

## Factors Associated with Osteoporosis among Women Diagnosed by Using Dual Energy X-ray Absorptiometry (DEXA)

العوامل المرتبطة بمرض هشاشة العظام بين النساء المشخصات بالأشعة السينية مزدوج الطاقة (الديكسا)

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### الخلاصة :

**خلفية البحث :** هشاشة العظام هي مشكلة صحية عامة ، تؤدي إلى ضعف الهيكل العظمي وزيادة خطر الإصابة بالكسور وخاصة كسور العمود الفقري والورك، وزيادة معدلات الاعتلال والوفيات، والتي تشكل عبئا كبيرا على النظام الصحي بسبب التكاليف الاقتصادية الباهظة لرعاية الكسور التي تنتج عنها.

**الهدف:** للتعرف على بعض العوامل المرتبطة بحدوث مرض هشاشة العظام بين النساء في محافظة النجف الأشرف.

**المنهجية:** أجريت دراسة وصفية مقطعية في وحدة الديكسا في قسم الأشعة في مستشفى الصدر التعليمي في محافظة النجف / العراق ، نفذت الدراسة خلال الفترة من اب 2014 وحتى نهاية اذار 2015. أخذت عينة غرضية مكونة من (150) امرأة من اللاتي تمت إحالتهم لتشخيص هشاشة العظام تم جمع البيانات اعتمادا على المقابلة المباشرة مع النساء باستخدام استبيان خاص، تضمن الأسئلة حول الخصائص الاجتماعية والديموغرافية، مثل العمر والمستوى التعليمي، والسكن والمتغيرات الإيجابية مثل عمر الأم في سن الأمل والتاريخ الطبي للمرأة مثل وجود ضغط الدم والسكري وأمراض الكلى وعوامل أخرى مثل مؤشر كتلة الجسم والأنشطة الجسمية. تم استخدام الإحصاء الوصفي والاستدلالي لتحليل البيانات

**النتائج:** أشارت نتائج الدراسة أن نسبة انتشار هشاشة العظام في هذه الدراسة هو 45.3%. وكانت أعلى نسبة لهشاشة العظام (75%) ضمن الفئة العمرية (< 60) سنة، (53.7%) امرأة في سن الأمل، (67.8%) من المدخنات، (31.3%) لديهن مشاكل فقط في الكلية والجهاز البولي . وأظهرت هذه الدراسة أن (85%) من النساء المصابات بهشاشة العظام كان مؤشر كتلة الجسم طبيعي، في حين (31.1%) يعانون من السمنة المفرطة (30+). وأن (60%) من النساء كانوا ضمن المستوى الأدنى من مستويات الأنشطة الجسمية.

**الاستنتاج:** نستنتج من هذه الدراسة أن مرض هشاشة العظام كان مرتبطا بشكل كبير مع مؤشر كتلة الجسم، والعمر الحالي، ومشاكل الكلى، ومستوى النشاط البدني، وانقطاع الطمث، والتدخين.

**التوصيات :** توصي الباحثة على جميع النساء فوق سن 50 عاما تقوم بإجراء فحص قياس الأشعة السينية مزدوج الطاقة سنويا أو كل سنتين لتقليل احتمال خطر الإصابة بمرض هشاشة العظام.

### Abstract:

**Background:** Osteoporosis is a major public health problem, because it is lead to weakness of the skeleton and increased risk of fractures particularly of the spine and hip, increased morbidity and mortality, and which are a huge burden on the health system due to the high economic costs of those care fractures they produced.

**Objective:** to identify some factors associated with occurrence of osteoporosis among women in AL-Najaf province

**Methodology:** A descriptive study was conducted in DEXA unit in radiology department in Al-Sader Teaching Hospital in AL-Najaf Province /Iraq from August 2014 till the end of March 2015. A purposive sample was (150) woman who referred for investigation osteoporosis by using DEXA measurement. Data were gathered by direct interview with the women using especial questionnaire that include questions about socio-demographic characteristics such as age of women, level of education , residency, reproductive variables such as menopausal age, medical history such as hypertension, diabetic mellitus , body mass index (BMI) and physical activities.

**Results:** The results indicated that the osteoporosis in this study was 45.3%. The most of osteoporosis (75%) within age group (> 60) years, (53.7%) woman at menopause, (67.8%) were smoking, (31.3%) had renal problems. The present study showed that (85%) of women with osteoporosis had normal body mass index, while (31.1%) were obese (30+). In addition to, the study revealed that (60%) of women with osteoporosis were within low physical activities levels.

