



Epidemiological, Characteristics and Outcomes of Hip Fracture Among Patients in Baghdad

Dr Saman Mohammad AbdulRazaq¹

1, MBBS, MCPS, MRCP, FCPS, Clinical Assistant Professor and Associate Staff Physician Gastroenterology.

Corresponding Author: Dr. Saman Mohammad AbdulRazaq, MBCHB, FIBMS, FABMS. Iraqi Ministry of Health Baghdad -Iraq.

Copy Right: © 2021 Dr. Saman Mohammad AbdulRazaq. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received Date: September 22, 2021

Published date: October 01, 2021

Abstract

Hip fracture is one of main public health problems and it's occurred among elder people. This study aimed to assess the epidemiological, complication and outcomes of hip fracture among patients during the study period. A cross-sectional study was conducted at Al-WASITI Hospital for Plastic and Orthopedics surgery in Baghdad from 15th of January to the end of April 2021. The sample size was 91 patients. The cases were selected randomly from the list of patients that admitted to outpatient's clinic of orthopedics that occurred during the study period. Characteristics and risk factors were all recorded. Continuous variables were illustrated by mean \pm standard deviation; Chi-square test was used for comparison between groups. The mean ages were 72.4 with SD 10.2 years; twenty-nine of them still in the age groups 70 to 79 years old. Male cases 51.7% were slightly more than 48.3% in female cases.

Half of them were married. The mean of frequency to had hip fracture was 1.41 ± 0.66 times. Most of them 63.7%; 62.6% had history of smoking and osteoporosis disease, respectively. Thirty-nine of patients had a sub capital fracture; thirty-four of them had overweight BMI.

Our results indicated that male patients had greater risks of hip fracture complications than female patients (odds ratio [OR] = 1.7; 95% CI 1.23-2.96). Patients with diabetes diseases were more likely to suffer from hip fracture complications than those without diabetes diseases (OR = 1.43; 95% CI 1.87–2.20). Patients with higher osteoporosis were more likely to suffer from hip fracture complications than patients with lower results (OR = 1.15; 95% CI 1.23–4.34). Partial hip replacement was the fundamental type of operation procedures. Tumble is a main cause of hip fractures. Pneumonia disease is one of the major complications as a result of hip fractures. Physical therapy can significantly improve the outcome of hip fracture among people.

Keyword: Hip fracture, Complication, Demographic, Baghdad, Pneumonia, Outcomes

Introduction

Hip fracture is a particularly life-threatening injury to elderly people (1). One in three adults over the age of 50 dies each year from hip fractures, and the risk of older people is five to eight times higher during the first three months of hip fracture compared to the healthy adults(2, 3). In addition to the excruciating pain suffered by those with hip fractures, they also lose part of their physical functions, their social life diminishes, their dependence on others increases, and their lives deteriorate in general(4). Many hip fracture sufferers are forced to change their lifestyles, some move from their home to live in a nursing home (5). Ultimately, the rapid deterioration in the elderly life following a hip fracture is a bad indicator of their health(6).

With advancing age, the rate of hip fractures increases dramatically to people with age 50 to 65 years and over(7). Also, the cognitive impairment, such as dementia, increases the risk of falling; general fatigue; visual impairment; taking a combination of medications(8). Ordinary home hazards increase the odds of falling (9). Injuries often occur as a result of a fall, or the thigh hits a hard object such as a kitchen sink(10). Injury can also occur as a result of light ; even no trauma when getting up, for example; osteoporosis: low bone mass and deterioration of bone tissue increase the risk of hip fractures in the elderly(11).For some reason that is not clear, femoral fractures disproportionately affect the socially disadvantaged (12).

The presence of previous fractures, as previous research indicated that about 30% of people with fractures of the thigh bones had a previous fracture in what is known as complication fractures (13). The risk of fracture recurrence persists in ten years, which illustrates the importance of treating primary

fractures quickly and effectively (14). Treatment options include surgery, and statistics indicated that more than three-quarters of people with a broken hip undergo surgery, often a joint replacement (15). Surgical intervention usually occurs to 48 hours(16). The patient's health condition may significantly increase the risk of death(17).

In addition to, some complication such infection, internal bleeding, stroke, or heart failure and it's in sometimes leads to death after hip fractures (18). Studies show that problems with treatment, surgery, or immobility (which can put the patient at risk of pneumonia) as a result of fractures eventually lead to other complications that increase the rate of early death(19, 20). In parallel with the treatment of postoperative pain and symptoms, patients should be rehabilitated and, physical training performed to ensure that mobility is restored(21).

