Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2017; 5(7E):2885-2891 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2017.v05i07.069

Original Research Article

Diagnosis of Osteopenia and Osteoporosis by Dual Energy X-Ray Absorptiometry

Awadia Greeballa Suliman Ali[2], E. Abd Elrahim[1,2], H.Osman[1]
[1]Taif University, College of Applied Medical Science, P.O. Box 2425, Post Code 21944, Taif KSA
[2] Faculty of Radiology Science and Medical Imaging, Alzaiem Alazhari University, P.O. Box 1432, Khartoum North, Sudan

***Corresponding author**
Dr. Awadia Greeballa Suliman Ali
Email: yadav.ashwani4@gmail.com

Abstract: This was analytic descriptive study. The aim of this study was to assess the role of the Dual Energy X-ray Absorptiometry scan (DEXA) for lumbar spine and hip joint in diagnosis of osteopenia and osteoprosis. This study carried out by Gamma Camera Department in Fedail Hospital in Khartoum state –Sudan, during the period from November 2016 to February 2017.The data was collected by data collection sheet formed especially for the purpose of the study. 58 patient's scan by Dual Energy X-ray Absorptiometry (DEXA) then the variables analyzed using statistical package for social science (SPSS). The study found that 15.5% of patients was normal with t-score more than -1 , followed by 39.7% osteoporotic with t-score less than -2.5 (41.3% of them within the age of 46-60 yrs), and 44.8% was osteopenic with t-score of -1 to -2.5. Also the study concluded that 12.28% of patients were osteoporotic (have high risk of fracture) according to t-score of lumbar spine. According to t-score of hip joint 36.21% of patients were osteoporotic (have high risk of fracture), and according to that the use of t-score for hip joint is more accurate in diagnosis of osteoporosis and risk of fracture. The study resulted that when the age increase by factor of one year the t-score will decrease by factor -0.05 for hip and -0.02 for spine.
Keywords: DEXA, osteopenia, osteoporosis.

INTRODUCTION

Bone density scan, also called dual-energy x-ray absorptiometry (DEXA) or bone densitometry, is an enhanced form of X-ray technology that is used to measure bone density. It is uses a very small dose of ionizing radiation to produce picture of the inside of the body (usually the lower spine and hips). DEXA is simple, quick, noninvasive, and an accurate method to diagnosis and management of osteoporosis [1].

Dual energy *x* ray absorptiometry (DEXA) scans to measure bone mineral density (BMD) at the spine and hip have an important role in the evaluation of individuals at risk of osteoporosis, and in helping clinicians advise patients about the appropriate use of fracture treatment. Compared with alternative bone densitometry techniques, hip and spine DEXA examinations have a number of advantages that include a consensus that BMD results can be interpreted using the World Health Organization T-score definition of osteoporosis, a proven ability to predict fracture risk, proven effectiveness at targeting fracture therapies, and the ability to monitor response to treatment)) [2]. Today, BMD measurements have an important role in the evaluation of patients at risk of osteoporosis and in the appropriate use of fracture treatment [3-5]. In general the preferred method of testing is to use DEXA scans of the central skeleton to measure BMD of the lumbar spine and hip. Central DEXA examinations have three major roles, namely the diagnosis of osteoporosis, the assessment of patients' risk of fracture, and monitoring response to treatment. The reasons for preferring to use central DEXA include: the fact that the hip BMD is the most reliable measurement for predicting hip fracture risk [6-8]. The use of the spine for monitoring treatment, and the consensus that spine and hip BMD measurements in postmenopausal white

women should be interpreted using the WHO T-score definitions of osteoporosis and osteopenia [9, 10].

OBJECTIVE

To assess role of DEXA in diagnosis of osteoporosis and osteopenia.

METHODOLOGY AND MATERIALS

This study is experimental, cross sectional, analytic type. 58 adult patients with different gender and age came to Fedail Hospital – Khartoum– Sudan during the period from November 2016 to February 2017. The Equipment used in study is Norland XR-800 central DEXA machine for assessment of bone mineral density in Gamma Camera Department in Fedail Hospital. The data analyzed by using software computer system (SPSS) for quantitative statistical techniques mainly frequencies and correlation to study the relationship between the different variables.