**Conclusion :** The study concludes that the osteoporosis was significantly associated with body mass index, current age, renal problems,

**Recommendations:** the researcher recommended that all women above 50 years to be done DEXA examination yearly or every two years to decrease possibility of osteoporosis .

**Key word:** osteoporosis , DEXA , Associated.

## INTRODUCTION

Osteoporosis is a disease characterized by reduction in the bonemass and disruption of bone architecture leading to impaired skeletal strength and increased susceptibility of fractures<sup>(1)</sup>. It is the most common metabolic bone disease, affecting one in two women and one in five men aged >50 years in the western world<sup>(2)</sup>. The loss of bone occurs progressively over many years and without apparent symptoms, and often the first sign of osteoporosis is a fracture. For this reason, osteoporosis is often referred to as the “silent epidemic”<sup>(3)</sup>. There are several sites of potential occurrence for osteoporotic fracture including: the spine, hip, distal forearm and proximal humerus<sup>(4)</sup>.

Osteoporosis is a major health burden<sup>(5)</sup>. Because fragility fracture, the consequence of osteoporosis, are responsible for excess mortality, morbidity, chronic pain, admission to institutions and economic costs<sup>(6)</sup>. They represent 80% of all fractures in menopausal women over age 50<sup>(7)</sup>. Those with hip or vertebral fractures have substantially increased risk of death after the fracture<sup>(8)</sup>. The 1-year mortality of elderly patients with hip fracture is approximately 24%<sup>(9)</sup>. The risk factors associated with osteoporosis may be modifiable or non-modifiable<sup>(10)</sup>. Non-modifiable risk factors include age and sex: estrogen deficiency following menopause or oophorectomy is correlated with a rapid reduction in bone mineral density.

Ethnicity is also recognized as a non-modifiable risk factor and European or Asian ancestry predisposes for osteoporosis. Genetics is also a predisposing factor: those with a family history of osteoporosis are more likely to have increased risk<sup>(11)</sup>. Important modifiable risk factors include calcium and vitamin D deficiency, sedentary lifestyle, smoking; excessive alcohol and caffeine intake<sup>(12)</sup>. Dual-energy x-ray absorptiometry (DEXA) is the most applicable method to assess bone mineral density (BMD), is a highly accurate x-ray technique. DEXA is considered the gold standard of methods used to diagnose osteoporosis and is recommended by the International Osteoporosis Foundation<sup>(13)</sup>. A major advantage of DEXA is that it exposes the patient to radiation levels approximately 90% less than a standard chest radiograph<sup>(14)</sup>.

Radiologic laboratory assessments of bone mineral density generally should be reserved for patients at highest risk, including all women over the age of 65, younger postmenopausal women with risk factors, and all postmenopausal women with a history of fractures.

## METHODOLOGY:

**Study Design:** A descriptive study was carried out during the period from August 2014 till the end of March 2015.

**Setting of The Study:** It was conducted in DEXA unit in Radiology department in Al-Sader Teaching Hospital in AL-Najaf province

**Sample of the Study:** The sample of the study is a non-probability (purposive) sample. Included (150) females referred to DEXA unit from AL-Sader Teaching Hospital clinics, and other governmental Hospitals clinics and out Patients,

**Data Collection Methods and Tools:** (A) Interviewing of the study sample: using special questionnaire consisted of five parts: the first part socio-demographic variables such as age of women. Level of education, second part, obstetric-gynecological such as menopause third part medical history such as hypertension, diabetes mellitus, renal problem, fourth part was physical activities levels, and measured body mass index (BMI). The interview lasted for about (30) minutes, (B) Review of the women's medical records (case sheet): giving information about medical diagnosis of diseases such as Hypertension, and Diabetes mellitus (C) BMD Measurements : Bone mineral density measurements at both the lumbar spine Anteroposterior (AP) L1–L4 and femoral hip (neck, trochanter) were carried out by DEXA These sites. were chosen because many prospective studies have shown that a decrease in BMD at the spine or

hip of one standard deviation (SD) increases fracture risk by a factor of two to three<sup>(15)</sup> the unit of measurement for bone density with the use of DEXA is areal density (g/cm<sup>2</sup>); however, BMD is reported as a T-score on the basis of this measurement. According to the WHO we used the following diagnostic guidelines: Normal-score ( $\geq -1.0$ ); Osteopenia: T-score between (-1.0 and -2.5); Osteoporosis: T-score ( $\leq -2.5$ )<sup>(16)</sup>

DEXA measures bone density in the hip and spine, the patient lies on a padded table an x-ray generator is located below the patient and an imaging device, or detector, is positioned above. There are five steps necessary to complete patient measurements:

