

Osteoporosis in postmenopausal Saudi women using dual x-ray bone densitometry

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ABSTRACT

Objective: A pilot study to estimate the prevalence of osteopenia and osteoporosis in postmenopausal Saudi women.

Methods: Lumbar spine bone density was measured in 830 postmenopausal Saudi women 50-80 years of age (average 59 years), using dual x-ray absorptiometry (DXA) at the King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia between 1989 and 1999.

Results: The results of the bone mineral density (BMD) in gm/cm² were compared to the peak bone density (PBD) in healthy young women (T-score). Based on the definition of World Health Organization (WHO), the T-score value was considered for analysis. Accordingly, 248 (29.9%) subjects showed normal result, mean BMD of 1.117 ± 0.13 and T-score of -0.66 SD; while 254 (30.6%) subjects showed osteopenia, mean BMD of 0.983 ± 0.11 and T-score of -2.4 SD and 328 (39.5%) subject showed osteoporosis, mean BMD of $0.767 \pm$

0.11 and T-score of -3.4 SD. When the 830 subjects were analyzed by decades, there were 42.3% normal, 33.4% osteopenia and 24.3% osteoporosis in age 50-59 years; 11% normal, 27% with osteopenia and 62% with osteoporosis in age 60-69 years while in older age 70-79 years only 4.6% had normal BMD, 21.5% had osteopenia and 73.8% had osteoporosis.

Conclusion: Osteopenia and osteoporosis are common among postmenopausal Saudi women and should be considered as a matter of public health. Bone densitometry should be used to assess the severity of bone loss, identify those who need therapy and for follow up and early diagnosis of those with osteopenia in order to institute proper therapy and avoid future osteoporosis.

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Osteoporosis is defined as a progressive systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture.¹ Once thought to be relatively benign, inevitable feature of aging, osteoporosis has emerged as a growing public health problem.² In the United Kingdom, more than 2 million people suffer from osteoporosis, including total annual costs for osteoporotic fractures of 6.4 million pounds in England and Wales alone and 18 billion dollars per year in United

States America (USA).^{2,3} Age related bone loss is well established and rapid bone loss at the start of the menopause is also an important contributing factor to the development of osteoporosis due to lack of estrogen hormone.⁴⁻⁶ Bone densitometry (dual x-ray absorptiometry [DXA]) has been shown to be very reliable and sensitive in assessing bone mineral density (BMD) and, when repeated, it will allow estimation of the rate of bone repair and patient compliance with treatment.^{6,7} The precision and accuracy rates of bone densitometry are quite high. The World Health

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Organization (WHO) has published a guidelines for the diagnosis of osteopenia and osteoporosis, which related to an individual's BMD to the mean peak bone density of young adults (T-score).^{1,8} Osteoporosis is defined as a BMD of more than 2.5 SD below that of young adults (T-score -2.5 or more) whereas a BMD between one and 2.5 SD below that of young adults (T-score -1 to -2.5) is considered osteopenia.^{1,6,8} This study was undertaken prospectively to evaluate the prevalence of osteoporosis in postmenopausal Saudi women.

Methods: A heterogenous patient population of consequent 830 postmenopausal Saudi women aged between 50 and 80 years (average 59 years) with established amenorrhea were recruited from the primary care, gynecologic and employee health clinics at the King Khalid University Hospital (KKUH), Riyadh, Kingdom of Saudi Arabia (KSA) for the measurements of BMD. Based on a simple questionnaire the patients were selected. Only mobile postmenopausal women with established amenorrhea according to patients history were included. No blood tests were carried out to measure hormonal status. Patients with chronic illness, bone or metabolic disorders and those taking medications, which can affect the bone, were excluded. Patients with known osteoporosis, chronic back pain and history of fractures were also excluded. All the 830 women had undergone DXA (Lunar Radiation Corp, Wisconsin) measuring BMD of the lumbar spine (L2-L4) in gm/cm². All measurements were carried out in one center (Department of Nuclear Medicine, KKUH between 1989 and 1999) and interpreted by a physician (El-Desouki).