A retrospective study conducted among 36 of hip fracture in Ireland, were recorded in 2020, compared with 45 in 2019, resulting in a 20% reduction in presentations. Thirty-day mortality in hip fractures during the Covid-19 crisis was 8.3% compared with 2.2% in 2020. The epidemiological study conducted among 232 patients in Al- Najaf – Iraq found that the female to male ratio was 2:1. The mean age for this group was 68 years. The causes of the fracture were fall in 83%, fall from height in 11%, and road traffic accident in 6%. A case control study conducted in Iraq among 75 cases and 150 controls found that the highest risk factors associated with increased occurrence of hip fracture were using cortisone, Osteoporosis, tobacco smoking, consuming soft drinks, and less exposure to sunlight.

Hip fracture is as yet thought to be quite possibly the most genuine medical services issues, notwithstanding numerous analysts concern. Also, regardless of some proof of genuine declining in the commonness pace of hip fracture, it is as yet considered as a steady reason for extreme dreariness, unsatisfied life quality and early mortality among more seasoned grown-ups. Also, in light of the fact that the administration conventions are not all around applied around the world, it is required to see an expanded, instead of diminished yearly frequency of hip fracture throughout the following not many years [6]. As it is known, there are intracapsular and extracapsular fractures; the AVN (avascular necrosis) is the most hazardous difficulty of the intracapsular fractures [2].

There is little information about the epidemiology of hip fractures in Iraq, and the main danger variables of this handicapping break. Forestalling the event of hip fracture is a general wellbeing need in our general public, given the continuous change to the super-maturing society. The danger for hip fracture can be decreased by forestalling falls. Distinguish those people most in danger of tumbling to boost the adequacy of any proposed general wellbeing and family nursing mediations [13]. From this point, this study aimed to assess the characteristics of patients with hip fractures and, also to identify the complication and outcomes of hip fractures among them during the study period.

Materials and Methods

A cross-sectional study was conducted at Al-Wasiti Hospital for Plastic and Orthopedics surgery in Baghdad from 15th of January to the end of April 2021 to evaluate the demographic; characteristics of the participants and, to determine the complications of hip fracture and outcomes during the study period. Sample size was 91 patients. Randomly selection was chosen from the list of patients that admitted to outpatient's clinic and they had hip fractures.

Inclusion and exclusion criteria

The inclusion criteria were the age groups above 50 years and already had hip fracture and the ages less than 50 years and; those with other fractures in other parts of the body and also, those with other diseases and those with hip fracture and occurred before were excluded from this study .

Ethical clearance

Ethical approvals for conducting this research were obtained from the Iraqi Ministry of Health under number 11457 in 31/12/2020 and also, oral consent from the participants was obtained from them before starting to collect the data.

Data collection

Characteristics features and risk factors were also, recorded. From the medical records, additional information was recorded such patients' condition before the fracture as (residence, type of activity , physical and mental condition, fracture history), cause of fracture as (falls from height , tumble , traffic accident, un focusing due to illness), age, sex, height, weight to calculate the BMI . Major chronic disease included diabetes were categorized to yes or no, hypertension (yes or no), and osteoporosis (yes or no). Fracture and treatment details including fracture type(Sub capital, Per-trochanteric, Sub-trochanteric) , treatment modalities, surgical procedures were categorized as (partial hip replacement , dynamic hip screw, cannulated screw), complications were categorized to (pneumonia, heart failure, severe arrhythmia, artificial joint dislocation, electrolytic imbalance, bed sore, urinary infection) , length stay in hospital were categorized to (less than 15 days , 15 to 21 days . more than 21 days) , for outcomes is classified to (improved, recovery , death), were also collected. Age was stratified according to four different ages based groups: 50 to 59 years old, 60 to 69 years, 70 to 79 years, and above 80 years. The BMI was stratified into four groups: less than 18.5, 18.5 to 24.9, 25.0 to 29.9, and equal 30 or greater and it are measured by kg/m².

Statistical analysis

All data was entered into the Excel program before starting the analysis to ensure the validity and accuracy of the data. STATA 13 software was used for statistical analysis. With continuous variables were calculating and assessing the mean, median, standard deviation. The Chi-Square Test of

Independence is used to test if two categorical variables are associated. It also used to see if there is a difference between two or more groups. Univariate analysis was used to describe the data and find patterns that exist on it and, use the tables as (mean, standard variation and range), charts, and histograms for univariate analysis. In addition to, multivariate analysis was used to analysis the data that contain more than one variable. Multivariate Analysis of Variance (MANOVA) was used to examine the dependence relationship between a set of dependent measures across a set of groups. Use this command of STATA program manova, mvreg for multivariate analysis. Statistically significant was set at the p. value < 0.05.

