Original Article

Effect of nulliparity, Body Mass Index and residency on bone mineral density in women between 40 and 50 years in Al-Medina, KSA

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Abstract

Background:

Osteoporosis causes adverse effects on the quality of life of individuals. We need to evaluate its risk factors in women between 40 and 50 years. Because they are either a t e a r l y menopause or not reaching menopause, so the hormonal effect is minimal.

Our aim was to investigate the effect of nulliparity, body mass index (BMI) and

location of residency on bone mineral density (BMD) in woman aged between 40 and 50 years.

Methods: A cross sectional study was conducted between February and April 2018. The study included 271 women aged between 40 and 50 years, with abnormal Dual Energy X-Ray Absorptiometry (DEXA) scan. The data was collected through a questionnaire, site of abnormality and its severity (osteoporosis or osteopenia) as well as nulliparity, BMI and location of residency. Data was collected from patients' files and by contacting them through their mobile phones. consent taken verbally.

Results: 46.1% of the subjects were overweight and 53.1% were obese, there was an inverse relationship between BMD and BMI ($p < 0.05$). Eighty-nine percent of women were living in urban areas, but there was no relationship between DEXA diagnosis and residency ($p > 0.05$). Nulliparity women were78.3%, There was no relationship between BMD in spine or left femur and nulliparity ($p > 0.05$), but there was a relationship with the right femur ($p < 0.05$).

الملخص

المقدمة:

تؤثر هشاشة العظام سلبا على الحياة اليومية للفرد ونحتاج الى ان نقيم عوامل الخطر التي تؤدي لحدوثها للسيدات في الفترة العمرية ما بين ٤٠ الى ٥٠ عاما، لأنهن في هذه المرحلة إما أن يكن قد وصلن إلى بدايات سن اليأس أو ما قبلها، فيكون تأثير الهرمونات شبه معدوم. هنالك قلة في الأبحاث المنشورة عن هذه الفئة العمرية، فالغالبية العظمى تتحدث عن الهشاشة في سن اليأس. لهذا يهدف البحث إلى دراسة تأثير عدم الحمل، معدل كتلة الجسم ومكان الإقامة على كثافة العظام لدى السيدات من ٤٠ الى ٥٠ عام.

طريقة البحث:

هذه دراسة مقطعية، أقيمت في الفترة ما بين فبراير وأبريل من عام ٢٠١٨ بمستشفى الملك فهد بالمدينة المنورة. الدراسة شملت الدراسة ٢٧١ من السيدات اللاتي تبلغ أعمارهن بين ٤٠ و٥٠ عام ولديهن نتائج غير طبيعية في فحص الديكسا (أشعة تستخدم لقياس كثافة العظام). تم جمع البيانات عن طريق استبانات تحتوي على أسئلة عامة كالعمر والحالة الاجتماعية ومجموعة من المتغيرات مثل: مكان نقص كثافة العظم ومقداره، الطول والوزن وكذلك مكان الإقامة. تم جمع البيانات من المرضى أنفسهم عن طريق الهاتف ومن السجلات الطبية بعد أخذ الإذن وضمان سرية المعلومات.

النتائج:

أكثر الأماكن تأثرا بنقص كثافة العظام هي عظام الفقرات القطنية ب ٦٩,٧ ٪ قلة الكثافة و٢٢,٩ ٪ هشاشة العظام. هنالك ٤٦,١ ٪ من السيدات يعانين من الوزن الزائد و٥٣,١ ٪ يعانين من السمنة. هناك علاقة عكسية بين معدل كتلة الجسم

Conclusion: In women, BMI has an inverse relationship with BMD. Nulliparity has an inverse
relationship with right, but not with the left femur. There is no relation between
location of residency and BMD.

Keywords: body mass index, bone mineral density, DEXA, osteoporosis, risk factors

وكثافة العظام. ٧٨,٣ ٪ من السيدات لم يلدن. لا توجد علاقة بين كثافة العظام في الفقرات والفخذ الأيسر وعدم الولادة، لكن هنالك علاقية عكسية مع عظام الفخذ الأيسر. لا توجد علاقة بين كثافة العظام ومكان الإقامة.

الخلاصة:

هناك علاقة عكسية بين معدل كتلة الجسم وكثافة العظام. لا توجد علاقة بين كثافة العظام في الفقرات والفخذ الأيسر وعدم الولادة، لكن هنالك علاقة عكسية مع عظام الفخذ الأيسر. لا توجد علاقة بين كثافة العظام ومكان الإقامة.

