

High prevalence of osteoporosis in Saudi men

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ABSTRACT

Objective: To determine the prevalence of osteoporosis in healthy Saudi men.

Method: We randomly recruited 429 Saudi men from the community. The recruited Saudi men were subjected to an interview to reveal their lifestyle parameters, calcium intake and level of activity. Bone densitometry was assessed at lumbar spine (L1-4) and the femoral neck. The dual x-ray absorptiometry (DXA) scan was carried out in the Nuclear Medicine at King Khalid University Hospital, Riyadh, Saudi Arabia from September 2002 to December 2004. The World Health Organization definition of low bone mineral density was used.

Results: Poor oral calcium intake and low level of daily activity were noted. The overall prevalence of osteopenia for the lumbar spine in the whole group was 35.7% while osteoporosis was present in 21.4% of the subjects. In the femoral neck, osteopenia was noted in 38% and osteoporosis in 11.4%. When either lumbar spine or femoral neck osteoporosis is used for diagnosis, the prevalence of osteoporosis rises to 23.5%. Within the whole group, osteopenia and osteoporosis were more common in individuals above the age of 50 than those below 50 years old.

Conclusion: Low bone mineral density occurs with high frequency in Saudi men. Lumbar spine appears to be affected to a higher degree. The reason for the high prevalence of osteoporosis in Saudi men is unclear. Possible underlying causes include nutritional, life style and genetic factors.

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It is now recognized that osteoporosis in men is much more common than previously recognized.¹ Indeed, osteoporosis in men is currently considered as a major health problem. In 2002, it was estimated that 2 million men in the United States have osteoporosis while 12 million had low bone mass.¹ Approximately 30% of hip fractures occur in men while one in 8 men older than 50 years will have a fracture.^{2,3} Data suggest that mortality rate is higher for hip fractures in men than in women. The symptoms associated with vertebral fractures can also be quite distressing.^{4,5} The etiology of osteoporosis including that in men is complex.⁷ Many factors appear to play different roles in its pathogenesis. Genetic factors are very important. Other important factors include the hormonal role, degree of physical activity, cigarette smoking, alcohol intake, calcium and vitamin D intake and drugs especially corticosteroids.⁶⁻¹²

In Saudi females, previous studies have revealed a high prevalence of osteopenia and osteoporosis among post-menopausal women.¹³ Nutritional, genetic and environmental factors have been blamed for such trend.¹³⁻¹⁶ The lifestyle of Saudis including Saudi men is different from the West. Their level of physical activity, sun exposure, calcium and vitamin D intake are also variable. Low exposure to the sun and low vitamin D level, have been noted among Saudis.¹³⁻¹⁹

In the present study, we have examined the prevalence of osteopenia and osteoporosis of the lumbar spine and femoral neck in 429 healthy ambulatory Saudi men and some dietary and lifestyle factors, which may have a role in this pathogenesis.

Methods. The study was undertaken at King Khalid University Hospital, Riyadh, Saudi Arabia. A heterogeneous patient population of consecutive 429 Saudi men were recruited in random from the community through advertisement in men local social clubs and meetings. The men were healthy, ambulatory with no chronic cardiac, pulmonary, hepatic or renal diseases. The research was approved ethically and scientifically by King Abdul-Aziz City for Science and Technology. Exclusion criteria included history of hyperthyroidism, liver disease, kidney disease, persons taking steroids or other medications known to affect bone density such as

L-thyroxine, biphosphonates, antiepileptic medications and others. An informed consent was obtained. A standard questionnaire was used to have information on individual's lifestyle, especially their daily level of exercise and activity. The levels of physical activity were subdivided into sedentary (sitting, standing, casual walking), moderate (regular walking or swimming) and heavy (brisk daily jogging or lifting) as previously described.²⁰ Daily sun exposure in minutes and average daily milk intake in glasses of milk were also assessed. The subject's heights in centimeters were taken using a standiometer and their weight without shoes in kilograms was taken and body mass index (BMI) was calculated by the formula kg/m^2 .

Fasting blood samples were taken to exclude patients with abnormal renal, hepatic and thyroid disease or abnormal blood counts. Dual energy x-ray absorptiometry (DXA) was used to evaluate bone mineral density (BMD). Lunar prodigy (General Electric, USA) was used in measuring BMD of the lumbar spine (L1-L4) and the femoral neck of the left hip. All DXA scans were carried out in the Nuclear Medicine Department at King Khalid University Hospital, Riyadh from September 2001 to December 2004. The National Health and Nutrition Examinations Survey (NHANES) normative data was used for the hip BMD assessment and United States reference was used. Quality control procedures were performed in accordance with manufacturer guidelines.