RESULTS

Table-1: Frequency distribution of patient age

Age group	Frequency	Percent	Valid Percent	Cumulative Percent
30- 45 years	10	17.2	17.2	17.2
46-60 years	24	41.4	41.4	58.6
61-75 years	20	34.5	34.5	93.1
76-90 years	4	6.9	6.9	100.0
Total	58	100.0	100.0	

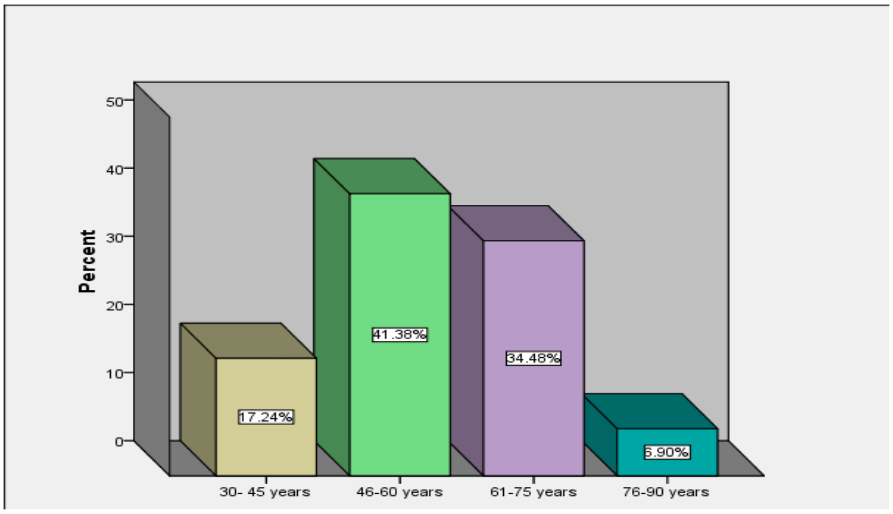

Fig-1: Frequency distribution of patient age

Table-2: Frequency distribution of patient gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	53	91.4	91.4	91.4
Male	5	8.6	8.6	100.0
Total	58	100.0	100.0	

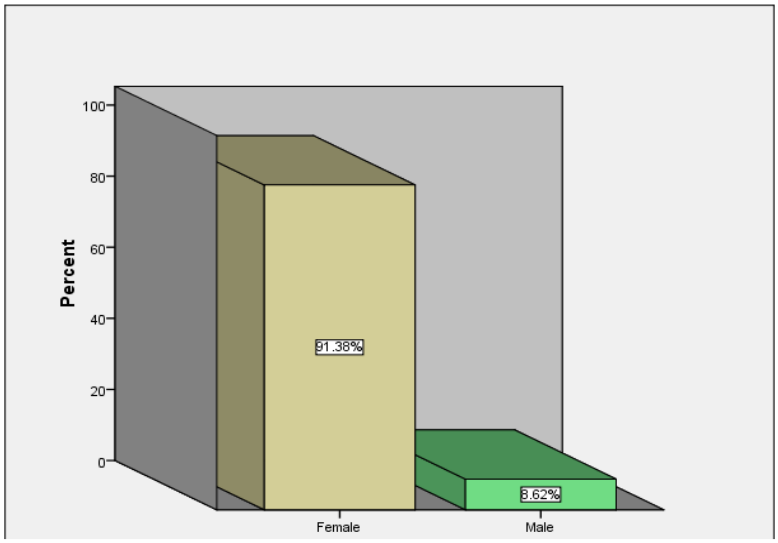

Fig-2: Frequency distribution of patient gender

Table-3: Frequency distribution of patient height

Height	Frequency	Percent	Valid Percent	Cumulative Percent
60-80 cm	1	1.7	1.7	1.7
141-160 cm	27	46.6	46.6	48.3
161-180 cm	30	51.7	51.7	100.0
Total	58	100.0	100.0	