Introduction

Low bone mineral density (BMD) represents a significant risk factor for osteoporosis and its associated fractures [1]. Over the past decade, osteoporosis has been considered a large-scale health issue by both the public and the medical profession [2]. Osteoporosis is a skeletal disease characterized by low BMD and microarchitectural deterioration of bone tissue, which leads to increase in bone fragility and its susceptibility to fractures [2,3]. osteopenia is the low grade which occurs before osteoporosis.

Bone tissue remodels itself continuously throughout life, through bone resorption and bone formation [4]. As we grow older, bone resorption exceeds bone formation. As a result, bones become osteopenic due to decrease in the stored calcium and minerals in the bones and makes them less dense, lighter in weight and more fragile [1].

Bone strength can be assessed by measuring the BMD. [1,5] Currently, dual-energy x-ray absorptiometry (DEXA) is used widely to measure BMD and is considered the gold standard [6]. This wide use has enabled specialists to assess BMD in many skeletal sites [7,8], a technique that is verified widely [7]

BMD is regulated mainly by genetics, but it is influenced by many environmental factors too, such as pregnancy, period of lactation, body mass, nutrition, physical activity, smoking, alcohol consumption, and Follicle Stimulating Hormone (FSH) deficiency. [3,8,9] Many studies have reported the significant variation in BMD levels by gender, age group, geographical area and ethnicity/race [1]. Values of BMD also differ widely between different local regions of one country or nearby countries, such as the Gulf States. [8]

Low BMD is a main public health problem around the world, but, in most of the Middle East countries, the epidemiology of osteoporosis is not well known yet. [1,5] Osteoporosis is also an important cause of fractures which may keep the person bedridden. In addition to be a major cause of fractures, osteoporosis is also an important cause of bedridden and its complications. These complications could be life-threatening specially among elderly people. [7]

Ito et al. reported that the maximum BMD among females is in the mid-30s, and then it tends to decrease with a particularly drastic decrease around menopause [10]. According to the WHO, osteoporosis is defined as a BMD that lies 2.5 standard deviations or more below the average value for young

healthy women (a T-score of <-2.5 SD) [7]. While, Osteopenia is defined as below normal bone density and the precursor to osteoporosis, with a T-score –1 to –2.5[11]. Based on global estimates around the world, there are about 200 million women have osteoporosis [12]. In the USA, osteoporosis affects about 30% of postmenopausal white women, and the ratio rises to 70% among the women over 80 years old [13]. While in Saudi Arabia, low BMD is a public health issue as AlQuaiz et al. (2014) reported that 58.6 % of Saudi women >40 years old have a low BMD [12].

Low BMD adversely affects the public health and country's economy in general due to the high medical cost. In addition, almost all previous osteoporosis studies focused on postmenopausal females and some focused on young females, or children [13,14]. Therefore, there is still a need to study risk factors related to osteoporosis among women aged 40-50 years, because women at this age are either at early menopause or not reaching menopause, so the hormonal effect will be minimal. Hence, this study aimed to evaluate the effect of nulliparity, body mass index (BMI), and residency on bone mineral density (BMD) in woman aged 40-50 years at king Fahad hospital in Al-Medina, Saudi Arabia.

Materials And Methods

Study design and setting:

A retrospective descriptive study was conducted in King Fahad hospital in Al-Madinah, KSA from February to April 2018.

Study population and sampling:

Women whose age was 40-50 years, who had abnormal DEXA scan wen visited King Fahd Hospital in Al-Madinah for a DEXA scan purpose between the first of January 2015 until the end of August 2017, as a new case or had a previous scan with an abnormal result, whether she had a complaint or not were selected for the study

Study tools:

Specialized questionnaire was designed for data collection. A pre- test was done for 50 persons and modifications was done by removing items that were hard to collect, and items that were not clear were revised. It covers the socio-demographic data, site of abnormality and its severity (osteoporosis or osteopenia) as well as the data needed to assess the risk factors of osteoporosis as nulliparity, BMI, residency, hormone levels, calcium level, previous Gastrointestinal (GI) surgery, medications, chronic diseases. Data were obtained from the patients' files and by contacting them through their mobile phones. BMI was calculated through equation: weight in kilograms divided by square of the person's height in meters. Ethical approval was obtained from King Fahad Hospital in Medina and from Taibah University. Consent was taken verbally after ensuring the confidentiality of data.

Statistical Analysis:

The Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA) was used for data analysis. Chi-square test was used for categorical data and the t-test was used for the quantitative data analysis and $p < 0.05$ was considered significant.