Results: The results of the lumbar spine BMD were compared to normal data provided by the bone density equipment, which was close to normal Saudi data, but more accurate as it was carried out on a larger population.⁹ Based on the definition of WHO the T-score was considered for analysis (**Table 1**). **Figures 1 and 2** show DXA scan of lumbar BMD in patients with osteopenia and osteoporosis. Of the 830 subjects 29.9% showed normal BMD (T-score -0.66 SD), 30.6% showed osteopenia (T-score -2.4 SD) and 39.5% showed osteoporosis (T-score -3.4 SD) (**Table 2**). When the subjects were analyzed by decades (**Table 3**) the percentage of osteoporosis was higher in the older population. Between age 50-59 years 42.3% showed normal BMD (T-score -0.61 SD), 33.4% showed osteopenia (T-score -2.36 SD) and 24.3% showed osteoporosis (T-score -3.21 SD). Between age 60-69 years 11% were normal (T-score -0.71 SD), 27% showed osteopenia (T-score -2.41) and 62% showed osteoporosis (T-score -3.4). In the age group 70-80 years 4.6% were normal (T-score -0.78 SD), 21.5% showed osteopenia and 73.84% showed osteoporosis. It was difficult to recruit older healthy population.

DISCUSSION. Osteoporosis is a disease of the skeleton characterized by decreased bone mass and increased susceptibility to fracture. Primary osteoporosis affects women 6 times more than men. The most common type of primary osteoporosis is that caused by estrogen withdrawal either due to menopause, ovarian failure or bilateral oophorectomy.⁵ Bone densitometry DXA gives or offers a significant advance in the assessment of BMD and widely used in the evaluation of bone mineral content and bone density in patients with metabolic bone diseases and to identify population at high risk.¹⁰ Proper diagnosis and management of osteoporosis minimize injury, disability and improves quality of life for patients and reduce costs to society.¹¹ Ghannam et al¹² found that BMD in healthy Saudi females was lower than that of their USA counterparts. They contributed that to increased number of pregnancies, longer duration of lactation with prevalent vitamin D deficiency. Similar findings were also reported by El-Desouki¹³ who observed that peak BMD in young Saudi females was 5% less than that of white American females. The general understanding is that in sunny countries such as KSA, vitamin D deficiency disorder such as rickets and osteomalacia would be rare if non-existent. But, this is not the case in Saudi women.¹⁴ The factors believed to have effects on the vitamin D nutritional status of Saudis include age, sex and the degree of exposure to sunlight.¹⁵ In contradistinction to reports in the literature, lower levels of 25-OHD are achieved in summer in KSA most likely due to the tendency of Saudi people to avoid direct exposure to sunlight and not to the unavailability of ultraviolet light.^{14,15} Bone mineral loss was reported to decline more rapidly in females and the highest rate of loss occurred around the time of menopause as reported by El-Desouki et al.¹⁶ A study by El-Desouki¹⁷ on 483 postmenopausal Saudi patients with an average age of 55 years (range 52-62 years), wherein 42% had normal BMD, 34% had osteopenia and 24% reported to have osteoporosis. In our current study which is a continuation of the previous study,¹⁷ we included both postmenopausal and senile group of patients and we used DXA machine to measure lumbar spine BMD, which we found more accurately than a femoral neck BMD. Our BMD results showed that 39.5% of patients had osteoporosis and 30.6% had osteopenia, values which are higher than expected but these can be explained as addition to the above mentioned environmental risk factors; senile osteoporosis was responsible of this high value as evidenced when we subgroup the patient and found osteoporosis was 24% of patients aged 50-59 years, 62% in patients aged 60-69 years while it was 73.8% in patient aged 70-79 years.

Consequently, when interpreting BMD results in postmenopausal patients, the age is an important factor to be considered. These findings may explain the common osteoporosis related proximal femur fractures reported by Al-Nuaim et al¹⁸ Pointing to the importance of the use of DXA scan to identify population at high risk.

Table 1 - World Health Organization bone density classification of osteoporosis.

Normal	Bone density is within 1SD (+1 SD or -1 SD) of young adult mean.
Low bone mass	Bone density is 1 to 2.5 SD below the young adult mean (-1 to -2.5 SD).
Osteoporosis	Bone density is 2.5 SD or more below the young adult mean (> -2.5 SD).
Severe (established) osteoporosis	Bone density is >2.5 SD below the young adult mean and there has been one or more osteoporotic fractures.

Table 2 - Percentage of osteopenia and osteoporosis in 830 female subjects.

Category	n	(%)	BMD ± SD	SD
Normal	248	(29.9)	1.117 ± 0.13	- 0.66
Osteopenia	254	(30.6)	0.983 ± 0.11	- 2.4
Osteoporosis	328	(39.5)	0.767 ± 0.11	- 3.4
Total	830	(100)		

BMD - bone mineral density

Table 3 - Classification of 830 postmenopausal subject according to the result of bone density, T-score and age group.