The World Health Organization's (WHO) criteria of low BMD were used. Osteopenia was defined at a T-score from 1 to 2.5 standard deviation (SD) below the mean, while a T-score equal to or greater than 2.5 SD or more below the mean was indicative of osteoporosis. The American reference data were used for men. It is noted that these guidelines have been established initially for the diagnosis of osteoporosis for post-menopausal women. However, studies have shown a reasonably similar relationship between absolute bone density measurements and the risk of fracture in men similar to women. It was also documented that the prevalence of a T-score less than -2.5 at the hip, spine or forearm in men over the age of 50 year is similar to the lifetime risk of fracture at these sites. Therefore, this suggests that WHO criteria may be applicable to the diagnosis of osteoporosis in both women and men. Based on the above discussion male reference data were used in computing T-scores.

The statistical analysis of the data was performed using the Statistical Package for Social Sciences software and Pearson's correlation method was used. A *p*-value of less than 0.05 was considered significant.

Results. The study included 429 Saudi men. Their age ranged from 30-90 years (mean age 53 ± 12.61

years). Their mean BMI was $28.56 (\pm 5.4)$. Enquiry related to their milk intake revealed that their average milk intake was approximately 200 ml/day (± 25 ml) equivalent to $208 \text{ mg} \pm 26 \text{ mg/day}$ of calcium. None of the subjects was performing any formal physical activity. In fact, all of them were leading a sedentary lifestyle. Their mean direct sun exposure time was not exceeding 10 minutes/day on average. This may have been due to avoiding the hot sun, modern sedentary life and traditional dress covering the body except face and hands. The degree of correlation between BMI and BMD of lumbar spine was ($r=0.243$) $p<0.0001$ while that of BMI and BMD of femoral neck was ($r = 0.416$) $p=0.0001$.

The whole group was stratified into 2 main groups: group I (subjects 30-50 years of age) and group II (subjects above 50 years of age). The number of men in group I was 203 men while the number of men in group II was 226 men. Mean BMI in group I was 29.5 while in group II it was 27.7.

Prevalence of osteopenia and osteoporosis of the lumbar spine. Of the whole population, 153 (35.7%) subjects had osteopenia of the lumbar spine. In group I, 74 (36.5%) subjects had osteopenia of the lumbar spine while 79 (35%) subjects in group II had osteopenia of the lumbar spine. Osteoporosis of the lumbar spine was prevalent in 92 (21.4%) subjects of the whole population. In group I, 39 (19.2%) subjects were affected while in group II, 53 (23.5%) subjects were affected (**Table 1**).

Osteopenia and osteoporosis of the neck of the femur. Osteopenia of the neck of the femur was present in 163 (38%) subjects of the whole population; 69 (34%) subjects in group I and 94 (41.5%) subjects in group II. Osteoporosis of the neck of the femur was present in 49 (11.4%) subjects in the whole population; 10 (4.9%) subjects in group I and 39 (17.3%) subjects in group II (**Table 2**). When either osteoporosis of the lumbar spine or that of the femoral neck is used to diagnose

Table 1 - Summary of osteopenia and osteoporosis of lumbar spine in Saudi men.

Group	No. of subjects (%)			Total
	Normal	Osteopenia	Osteoporosis	
<i>Group I</i>				
Age 30-50	90 (44.3)	74 (36.5)	39 (19.2)	203 (100)
<i>Group II</i>				
Age 51-90	94 (41.5)	79 (35)	53 (23.5)	226 (100)
Total	184 (42.9)	153 (35.7)	92 (21.4)	429 (100)

*Difference between osteopenia and osteoporosis is statistically significant ($p=0.0001$).

osteoporosis, the prevalence of osteoporosis was 23.5% in the whole population.

Discussion. In this study, the overall prevalence of osteopenia was 34-41.5% while osteoporosis was present in 4.9-23.5% of subjects depending on their age and the musculoskeletal site studied. Particularly at the lumbar spine, osteopenia was prevalent in 35% and osteoporosis in 23.5% in men aged 50 years and more.