- Step 1: Record new patient information includes name, sex, weight and height.
- Step 2: Position Patient: To assess the spine, the patient's legs are supported on a padded box to flatten the pelvis and lower (lumbar) spine. To assess the hip, the patient's foot is placed in a brace that rotates the hip inward.
- Step 3: Adjust measurement start position by central devices equipment.
- Step 4: Click on start measurement that appear on computerscreen. the detector is slowly passed over the area, generating images displays the bone mineral measurements on a computer screen.
- Step 5: Adjust the image and create results report. The BMD value printed machine and according to the T-score, the diagnosis of osteoporosis and osteopenia was made. the DEXA bone density test is usually completed within 10 to 30 minutes, depending on the parts of the body being examined:  
D- BMI Measurements : After measuring the height and weight of the patient, the body mass index is calculated by the equation =Weight (Kg) / Height (m<sup>2</sup>). Normal = BMI 18.5–< 25 kg/m<sup>2</sup>; Overweight = BMI 25–30 kg/m<sup>2</sup>; Obese = BMI > 30 kg/m<sup>2</sup><sup>(15)</sup>  
E- Calculating physical activity score: One of the easiest methods for recording of the intensity of a physical activity is the Metabolic Equivalent (METs) method. METs are multiples of the resting metabolic rates to yield a score in MET-minutes. A MET-minute is computed by multiplying the MET score by the minutes performed each activity was assigned a MET value, Light level < 3.0 METs, Moderate level 3.0–6.0 METs and Vigorous level >6.0 METs<sup>(17)</sup>. The time spent in each activity (or group of activities) was calculated for one week  
totalmin/week=(Walking(Light  
• METs\*min\*days)+(ModerateMETs\*min\*days) + (Vigorous METs\*min\*days).

**Statistical Analysis:** descriptive and inferential Statistical analyses were used

## RESULT

**Table 1 demographical characteristic of study samples**

Variable	No.	%	Variable	No.	%
<b>Current age (years)</b>			<b>Medical history</b>		
< 50	43	28.7	<b>Hypertension</b>		
50-60	67	44.7	Yes	69	46.0
> 60	40	26.7	No	81	54.0
<b>Residency</b>			<b>Diabetes mellitus</b>		
Urban	135	90.0	Yes	41	27.3
Rural	15	10.0	No	109	72.7
<b>Education level</b>			<b>Renal problems</b>		
Illiterate	71	47.3	Yes	48	32.0
Primary school	42	28.0	No	102	68.0
Secondary school	27	18.0	<b>Body mass index</b>		
Higher education	10	6.7	Normal(<25)	20	13.3
<b>Smoking</b>			Overweight	40	26.7
Yes	28	18.7	Obesity(30+)	90	60
No	122	81.3	<b>Physical activity level</b>		
<b>Menopause</b>			Low	50	33.3
Yes	108	72.0	Moderate	81	54.0
No	42	28.0	High	19	12.7
<b>Diagnosis</b>					
Normal	46	30.7			
Osteopenia	36	24.0			
Osteoporosis	68	45.3			

Table (1), shows that most of women (44.7%) reported within age group (50-60) years, (90%) of women lived in urban areas and (47.3%) of women level of education illiterate. Just over (80,3%)of the women reported not smoker and (72%)of women reported at menopause. Just 45.3% of the women were diagnosed as osteoporosis, (24%) osteopenia. According medical history of women, Hypertension was reported by 46%, and 32% had renal problems. Body mass index (obesity 30+) was reported by 60%, also, 54.6% of the women reported with in moderate physical activity level,

Table (2) Distribution of study samples according to Bone mineral density and Variables