Results

Table 1: Characteristics of hip fracture among studied sample

Parameters	Frequency (91)	Percent
Age groups (years)		
Mean ±SD	72.4 ±10.2 years	
50-59	12	13.19
60-69	25	27.47
70-79	29	31.87
≥80	25	27.47
Gender		
Male	47	51.65
Female	44	48.35
Marital status		
Married	52	57.14
Widowed, separated, divorced	39	42.86
Frequency of hip fracture		
Mean ±SD	1.41 ±0.66 times	
Once	63	69.23
2-3	19	20.88
4-5	9	9.89
Smoking habits		
Yes	58	63.74
No	33	36.26
Diabetes		
Yes	71	78.02
No	20	21.98
Hypertension		
Yes	59	64.84
No	32	35.16
Osteoporosis		
Yes	57	62.64
No	34	37.36
Types of fracture		
Sub capital	39	42.86
Per-trochanteric	31	34.07
Sub-trochanteric	21	23.08
BMI kg/M ²		
Below 18.5	15	16.48
18.5-24.9	23	25.27
25.0-29.9	34	37.36
30 and greater	19	20.88
Length of stay (Days) in hospital		
Mean ±SD	1.93 ±0.80 days	
Less than 15	32	35.16
15 to 21	33	36.26
More than 21	26	28.57

In [Table 1] Out of 91 participants with hip fractures, the mean age was 72.4 with SD 10.2 years. Majority 31.9% (29/91) of hip fractures occurred among age group 70 to 79 years old and followed by the same frequency 27.5% (25/91) in each age groups 60-69 and ≥ 80 years old, respectively. Male cases 51.7% were slightly more than 48.3% in female cases. Half of them were married. The mean of frequency to had hip fracture was 1.41 ± 0.66 times and, most of whom 69.2% had a hip fracture for the first time and 63.7% had history of smoking. Majority 78% of them had history of diabetes disease. While 22% of them had history of hypertension disease and, 62.6% had history of osteoporosis disease. Thirty nine of them had a sub capital of fracture and thirty four had overweight BMI.

For treatment, partial hip replacements 45.1% were the main types of operation as show in [Figure 1].

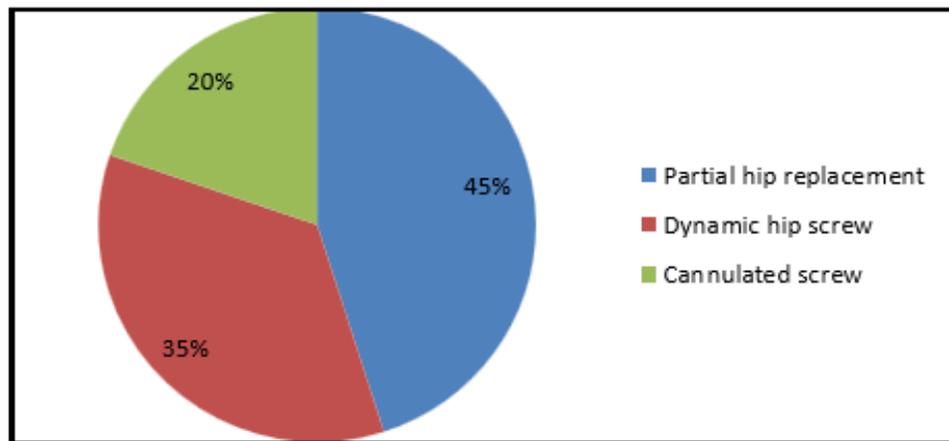


Figure 1: Types of operation according to hip fractures

Tumble and fall from the height 38.5% were the main causes of hip fractures, followed by 23% were the traffic accident and its show in [Figure 2].

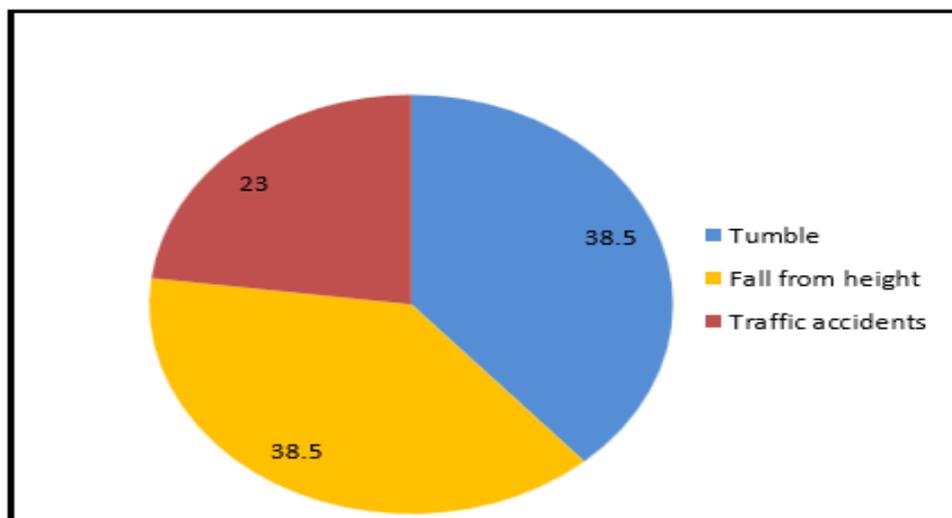


Figure 2: Factors of first time of hip fracture

The highest frequency 36.2% of them had long time to stay in hospital with range 15 to 21 days and, the mean was 1.93 ± 0.80 day [Figure3].