RESULTS

Table 1
participants distribution according to BMI, marital status, location, and null- parity

Variable		Frequency (n= 271)	%
Class of BMI	Normal (BMI <25 kg/) Overweight (BMI <30 kg/ Obese	2 125 144	0.7 46.1 53.1
		Frequency (n= 145)	%
Marital status	Married Single Divorced Widow	120 20 3 2	82.8 13.8 2.1 1.4
		Frequency (n= 245)	%
Residency	Urban Rural	218 27	89.0 11.0
		Frequency (n= 153)	Percentage %
Null parity	Yes	116	75.9
	No	37	24.1

The mean age of participants was 45.43 years (SD=2.879). The mean BMI of participants' is 30.43 Kg/m^2 (SD=5.614). Most participants were married (82.8%), live in urban area (89.0%) and null- parous (75.9%).
Table 1

Table (2) shows the participants' distribution according to the diagnosis based on DEXA done for the spine, right femur, and left femur, and shows that, the most affected area was spine with 69.7% osteopenia and 22.9% osteoporosis.

Table 2:
participants' distribution according to DEXA diagnosis for the spine, right femur, and left femur (n=271)

Variable		Frequency	Percentage
DEXA diagnosis for spine	osteoporosis	62	22.9
	osteopenia	189	69.7
	normal	20	7.4

DEXA diagnosis for right femur	osteoporosis	16	5.9
	osteopenia	86	31.7
	normal	169	62.4
DEXA diagnosis for left femur	osteoporosis	18	6.6
	osteopenia	99	36.5
	normal	154	56.8

Table 3: Participants distribution according to steroid use, chronic diseases, GI surgery, previous calcium level, parathyroid level, thyroid level, sex hormone level, and corticosteroid level (n=247)

Variable		Frequency	Percentage
Steroids use	No	2	0.8
	Yes	18	7.3
	None	227	91.9
Chronic diseases	IBD	1	0.4
	Kidney disease	5	2.0
	liver disease	3	1.2
	None	238	96.4
GI surgery	Yes	5	2.0
	No	242	98.0
Previous calcium level	High	2	0.8
	normal	93	37.7
	Low	3	1.2
	None	149	60.3
Parathyroid level	High	7	2.8
	normal	78	31.6
	Low	6	2.4
	None	156	63.2
	Missing	24	9.7
Thyroid level	High	4	1.6
	normal	87	35.2
	Low	34	13.8
	None	122	49.4
FSH hormone level	High	9	3.6
	normal	2	0.8
	Low	9	3.6
	None	227	91.9
Serum corticosteroid level	normal	12	4.9
	Low	2	0.81%
	None	233	94.33%

The participants' distribution according to steroids use, chronic diseases, GI surgery, previous calcium level, parathyroid level, thyroid level, FSH hormone level, and corticosteroid level is shown in table 3, and most of factors were not available for all patients and majority of them had no history of GI surgery (98.0%).

There is a relationship between DEXA diagnosis for spine, right femur and left femur and BMI, but there is no relationship between DEXA diagnosis and residency location or nulliparity (Table4).

Table 4
The relation between DEXA diagnosis and (BMI, residency, and nulliparity)

Variables		**BMI**			**Residency**		**Nulliparity**	
		over-weight	normal	obese	urban	rural	Yes	No
DEXA diagnosis for spine	osteoporosis	36	1	25	47	5	18	7
	osteopenia	79	0	110	153	21	83	20
	Normal	10	1	9	18	1	7	3
P-value		0.012			0.624		0.521	
DEXA diagnosis for right femur	osteoporosis	15	0	1	12	2	3	4
	osteopenia	51	1	34	72	5	26	11
	Normal	59	1	109	134	20	79	55
P-value		0.000			0.306		0.015	
DEXA diagnosis for left femur	osteoporosis	12	0	6	13	2	5	3
	osteopenia	54	2	43	86	5	37	12
	Normal	59	0	95	119	20	66	15
P-value		0.008			0.104		0.391	

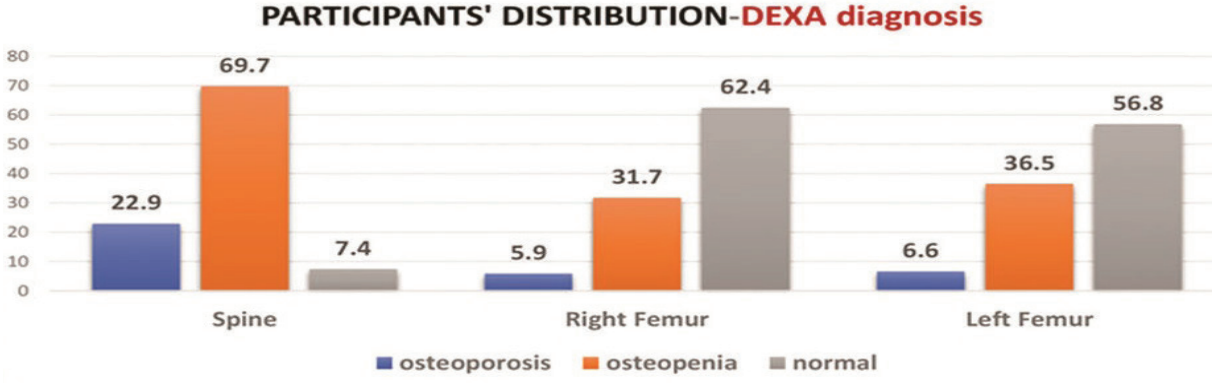


Figure 1. participants distribution for DEXA diagnosis

The current study showed that there is a high prevalence of osteoporosis and osteopenia among the women in the study population. The analysis of DEXA diagnosis for our participants revealed significant differences among measurements of spine and femurs (figure 1).