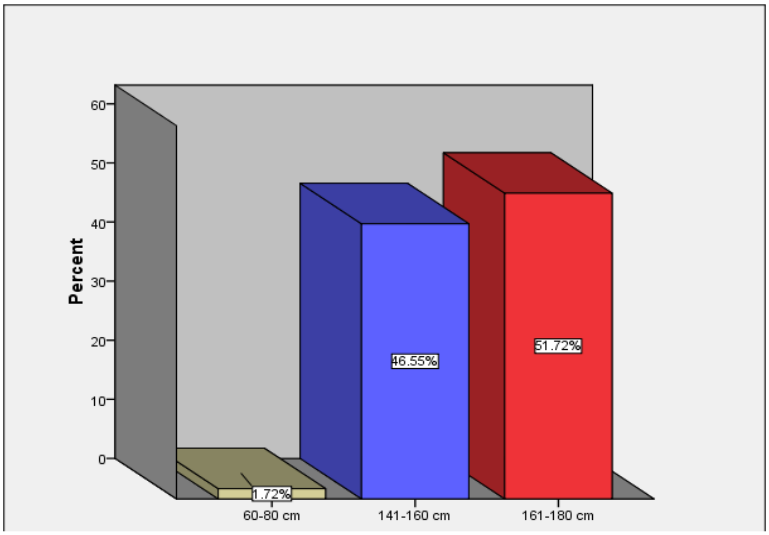

Fig-3: Frequency distribution of patient height

Table-4: Frequency distribution of patient weight

Weight	Frequency	Percent	Valid Percent	Cumulative Percent
35-55 kg	7	12.1	12.1	12.1
56- 75 kg	17	29.3	29.3	41.4
76-95 kg	29	50.0	50.0	91.4
96-115 kg	4	6.9	6.9	98.3
156-175 kg	1	1.7	1.7	100.0
Total	58	100.0	100.0	

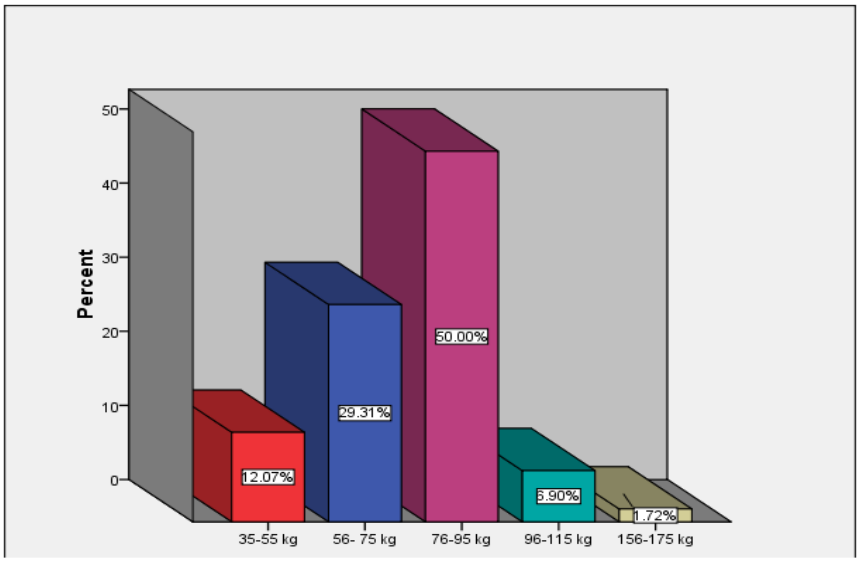

Fig-4: frequency distribution of patient weight

Table-5: frequency distribution of final diagnose by t-score hip joint

Final diagnose by t-score	Frequency	Percent	Valid Percent	Cumulative Percent
Normal	13	22.4	22.4	22.4
Osteopenia	24	41.4	41.4	63.8
Osteoporosis	21	36.2	36.2	100.0
Total	58	100.0	100.0	