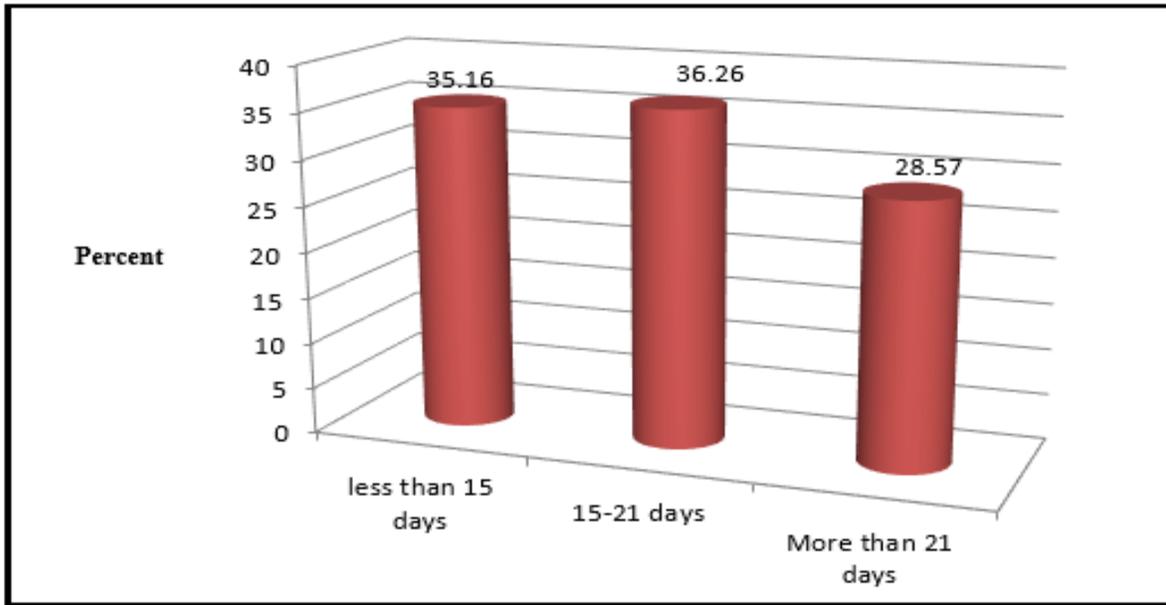


Figure 3: length of hospitalization (days) among patients with hip fracture

According to complication from hip fractures, 17.8% of them had pneumonia disease as results of hip fracture complication as show in [Figure 4].