Variables	Bone mineral density						Total		X <sup>2</sup>	- value
	Normal		Osteopenia		Osteoporosis		No.	%		
	No.	%	No.	%	No.	%				
<b>Current age (years)</b>										
< 50	20	46.5	13	30.2	10	23.3	43	28.7	<b>23.002</b>	<b>&lt; 0.001 (HS)</b>
50-60	23	34.3	16	23.9	28	41.8	67	44.7		
> 60	3	7.5	7	17.5	30	75.0	40	26.7		
<b>Residency</b>										
Urban	41	30.4	33	24.4	61	45.2	135	90.0	<b>0.012</b>	<b>&gt; 0.05 (NS)</b>
Rural	5	33.3	3	20.0	7	46.7	15	10.0		
<b>Education level</b>										
Illiterate	17	24.0	16	22.5	38	53.5	71	47.3	<b>0.327</b>	<b>&gt; 0.05 (NS)</b>
Primary school	15	35.3	12	28.6	15	35.7	42	28.0		
Secondary school	12	44.4	5	18.5	10	37.0	27	18.0		
Higher education	2	20.0	3	30.0	5	50.0	10	6.7		
<b>Smoking</b>										
Yes	5	17.9	4	14.3	19	67.8	28	18.7	<b>7.047</b>	<b>&lt; 0.01 (HS)</b>
No	41	33.6	32	26.2	49	40.2	122	81.3		
<b>Menopause</b>										
Yes	26	24.1	24	22.2	58	53.7	108	72.0	<b>10.905</b>	<b>&lt; 0.01 (HS)</b>
No	20	47.6	12	28.6	10	23.8	42	28.0		
<b>Medical history</b>										
Hypertension			16				69		<b>0.563</b>	<b>&gt; 0.05 (NS)</b>
Yes	24	34.3	20	23.2	29	42.0	81	46.0		
No	22	27.2		24.7	39	48.1		54.0		
Diabetes mellitus			12				41			
Yes	11	26.8	24	29.3	18	43.9	109	27.3	<b>0.047</b>	<b>&gt; 0.05 (NS)</b>
No	35	32.1		22.0	50	45.9		72.7		
Renal problems			13				48		<b>5.649</b>	<b>&lt; 0.05 (S)</b>
Yes	20	41.7	23	27.0	15	31.3	102	32.0		
No	26	25.5		22.5	53	52.0		68.0		
<b>Body mass index</b>										
Normal(<25)	1	5.0	2	10.0	17	85.0	20	13.3	<b>22.433</b>	<b>&lt; 0.001 (HS)</b>
Overweight	11	27.5	6	15.0	23	57.5	40	26.7		
Obesity(30+)	34	37.8	28	31.1	28	31.1	90	60		
<b>Physical activity level</b>										
Low	10	20.0	10	20.0	30	60.0	50	33.3	<b>11.179</b>	<b>&lt; 0.001 (HS)</b>
Moderate	26	32.1	20	24.7	35	43.2	81	54.0		
High	10	52.6	6	31.6	3	15.8	19	12.7		

Table (2) shows that (75%) of women age >60 years had osteoporosis compared to only 23.3% of those age <50 years and the difference was significant (p < 0.001). Smoking was significantly associated with osteoporosis (p < 0.01) and (22.2%) of menopausal women with osteopenia and (53.7%) osteoporosis. Also, 31.3% of women with renal problems had

osteoporosis ( $P < 0.05$ ) BMI had significant with osteoporosis ( $P < 0.001$ ). The rate of osteoporosis significantly increased from 31.1% among Obese women (30+) to as high as 85% among Normal (<25) of BMI). categories, while Overweight (25- 29.9) of

BMI-and the difference was significant ( $P < 0.001$ ). Also physical activities score categories had significant with osteoporosis ( $p < 0.01$ ).

**Table 3: factors associated with osteoporosis in women patients**

Factors	oR	95% CI for OR
<b>1.Body Mass Index</b>		
Normal(<25)	Ref.	–
Overweight(25-29.9)	0.12	0.005 – 1.100
Obesity(30+)	0.05	0.002 – 0.38
<b>2. Age (years)</b>		
< 50	Ref.	–
50-60	2.44	0.866 – 6.952
> 60	20.00	4.259 – 108.206
<b>3.Renal Problems</b>		
Yes	0.37	0.149 – 0.899
No	Ref.	-

**OR= Odds ratio, CI= confidence interval, Ref =reference category**

Table 3 shows that women who were obesity (30+) of BMI-categories were only (0.05 times) as likely to have osteoporosis compared with those who were normal (<25) of BMI-categories. Women who were >60 years old (20 times) more likely to have osteoporosis compared with those who were <50 years old, while women within age group (50-60) years old (2.44) times more likely to have osteoporosis compared with those who were <50 years old. Participants who reported having renal problems were (0.37 times) more likely to have osteoporosis compared with those who did not report having osteoporosis categories was 57.5%. also.

## DISCUSSION

### Part 1:socio demographic characteristics:

Present findings demonstrated a significant correlation between age and osteoporosis. As the age increases, osteoporotic cases increase, especially after 60 years. This result is closely matching with other research<sup>(18)</sup>. The probable explanation is that the balance of cellular activity is altered with ageing process, with a reduced osteoblast response to continued bone resorption, so the resorption cavities are incompletely filled by a new bone formation during the remodeling cycle<sup>(19)</sup>.