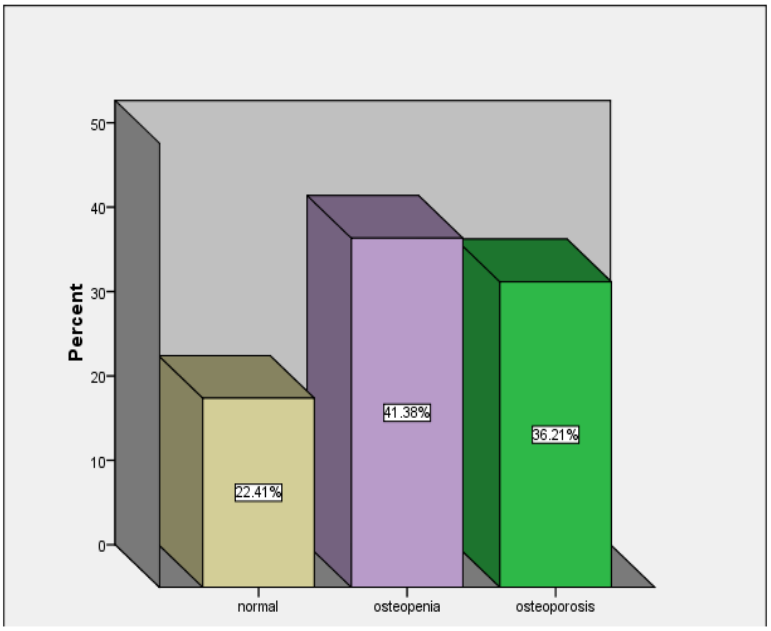

Fig-5: frequency distribution of final diagnose by t-score hip joint

Table-6: frequency distribution of final diagnose by t-score spine

Final diagnose by t- score spine	Frequency	Percent	Valid Percent	Cumulative Percent
Osteopenia	27	46.6	47.4	47.4
Osteoporosis	7	12.1	12.3	59.6
Normal	23	39.7	40.4	100.0
Total	57	98.3	100.0	
Not mention	1	1.7		
Total	58	100.0		

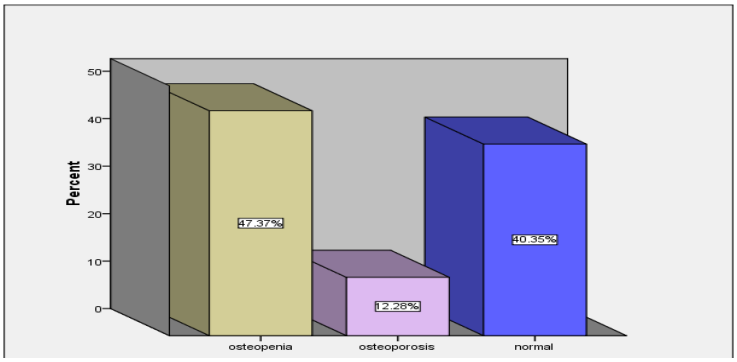

Fig-6: frequency distribution of final diagnose by t-score spine

Table-7: frequency distribution of final diagnose by t-score of combination of hip and spine dexa

Final diagnose by both t- score for spine and hip	Frequency	Percent	Valid Percent	Cumulative Percent
Osteoporosis	23	39.7	39.7	39.7
Osteopenia	26	44.8	44.8	84.5
Normal	9	15.5	15.5	100.0
Total	58	100.0	100.0	

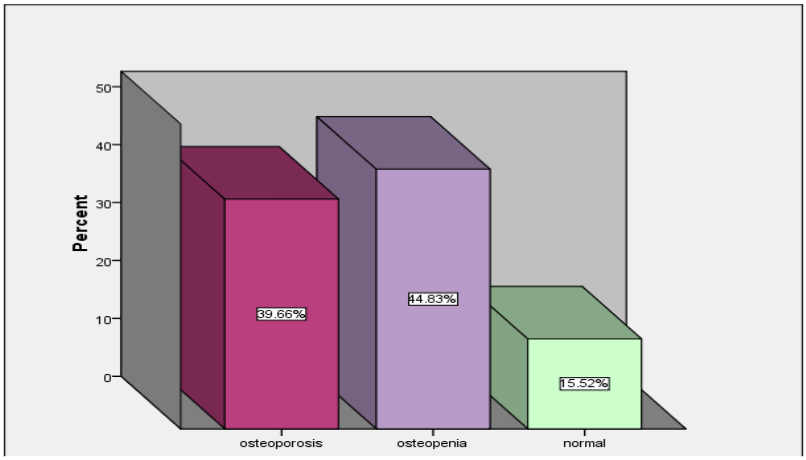

Fig-7: frequency distribution of final diagnose by t-score of combination of hip and spine dexa.

DISCUSSION

The study found that the frequency distribution of the age, height, weight, were 58.50±13.210, 158.41±14.770, 77.97±19.813. The values of BMD were .46 minimum, 1.94 maximum, .8846 mean ± .21844gm\cm^2 standard deviation, this record disagree with Alena Remer 2011whom found that the BMD was 0,945 ± 0,125 g/cm^2 for vertebrae L1-L4 with range 0.75-1.35 g\cm^2 and this variance because our study done in osteoporosis grade III post menopausal over age of 64 years[11].