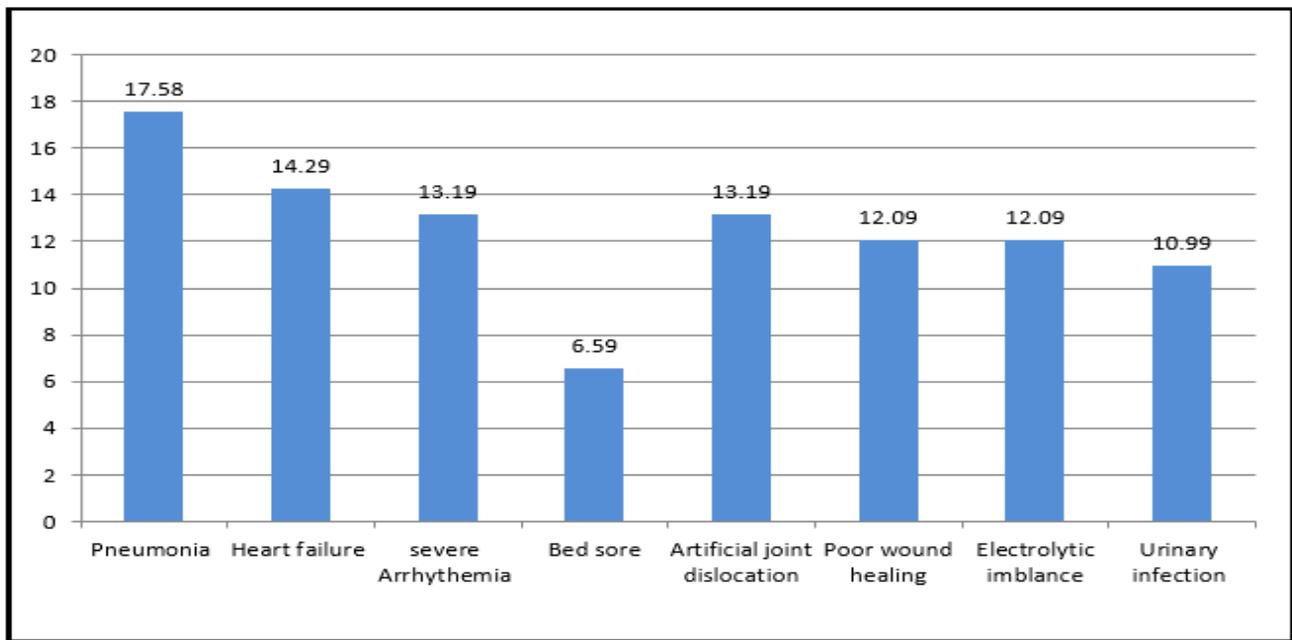


Figure 4: Complication of hip fracture

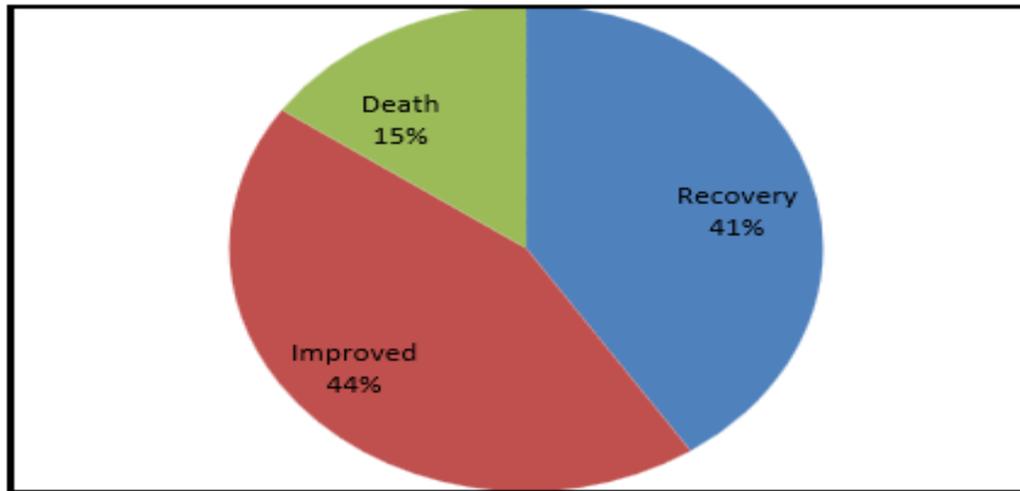


Figure 5: Outcomes of hip fracture among patients

In **[Figure 5]**, show that 84.7% of them were recovering and improving their health from hip fracture and, 15.3% were died due to fracture complications.

Univariate and Multivariate analysis showed that male sex, marital status, diabetes and osteoporosis were independent risk factors for complications of hip fracture among the studied samples. Our results indicated that male patients had greater risks of hip fracture complications than female patients (odds ratio [OR] = 1.7; 95% CI 1.23-2.96). Patients with diabetes diseases were more likely to suffer from hip fracture complications than those without diabetes diseases (OR = 1.43; 95% CI 1.87–2.20). Patients with higher osteoporosis were more likely to suffer from hip fracture complications than patients with lower results (OR = 1.15; 95% CI 1.23–4.34) **[Table 2]**.

Table 2: Univariate and Multivariate analysis among independent parameters by dependent outcomes

Parameters	Univariate analysis		Multivariate analysis		
	X ²	P	Exp(β)	95% CI	P
Gender	7.4	0.024*	1.70	1.23-2.96	0.004*
Marital status	8.7	0.012*	1.48	1.21-2.23	0.011*
Frequency of hip fracture	7.8	0.097	1.01	0.97-3.24	0.849
Smoking habits	1.4	0.482	1.02	0.55-1.97	0.201
Diabetes	6.1	0.045*	1.43	1.87-2.20	0.002*
Hypertension	4.4	0.784	0.77	0.42-1.94	0.162
Osteoporosis	10.6	0.005*	1.15	1.23-4.34	0.041*
BMI	4.78	0.572	1.01	0.78-1.97	0.930
Types of operation	3.5	0.466	1.13	0.84-2.61	0.243
Types of fracture	5.5	0.232	1.08	0.77-3.71	0.483
Factors of first time of hip fracture	8.1	0.881	1.38	0.96-1.94	0.324
Length of stay in hospital	1.5	0.823	1.01	0.68-1.41	0.998
Complication of hip fracture	9.2	0.812	1.03	0.95-2.02	0.407

* The result is significant at p. value less than 0.05

Discussion

This study aimed to assess the characteristics, complication and outcomes of hip fractures among patients during the study period.