Category	n	(%)	BMD ± SD	SD
Age 50-59 years				
Normal	216	(42.2)	1.098 ± 0.11	- 0.61
Osteopenia	171	(33.4)	0.893 ± 0.13	- 2.36
Osteoporosis	124	(24.3)	0.795 ± 0.15	- 3.21
Total	511	(100)		
Age 60-69 years				
Normal	28	(11)	1.092 ± 0.12	- 0.71
Osteopenia	69	(27)	0.986 ± 0.13	- 2.41
Osteoporosis	157	(62)	0.774 ± 0.141	- 3.4
Total	254	(100)		
Age 70-80 years				
Normal	3	(4.6)	1.102 ± 0.13	- 0.78
Osteopenia	14	(21.5)	0.981 ± 0.12	- 2.43
Osteoporosis	48	(73.8)	0.732 ± 0.12	- 3.5
Total	65	(100)		

BMD - bone mineral density

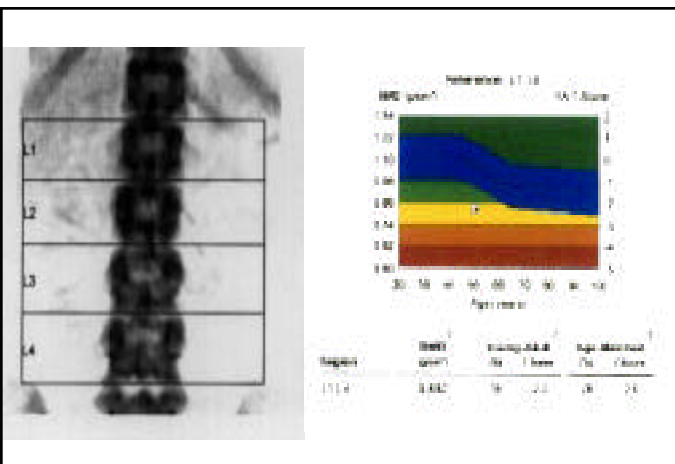


Figure 1 - Dual x-ray absorptiometry scan of lumbar bone mineral density (BMD) in a 50-year-old patient with osteopenia (-2.2 SD). YA - young adult, L1-L4 - region

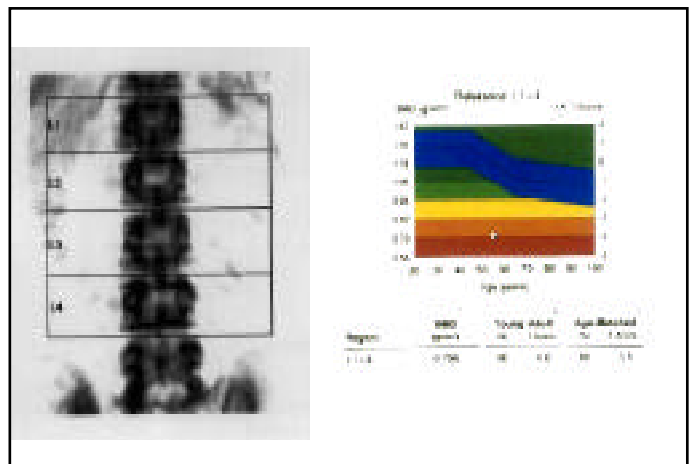


Figure 2 - Dual x-ray absorptiometry scan of lumbar bone mineral density (BMD) in a 55-year-old patient with osteoporosis (-4.0 SD). YA - young adult, L1-L4 - region

In conclusion, osteopenia and osteoporosis are common among postmenopausal Saudi women. In the postmenopausal women between the age 50-59 years 58% have osteopenia and osteoporosis and rate increased to 89% in the age of 60-69 years and it increased more in the female group of age 70-80 years to reach 94%. Despite an increasing awareness of the importance of osteoporosis, many women and health care professional are unaware of the disease for it is silent. Women and health personal should be more aware of osteoporosis and subsequent complications. These findings indicate the size of the problem, which should be considered a matter of public health and the importance of the use of bone densitometry to assess the severity of bone loss, early diagnosis of the disease and initiation of proper therapy as well as follow up of this group of patients. Treatment for osteoporosis is available; however; prevention is definitely more cost-effective.

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