Regarding the distribution of patients ages the study found that the most affected age group were 46-60 years 41.38% and 61-75 34.48% respectively. Regarding the frequency distribution of the gender, female was most affected 91.38%, those results due to fact that osteoporosis is three time more common in women than in men because women have lower peak bone mass and partly because of hormonal changes that occur at menopause estrogen have an important results in preserving bone mass during adulthood and bone loss occur after age of 50 [12, 13]. These records were similar to Eman et al 2016[14].

Regarding the frequency distribution of patient height the study was found that: 161-180 years 51.72% and 141-160years was 46.55% and concerning the frequency distribution of patient weight the study was found that: 76-95kg was 50 % and 56-75kg was 29.31%.

Regarding the frequency distribution of final diagnoses by t-score of combination hip and spine DEXA the study found that 39.7%of patients had osteoporosis and 44.8% of patents had osteopenia.

Regarding the frequency distribution of risk of fracture by t-score spine the study found that 12.1% of patient had high risk of fracture which diagnose as osteoporotic patient, 46.6%of patient had medium risk of fracture which diagnose as osteopenic patients and 39.7% had low risk of fracture (adequate bone density), this record was similar to Rabaa 2013[15].

CONCLUSION

The study concluded that the dual energy x-ray absorbtiometry is gold standard method and play important role in diagnosis and management of osteoporosis and osteopenia. It can assess the mineral

bone density and determine the risk of fracture so it can determine the methods of treatment.

The study concluded that the most affected age group with osteoporosis was 40-60 years and 61-75 34.48% respectively and most of them were female.

REFERENCES

1. Available from www.radiologyinfo.org/en/info.cfm?pg:dexa accessed on December 8 2016 at 4:00 pm.
2. Cummings SR, Melton LJ. Epidemiology and outcomes of osteoporotic fractures. 2006 February; 30(1): 11-14.
3. Kanis JA, Gluer CC, for the Committee of Scientific Advisors, International Osteoporosis Foundation. An update on the diagnosis and assessment of osteoporosis with densitometry; 2000;11(3):198-191.
4. Kanis JA, Delmas P, Burckhardt P, Cooper C, Torgerson. Guidelines for diagnosis and treatment of osteoporosis. The European Foundation for Osteoporosis and Bone Disease; 1997;7(4):390-406.
5. RCP. Royal College of Physicians Clinical guidelines for the prevention and treatment of osteoporosis; 1999 London: RCP, 1999.
6. Marshall D, Johnell O, Wedel H. Meta-analysis of how well measures of bone mineral density predict occurrence ofosteoporotic fractures. BMJ; 1996 May 18;312(10) : 1254 .
7. Stone KL, Seeley DG, Lui LY, Cauley JA, Ensrud K, Browner WS, Nevitt MC, Cummings SR. BMD at multiple sites and risk of fracture of multiple types: long-term results from the Study of Osteoporotic Fractures. Bone mineral research; 2003 November; 18(11) : 1947-1954.
8. Johnell O, Kanis JA, Oden A, Johansson H, De Laet C, Delmas P, Eisman JA, Fujiwara S, Kroger H, Mellstrom D, Meunier PJ. Predictive value of BMD for hip and other fractures ; Bone mineral research ; 2005 March 7 ; 20(7) : 1185-1194.
9. Eastell R. Treatment of postmenopausal osteoporosis. NEJM; 1998 March 12; 338(11) : 736-746.
10. Gluer CC. Monitoring skeletal change by radiological techniques. Bone and mineral research; 1999 November; 14(11): 1952-1962.
11. Raba'a Al-Maitah. The relation between T-score Z-score, bone mineral densityand body mass index. 2013 November; 3(2225-0522): 2.
12. Oommen A, AlZahrani I, Shoro A, Alruwaili J, Aboalseel B. Relationship between body mass index and bone mineral density in Saudi womem above 40 years with vitamin D deficiency. 2014 November; 2(6):601-604.
13. Farzaneh Montazerifar, Mansour Karajibani, Sara Alamian, Mahnaz
1. Montazerifar F, Karajibani M, Alamian S, Sandoughi M, Zakeri Z, Dashipour AR. Age, weight and body mass index effect on bone mineral density in postmenopausal women. 2014 May; 3(2):2.
14. Available from https://nos.org.uk accessed on April 12 2017 at 8:59 am.
15. Norland, a cooper surgical company operator's guide 435 D 109 Rev.f.