The prevalence of osteoporosis at the femoral neck using the NHANES III data base in Saudi men over age 50 was 17.3%. These data reflect a higher prevalence when compared to western populations. In the third NHANES, 7% of Caucasian men above 50 years of age, 5% of black men and 3% of Hispanic men had osteoporosis of the femoral neck.²¹ A United Kingdom study revealed an evidence of femoral neck osteoporosis of 6% in healthy men aged 50 years and older.²² In Brazil, osteopenia was present in 33.3-57.4% while 6.4-16.1% in osteoporosis.²³ In Denmark, Vestergaard et al²⁴ estimated the prevalence of osteoporosis to be 17.7% among men aged 50 years or more. However, when using NHANES III reference data the prevalence would be 3.6% only.²¹ In Canada, the prevalence of osteoporosis was 2.9% of the lumbar spine and 4.8% of the femoral neck.²⁵ The data from Melton et al²⁶ in the Mayo clinic revealed a prevalence of 19% at the hip in men above 50 years of age.²⁶⁻²⁷ Again, in their study local reference data was used. When American female reference data was used the prevalence of osteoporosis at femoral neck would be of 5.8%. It has to be realized that in most previous studies, especially that of the NHANES III and the United Kingdom study, femoral neck BMD was measured. Even our osteoporosis prevalence rate of this site (17.3%) was higher. The issue of the particular skeletal site, which is assessed and its impact on the magnitude of the prevalence of osteoporosis has been discussed before.^{26,27} In the Rochester, MN study,²⁸

the change of the studied site changed the prevalence of osteoporosis in men from 0-36%.²⁸ Also, it is noted that in our study the correlation between BMI and BMD was greater with the femoral neck than with the lumbar spine. We speculate that the effect of posture in relation to our sitting habits may improve BMD of femur in comparison to spine. In Saudi post menopausal women the impact of osteoporosis was also higher on the lumbar spine than in the femoral neck. When compared to the data produced by Ardawi et al²⁹ from Jeddah, Saudi Arabia, it is noted that their osteoporosis prevalence in lumbar spine is even higher whether US/European reference was used or their Saudi reference. Indeed, in their study the osteoporosis prevalence of lumbar spine in subjects above 50 years old was 38.3% and 49.6% when using American or Saudi data respectively. In the hip, osteopenia and osteoporosis were prevalent in 32.3% and 6.3% respectively in men above 50 years.¹³

It has traditionally been stated that the 3 major causes of osteoporosis in men are alcohol abuse, glucocorticoid use and hypogonadism.³⁰ None of our subjects was consuming alcohol and none was using steroids. Although we are left with the issue of hypogonadism or hypoandrogenism, which we did not assess, we would like to raise other equally important factors.

It is clear from the data on our subjects that their calcium intake, degree of physical activity and exposure to sun were all minimal. The issues of physical activity and dietary calcium intake as equally important factors in the pathogenesis of osteoporosis in men were stressed by Nguyen et al³¹ and others.^{32,33} Despite the abundance of sunshine in our environment, the exposure of our population to the sun as documented in our study is very little indeed.^{17,19} This has been explained by the high temperatures in most days of the year. The deprivation from sunlight and its consequences on bone health has been previously emphasized.³⁴⁻³⁹

In addition to the 'traditional' causes of osteoporosis in men, we would like to suggest that other important 'lifestyle' issues should be addressed in the evaluation of osteoporosis especially in the Saudi population. Another important issue, which needs some emphasis is the fact that even in our younger age (group I) – osteopenia and osteoporosis were also common. This suggests that the process of decline of BMD in our male population starts early. Therefore, preventive measures such as increased physical activity and adequate calcium intake and sufficient exposure to sunshine (whenever possible) should be emphasized at the early ages, in fact as early as early childhood and adolescence. The genetic factor to explain our results – although difficult to prove - is also possible and can not be forgotten.

When it comes to fracture incidence, we actually have only one study on the incidence of proximal femur fracture in Saudi Arabia in which such incidence was found to be relatively lower than the western

Table 2 - Summary of osteopenia and osteoporosis of femoral neck in Saudi men

Group	No. of patients (%)			Total
	Normal	Osteopenia	Osteoporosis	
<i>Group I</i>				
Age 30-50	124 (61.1)	69 (34)	10 (4.9)	203 (100)
<i>Group II</i>				
Age 51-90	93 (41.2)	94 (41.5)	39 (17.3)	226 (100)
Total	217 (50.6)	163 (38)	49 (11.4)	429 (100)

*Difference between osteopenia and osteoporosis is statistically significant ($p=0.0001$).

populations.⁴⁰ The low BMD may indeed represent racial variation – possibly reflecting the size artifact seen with DXA. In conclusion, osteoporosis or low bone density occurs with high frequency among Saudi Arab males. Although, the exact reason for the high prevalence in our Saudi male population is not obvious, lifestyle, poor sun exposure and inadequate calcium and vitamin D intake are suggested as possible causes. Attempts to reduce the risk of fracture in this population should concentrate on adequate calcium intake, adequate sun exposure and physical activity.

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