In table 1:- Our findings reveals to the mean age was 72.4 with SD 10.2 years and compared with other study in UK(22), they reported the average age of hip fracture are 83 for women and 84 for men. A study in China (23), they mentioned the average age of hip fracture patients was 82.20 \pm 6.82 years old; this may be differences in lifestyle between the countries. In this study, we found that the majority 31.9% (29/91) of them still in the age groups 70 to 79 years old and followed by the same frequency 27.5% in each age group 60-69 and \geq 80 years old. A study done it in China (23), the authors reported the higher frequency of hip fracture occurred in the age groups 80- 84 years and 85-89 years old. This refers to differences in life expectancy between countries. Also we found the male cases 51.7 % were slightly more than 48.3 % female cases .Compared with other study in Spain (24), the investigators reported the incidence rate of [hip fracture](#) among women was 3 times higher than in men. This is due to women doing their jobs of home and work and not finding enough time to eat healthy food. In this study, 57.1% of patients were married ; compare with other study in Sweden (25) , they mentioned the divorced,

widowed or unmarried women had a higher risk of hip fracture than married or cohabiting women; the OR was 1.40 (95% CI 1.06-1.85).

This fact because of her does not have a breadwinner in her life, or she resorts to looking for a job and not taking care of her health and eating if she does not have money or a job. Smoking is a key factor of increasing pulmonary diseases, especially among the older and addicted. In this study we found 63.7% of patients had a history of smoking habits. In some previous studies, current smokers have had approximately a 50% increased risk of hip fracture, as compared with never smokers. In contrast to our findings, some studies have reported higher hip fracture risks of heavier smokers than among lighter smokers (26-29) Diabetes is a common chronic disease among the elderly people and their impact on human health. In this study, we found that 78% of them had history of diabetes disease. A study done in Canada (30), the authors reported that the diabetes was associated with hip fracture in both gender with 20% and, the danger of fracture remains higher after adjustment. High blood pressure is causes of hip fracture due to fall and, because of that, they are not focusing and realizing what happened. In our study we found that only 22% of them had history of hypertension disease and compared with other study in Sweden (31), the author reported the hypertension was related to hip fracture. Osteoporosis is also an essential factor of the fracture; this disease causes bones to become weak and porous, increasing the risk of fracture. Women are four times more likely to have osteoporosis than men (32). Our finding refer to the sixty three percent had history of osteoporosis disease. Compare with other study in Chile (33), they mentioned the most of the osteoporotic hip fractures occur to women, representing approximately 75% of these fractures. Sub capital fracture is the most common type of intracapsular [neck of femur fracture](#). The fracture lines to extend for the junction of the head and neck of femur. In this study we found the sub capital of fracture is considered the main type of fracture and shows in 42.9% from them. Most of these people are suffering from excessive weight and obesity that inevitably affect their health and restrict their movement which is one of the most important problems between the elderly people. In our study we found that 37.5% of them had overweight BMI and compared with other study in Norway (34), they reported the increasing of BMI lead to decrease the risk of hip fracture and another study in France; they mentioned the low BMI independently increased the risk of fractures (35). This difference in view is due to the difference in the lifestyle between countries and the factors that cause hip fracture. Partial hip replacements are the main operation procedure were using for it and shows in 45.1%. Compared with a study done it in Sweden (15), the hip replacements were the fundamental procedure which is using for it especially among elderly. The main causes of hip fractures was tumbling and fall from the height and shows in 38.5% compared with other study in New Zealand (10), they reported the majority were fall and exposed to traffic accident.

In this study, we found the highest frequency 36.2% of whom has long time to stay in the hospital started from 15 to 21 days and compared with other study in Korea (36), they reported the average length of stay was 30.7 days (standard deviation 24.5 days). In our study, we found that 17.8% of them had pneumonia disease as results of hip fracture complication and compared with other study in US

(19), they reported the most of them has hip replacement, do not has any medical complication after operation. Severe pulmonary and cardiac conditions had an effect on the rate of infection and death, and a patient with more than one complication has poor survival prospects. Multivariate analysis showed that male sex, marital status, diabetes and osteoporosis were independent risk factors for complications of hip fracture among the studied samples.

