Internet]. Nof.org. 2016. Available from: https://www.nog.org/preventing-fractures/general-facts/what-women-need-to-know/
16. Daniachi D, Netto ADS, Ono NK, Guimaraes RP, Polesello GC, Honda EK. Epidemiology of fractures of the proximal third of the femur in elderly patients. Rev Bras Ortop. 2015;50(4):371-7.
17. Wu S-C, Rau C-S, Kuo SCH, Chien P-C, Hsieh C-H. The influence of ageing on the incidence and site of trauma femoral fractures: a cross-sectional analysis. BMC Musculoskelet Disord. 2019;20(1):413.
18. Burgers PTPW, Hoogendoorn M, Van Woensel EAC, Poolman RW, Bhandari M, Patka P, et al. Total medical costs of treating femoral neck fracture patients with hemi- or total hip arthroplasty: a cost analysis of a multicenter prospective study. Osteoporos Int. 2016;27(6):1999-2008.
19. Fox KM, Magaziner J, Hebel JR, Kenzora JE, Kashner TM. Intertrochanteric versus femoral neck hip fractures: differential characteristics, treatment, and sequelae. J Gerontol A Biol Sci Med Sci. 1999;54(12):M635-40.
20. Leal J, Gray AM, Prieto-Alhambra D, Arden NK, Cooper C, Javaid MK, et al. Impact of hip fracture on hospital care costs: a population-based study. Osteoporos Int. 2016;27(2):549-58.
21. Castelli A, Daidone S, Jacobs R, Kasteridis P, Street AD. The determinants of costs and length of stay for hip fracture patients. PLoS One. 2015;10(7):e0133545.
22. Tamulaitiene M, Alekna V. Incidence and direct hospitalization costs of hip fractures in Vilnius, capital of Lithuania in 2010. BMC Public Health. 2012;12:495.