The present study shows that most of women (46.7%) who had osteoporosis were from rural areas and in contrast (45.2%) of them were from urban areas. The researcher believe that rural community less availability of health services and treatment which leads to lack of early

detection of osteoporosis as well as lack of awareness of food and health education in this community. These results are disagreement with the results of study in Thailand in a comparative study, who reported that the majority of the osteoporosis (18.2%) were from urban areas, while the rest (9.2%) were from the rural areas<sup>(20)</sup>. This disagreement may be due to different environmental condition between Iraq and Thailand.

The present study shows that most of women (53.5%) who had osteoporosis were illiterate and in contrast (35.7%) of them were primary school. This result could be due to the part that illiterate women are not aware of osteoporosis and therefore took no precautions against it. Also, the reason probably is the effect of education on lifestyle, nutrition, health care, good hygiene and economic status. The other possibility is the effect of economic status in education level. People from well to do families have more facilities for continuing their education and they also have better nutritional and health status during childhood which affect the peak bone mass<sup>(21)</sup>.

The findings of the study indicated that high significant association was found between smoking and osteoporosis ( $p < 0.01$ ). The most of women (67.8%) who had osteoporosis were smokers and in contrast (40.2%) of them were nonsmokers. This is agreement with the findings of some other studies in which smoking was considered a significant factor<sup>(22)</sup>. The present study shows high significant difference ( $p < 0.01$ ) between menopause and osteoporosis.

Menopause is an important predictor of osteoporosis associated as it leads to bone weakness. The findings of this study are comparable with those of other reported studies. The increased rate of bone resorption immediately after menopause clearly indicates a hormonal influence on bone density in women and the most likely explanation for this increased resorption is the drop in ovarian estrogen production that accompanies menopause<sup>(23)</sup>.

#### **Part 11: medical history characteristics**

The results in this study demonstrated that insignificant association was found between hypertension and osteoporosis ( $p > 0.05$ ). This result it is disagreement with the results of other studies shows significant correlation between hypertension and osteoporosis, thought to be through a link between cardiovascular diseases and osteoporosis, was demonstrated<sup>(24)</sup>. The latest research has shown that rennin-angiotensin system plays a main role in blood pressure control and has an influence on bone density. High blood pressure is associated with calcium metabolism disorder, which affects increased secretion of calcium through urine<sup>(24)</sup>.

The results in this study demonstrated that insignificant association was found between diabetes mellitus and osteoporosis ( $p > 0.05$ ). This result it is disagreement with the results of other studies in which diabetes mellitus correlated significantly with osteoporosis<sup>(25)</sup>.

Bone disease may occur early in the course of kidney disease, and worsens as the decline in kidney function progresses, and bone density tends to be worse in cortical sites. Kidney patients also may have poor quality bone, so they can suffer fractures even without severe loss of bone mass<sup>(25)</sup>.

Among BMI that found a statistically high significant association with osteoporosis ( $p$ -value=0.001). Overall, the results showed that the majority of osteoporosis was (85%) normal (<25), while (31.1%) of osteoporosis were obese (30+). so this factor was negatively associated with the BMD; this result is consistent with other studies<sup>(26)</sup>. The association between body weight and BMD could be explained in various ways. Firstly, subjects with a higher body weight may be subjected to larger loading on the skeleton, which would result in a higher bone mass. Secondly, better nutrition may result in both a higher skeletal bone mass and a higher body weight. Thirdly, the same genes may determine both body mass and bone mass<sup>(27)</sup>

The present study revealed that a high relationship between Physical activity and osteoporosis with  $p$ -value < 0.001, this agree with the study of Sharami S., et al., in Iran, (2008) who reported that a significant relationship was observed between physical activity and osteoporosis ( $p$ -value= 0.001) (18)

### **CONCLUSION:**

1. The prevalence of osteoporosis among the studied sample represents a high percentage
2. There was significant difference between osteoporosis and several factors include old age, smoking, menopause, renal problems, body mass index and physical activity.
3. The study has showed that body mass index, age and renal problems were the most significant predictors of osteoporosis.
4. The study has founded that are no significant difference between osteoporosis and some factors include residency, education level, hypertension and diabetes mellitus.

### **RECOMMENDATION:**

1. Provision of examination devices of osteoporosis in most hospitals of Al-Najaf province
2. Measuring of bone mineral density for menopausal women, and women with renal problems for early detection of osteopenia or osteoporosis.
3. Provide DEXA unit with published materials to enhance women knowledge and practices about osteoporosis.
4. Exploitation of the mass media for health education against osteoporosis to increase the public awareness.
5. Further larger studies should be including larger sample to find out the size of problem in Iraq.

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