Our results indicated that male patients had greater risks of hip fracture complications than female patients (odds ratio [OR] = 1.7; 95% CI 1.23-2.96). Patients with diabetes diseases were more likely to suffer from hip fracture complications than those without diabetes diseases (OR = 1.43; 95% CI 1.87–2.20). Patients with higher osteoporosis were more likely to suffer from hip fracture complications than patients with lower results (OR = 1.15; 95% CI 1.23–4.34). Compared with a study in China [23], the authors indicated that male patients had greater risks of perioperative complications than female patients (odds ratio [OR] = 1.987; 95% CI 1.118–3.531). Patients with respiratory diseases were more likely to suffer from perioperative complications than those without respiratory diseases (OR = 0.044; 95% CI 0.010–0.200).

Limitation of this study: - This study has several limitations. First, short duration of the study, it may be one of the limitations of this study. Second, small sample size, this may impact the adverse outcomes has the injuries were comparable. Third, Interviewer bias: biases introduced by the interviewer can directly affect the validity and reliability of the ultimate findings of the study, lastly, respondents may distort information to present what they perceive as a more favorable impression and this is type of interviewer bias and it's called social desirability.

Prospects of this Study: -

- Enhance the educational and support programs for patients and their families through health institutions or civil society organizations.
- Administrative protocols based on research results obtained in treatment, care, prevention and management of burns and burn patients. As well as providing social and economic strategies in the field of research and consultation with policy makers to help burn programs.
- Carry out joint research projects with other research centers and organizations.

Conclusion

we concluded that the hip fracture occurred among those in age group 70 to 79 years old; male cases had higher frequency of hip fracture; were married; majority of them had history of chronic disease. Most of them had overweight BMI. Partial hip replacements were the main operations that use it. Tumble

and fall from the height were the main causes of hip fractures. Majority of them had pneumonia disease as results of hip fracture complication. Male sex, marital status, diabetes and osteoporosis were independent risk factors for complications of hip fracture among the studied samples.

References

1. Parker M, Johansen A. Hip fracture. *BMJ*. 2006;333(7557):27-30.
2. Crilly RG, Kloseck M, Mequanint S. Hip Fracture Types in Canadian Men and Women Change Differently with Age: A Population-Level Analysis. *Clin Med Insights Arthritis Musculoskelet Disord*. 2016;9:75-9.
3. Bjørgul K, Reikerås O. Incidence of hip fracture in southeastern Norway: a study of 1,730 cervical and trochanteric fractures. *International orthopaedics*. 2007;31(5):665-9.
4. Clark P, Lavielle P, Franco-Marina F, Ramírez E, Salmerón J, Kanis JA, et al. Incidence rates and life-time risk of hip fractures in Mexicans over 50 years of age: a population-based study. *Osteoporosis international*. 2005;16(12):2025-30.
5. Chong CP, Savige JA, Lim WK. Medical problems in hip fracture patients. *Archives of orthopaedic and trauma surgery*. 2010;130(11):1355-61.
6. Bergström U, Jonsson H, Gustafson Y, Pettersson U, Stenlund H, Svensson O. The hip fracture incidence curve is shifting to the right. *Acta Orthop*. 2009;80(5):520-4.
7. Robinson CM, Court-Brown CM, McQueen MM, Christie J. Hip fractures in adults younger than 50 years of age. *Epidemiology and results. Clinical orthopaedics and related research*. 1995(312):238-46.
8. Tirelli A, D'Amico MP, Gimigliano F, Iolascon G. P22 - Cognitive Impairment in Hip Fracture Patients. *Clin Cases Miner Bone Metab*. 2010;7(3):228-.
9. Stolee P, Poss J, Cook RJ, Byrne K, Hirdes JP. Risk factors for hip fracture in older home care clients. *J Gerontol A Biol Sci Med Sci*. 2009;64(3):403-10.
10. Abey-Nesbit R, Schluter PJ, Wilkinson T, Thwaites JH, Berry SD, Jamieson HA. Risk factors for hip fracture in New Zealand older adults seeking home care services: a national population cross-sectional study. *BMC geriatrics*. 2019;19(1):93.
11. Metcalfe D. The pathophysiology of osteoporotic hip fracture. *Mcgill J Med*. 2008;11(1):51-7.