Discussion

This difference of BMD among different human body parts could be due to the variation of bone loss velocities between these different parts [16]. The presence of BMD differences between different body parts is one of the reasons for measuring BMD in several body sites, which can affect the diagnosis and therapeutic plan in an individual person [17].

In the present study, the BMD in the spine was less than the femurs. The spine had the highest prevalence of osteoporosis and osteopenia (22.9% and 69.7% respectively). Our findings here are consistent with Moayyeri et al., finding that lower BMD values were reported in the lumbar spine [17]. The literature showed that the vertebral fractures are the most common clinical manifestation of osteoporosis [16]. Otherwise, most of the etiologies of the secondary osteoporosis affect the spinal column first [18]. In general, the health status and history of our participants were not totally accessible due to change from paper record to electronic one, but we can say that there was no widespread prevalence of chronic diseases or previous surgeries among the participants.

High BMI is one of the strongest risk factors for osteoporosis [19]. Almost all participants in this study ranged from overweight to obese, our results here revealed an inverse relationship between BMD and BMI. Studies differed in their results regarding the relationship between BMD and BMI as some studies found that increased BMI reduces BMD [19,20], which is consistent with our results. While other studies have found that increased BMI increases BMD and thus reduces osteoporosis [21,22]. Differences in results can be explained by the fact that there is a negative genetic correlation between fat mass and weight-adjusted bone mass [19], so fat mass has a negative effect on bone mass in contrast with the positive effect of weight-bearing itself [23] Obesity, therefore, has negative effect on BMD [20].

Lifestyles particularly physical activity levels and dietary patterns generally vary between rural and urban areas. In the current study, most women (89%) were living in Urban areas. There is no relationship between BMD and location of residence. Since the study was in Saudi Arabia, which is a high-income country, our results here are consistent with Matsuzaki et al., study, which found that in some low and middle-income countries, BMD was higher in urban areas. While in high-income countries, the urban areas didn't show higher BMD [24]. While in Norway, Meyer et al., found higher BMD in rural areas compared with urban areas [25]. Also, In Thailand, Pongchaiyakul et al., found that BMD of the femoral neck was higher in rural men and women than their counterparts in urban areas [26]. This may be because the rural areas are usually having higher level of physical activity, high serum vitamin D level, and

lower levels of air pollution. The difference in the results between our study and these studies may be due to the difference of the target group in the studies in terms of age, gender, sample size and time of the study.

During pregnancy, the rise in bodyweight, multi-vitamin supplement and increasing estrogen hormone are thought to have positive effects on BMD. Otherwise, mothers' inability to compensate for the calcium loss with diet during pregnancy and lactation is thought to exert a negative effect on BMD [27]. So, differences appeared in the results of studies about the relationship between nulliparity and BMD. In the present study, about 75.9% of women were null-parous. Our results showed that there is no relationship between BMD in spine or left femur and nulliparity, but there is an inverse relationship between BMD in the right femur and nulliparity. Terzi et al.; Hillier et al. and Lenorav et al., found that there was no effect of nulliparity on the BMD among women [27,28]. While Cure-Cure et al., found that pregnancies appear to be a protective factor against the development of osteoporosis [29]. However, Ozdemir et al., findings indicate that the increased number of pregnancies and abortions and higher age at first pregnancy increases the risk of osteoporosis [30]. As well as, Gur, Ali et al., who found that among the group of 40-59-year women, the BMD of the spine in both the null-parous and one-to-two-parity groups was significantly higher than that of the more-than-five-parity group. No significant differences were found among the groups with respect to the BMD values at any femur sites [31].

The study revealed that bone mineral density (BMD) in the spine is less than femurs. The study showed that there is an inverse relationship between BMD and BMI. There is relationship between BMD on right femur and nulliparity, but not with left one. There is no relationship between BMD and residence of patients.

Limitations of the study

This study included only females aged 40-50, therefore the results cannot be generalized to males and females of other ages. Also, participants were selected from King Fahd Hospital in Al-Madinah only and may not be representative for the general population in Saudi Arabia.

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