12. Keyak JH, Sigurdsson S, Karlsdottir G, Oskarsdottir D, Sigmarsdottir A, Zhao S, et al. Male-female differences in the association between incident hip fracture and proximal femoral strength: a finite element analysis study. *Bone*. 2011;48(6):1239-45.
13. Maggi S, Siviero P, Gonnelli S, Caffarelli C, Gandolini G, Cisari C, et al. The burden of previous fractures in hip fracture patients. *The Break Study. Aging clinical and experimental research*. 2011;23(3):183-6.
14. Melton LJ, 3rd, Kearns AE, Atkinson EJ, Bolander ME, Achenbach SJ, Huddleston JM, et al. Secular trends in hip fracture incidence and recurrence. *Osteoporos Int*. 2009;20(5):687-94.
15. Vala CH, Kärrholm J, Kanis JA, Johansson H, Sten S, Sundh V, et al. Risk for hip fracture before and after total knee replacement in Sweden. *Osteoporos Int*. 2020;31(5):887-95.
16. Klestil T, Röder C, Stotter C, Winkler B, Nehrer S, Lutz M, et al. Impact of timing of surgery in elderly hip fracture patients: a systematic review and meta-analysis. *Scientific reports*. 2018;8(1):1-15.
17. Moja L, Piatti A, Pecoraro V, Ricci C, Virgili G, Salanti G, et al. Timing matters in hip fracture surgery: patients operated within 48 hours have better outcomes. A meta-analysis and meta-regression of over 190,000 patients. 2012.
18. Carpintero P, Caeiro JR, Carpintero R, Morales A, Silva S, Mesa M. Complications of hip fractures: A review. *World journal of orthopedics*. 2014;5(4):402.
19. Lawrence VA, Hilsenbeck SG, Noveck H, Poses RM, Carson JL. Medical complications and outcomes after hip fracture repair. *Archives of internal medicine*. 2002;162(18):2053-7.
20. Roche J, Wenn RT, Sahota O, Moran CG. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. *BMJ*. 2005;331(7529):1374.
21. Sherrington C, Tiedemann A, Cameron I. Physical exercise after hip fracture: an evidence overview. *Eur J Phys Rehabil Med*. 2011;47(2):297-307.
22. Swift CG. Prevention and management of hip fracture in older patients. *The Practitioner*. 2011;255(1743):29-33, 3.
23. Chen M, Zhang Y, Du Y, Hong W, Tang W, Li H, et al. Epidemiological and clinical study of hip fracture in hospitalized elderly patients in Shanghai, China. *Archives of osteoporosis*. 2019;14(1):37.
24. Lobo E, Marcos G, Santabárbara J, Salvador-Rosés H, Lobo-Escolar L, De la Cámara C, et al. Gender differences in the incidence of and risk factors for hip fracture: a 16-year longitudinal study in a southern European population. *Maturitas*. 2017;97:38-43.

25. Farahmand BY, Persson P-G, Michaëlsson K, Baron JA, Parker M, Ljunghall S. Socioeconomic status, marital status and hip fracture risk: a population-based case-control study. *Osteoporosis international*. 2000;11(9):803-8.
26. Baron JA, Farahmand BY, Weiderpass E, Michaëlsson K, Alberts A, Persson I, et al. Cigarette smoking, alcohol consumption, and risk of hip fracture in women. *Archives of internal medicine*. 2001;161(7):983-8.
27. Law MR, Hackshaw AK. A meta-analysis of cigarette smoking, bone mineral density and risk of hip fracture: recognition of a major effect. *BMJ*. 1997;315(7112):841-6.
28. Cumming RG, Klineberg RJ. Case-control study of risk factors for hip fractures in the elderly. *American journal of epidemiology*. 1994;139(5):493-503.
29. Meyer HE, Tverdal A, Falch JA. Risk factors for hip fracture in middle-aged Norwegian women and men. *American journal of epidemiology*. 1993;137(11):1203-11.
30. Lipscombe LL, Jamal SA, Booth GL, Hawker GA. The risk of hip fractures in older individuals with diabetes: a population-based study. *Diabetes care*. 2007;30(4):835-41.
31. Strandberg TE. Cardiovascular disease, hypertension, and risk of hip fracture. *JAMA*. 2010;303(8):731-2.
32. Birge SJ. Osteoporosis and hip fracture. *Clinics in geriatric medicine*. 1993;9(1):69-86.
33. Quevedo I, Ormeño JC, Weissglas B, Opazo C. Epidemiology and direct medical cost of osteoporotic hip fracture in Chile. *Journal of osteoporosis*. 2020;2020.
34. Sogaard AJ, Holvik K, Omsland TK, Tell GS, Dahl C, Schei B, et al. Abdominal obesity increases the risk of hip fracture. A population-based study of 43 000 women and men aged 60–79 years followed for 8 years. *Cohort of Norway*. *Journal of internal medicine*. 2015;277(3):306-17.
35. Aurégan J-C, Frison A, Bégué T, Hannouche D, Bossier C, Bensidhoum M, et al. Contra-lateral hip fracture in the elderly: are decreased body mass index and skin thickness predictive factors? *International orthopaedics*. 2017;41(2):247-52.
36. Yoo J, Lee J, Kim S, Kim B, Choi H, Song D, et al. Length of hospital stay after hip fracture surgery and 1-year mortality. *Osteoporosis International*. 2019;30(1):145-53.