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RESEARCH ARTICLE

STUDY OF BONE MINERAL DENSITY (BMD) IN ELDERLY MALE OF NORTH WEST PART OF INDIA

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ABSTRACT

Aims: To measure the Bone Mineral Density (BMD), determine the prevalence of osteoporosis in elderly men and correlate various risk factors with osteoporosis.
Material & Methods: Subjects were randomly selected for this study after explaining the detailed objective of the study, informed consent was taken. A total 140 subjects age ≥60 years male were included in this study.
Results: The prevalence of osteoporosis in study population was 14.3%. There was negative correlation of BMD with age (p>.05), glycemic status and diabetes mellitus (p<.01). There was positive relation of BMD with BMI (p<.05).
Conclusion: There is high prevalence of osteoporosis in elderly male population. Risk factor for osteoporosis includes advancing age, hyperglycemia, low BMI. However among these parametric age, smoking, alcohol and physical activity had insignificant association with BMD.

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INTRODUCTION

Osteoporosis is a condition that affects the bones, causing them to become thin and weak. Osteoporosis occurs more commonly in old age when the body becomes less able to replace worn-out bone. Special cells within the bones, called living bone cells, are no longer able to break down old bone and renew it with healthy, dense new bone. Bone is a living tissue that is constantly repairing itself. This mesh looks a bit like a honeycomb, with spaces between the different parts. Healthy bones are very dense, and the spaces within bones are small. In bone affected by osteoporosis, the spaces are larger, making the bones weaker and less elastic.

Bones are repaired and reinforced by a range of proteins and minerals, which are absorbed from the bloodstream. They include calcium, phosphorus, proteins and amino acids. The level of sex hormones controls the amount of mineral substance deposited in the bones. Changes in hormone levels can therefore affect the strength of the bones. For example, the female hormone estrogen offers some protection against osteoporosis. After the menopause, estrogen levels fall, often causing the bones to thin quickly. Osteoporosis is a metabolic bone disease characterized by relatively low bone mineral density (BMD), micro architectural deterioration of bone tissue, and increased susceptibility to fracture (Consensus Development Conference). With an aging global population, osteoporosis is fast becoming a worldwide concern because of its age-associated prevalence, costs, morbidity and mortality (Cummings and Melton, 2002). Osteoporosis is generally seen in up to, 20 and 30 per cent of symptomatic vertebral and hip fractures, respectively, in men (Eastell *et al*., 1998; Pande and Francis, 2001) . Important sex-specific differences are already known to occur in bone physiology and geometry, fracture epidemiology, bone gonadal hormone response, and post-hip-fracture mortality. These differences point to the importance of doing separate osteoporosis studies in men as it will lead to more specific and effective prevention-based strategies (Melton, 2001) . The WHO has defined osteoporosis in terms of BMD, based on prior studies using dual energy X-ray absorptiometry (DXA) (WHO, 1994). In order to assure the validity of the results of bone densitometry, those results have to be considered in comparison with the corresponding values that refer to age- and sex-matched, healthy persons from the same population. Although the normal reference data for women has been reported (Pongchaiyakul *et al.,* 2002).

Osteoporosis is not being recognized as a "silent epidemic"* and there is increasing need to improve its diagnosis and management. Osteoporosis is defined as a reduction of bone mass (or density or presence of a fragility fracture. This reduction in bone mass is accompanied by deterioration in the

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architecture of skeleton, leading to a markedly increased risk of fracture.

WHO criteria for diagnosis of osteopenia and osteoporosis–1994 (Sen *et al.,* 2000).

1. Normal – T score >-1.0
2. Osteopenia – T Score <-1.0 and >-2.5
3. Osteoporosis – T Score < -2.5

The WHO criteria for the diagnosis of osteopenia and osteoporosis are based on a patient's comparison to peak adult bone mass (PABM) which is achieved at age of 30 years and after age of 30 BMD declines over years.

$$\text{T Score} = \frac{(\text{Pts BMD}) - \text{Mean BMD of young normal reference population}}{\text{SD of BMD of the young normal reference population}}$$

Z score

It is based on comparison of patient's result to those of an age matched population that is also matched for race and gender. Low Z score (< -2.0 SD) may indicate the presence of a metabolic process causing bone loss other than aging of estrogen deficiency in post menopausal population. This study is a community basis study conducted in highly dense population of Bikaner City which is situated in North West part of India.

MATERIAL AND METHODS

Selection of Patients

Subjects were randomly selected for this study after explaining the detail objective of the study, informed consent was taken. A total 140 cases age 60 or more than 60 years male were included in this study. Osteoporosis was diagnosed according to WHO criteria based on T score (Sen *et al.,* 2000).

T Score > -1.0 normal
T score -1.0 to -2.5 osteopenia (Low bone density)
T score < -2.5 Osteoporosis
T score < -2.5 with a fracture: Severe osteoporosis

EXAMINATION OF PATIENTS

Each case was subjected to a meticulous history and complete physical examination.

Each case was asked about history.

1. History of weight loss >10%
2. History of drug use
    a. Steroid >3 months
    b. Androgen deprivation
    c. Other drugs
3. History of smoking
4. History of alcohol use
5. Physical activity
    a. Regular
    b. Irregular
6. History of prior fracture at >50 years of age.
7. Parental history of hip fracture
8. Dietary Habits
9. Past history of
    a. Hypertension
    b. Diabetes Mellitus
    c. Thyroid disorder
    d. Hypogonadism
    e. Malabsorption
    f. Rheumatoid arthritis
    g. Multiple myeloma
    h. Chronic liver
    i. Kidney disease
    j. Primary hyperthyroidism
    k.

Dietary history was taken especially about dairy product for estimation of total daily calcium intake. Height and weight were measured with case in light clothing and without shoes. Body mass index (weight/height in m^2) was calculated as estimate of obesity. All these cases which were suitable for the study were undergone for measurement of bone mineral density by osteosonography (DBM Sonic 1200 ICEA Italy).

We measured bone mineral density in forms of T score though the femur neck by ultrasound (DBM sonic 1200 IGEA Italy) by placing probes on lateral surface of femur neck which were approximately parallel hence reducing ultrasound scattering. Coupling was achieved by means of standard ultrasound gel, probes were rotated until the best signal (defined in terms of number of peaks and the amplitude of the peaks) was recorded on the screen. There were two 16mm diameter, 1.25 MHz transducers which were assembled on a high precision caliper ($\pm$0.02mm) that measured the distance between the probes.
T Score – Means comparison of individual results to those of peak adult bone mass (PABM) of same sex and age which is achieved at the age of 30 years.

STATISTICAL ANALYSIS

The data were expressed as χ^2 test using SPSS software 10.0.

RESULTS

In age group 60–70 years, there were total 93 cases out of which 14 cases in BMD range $\leq$ -2.5, 41 cases in the BMD range –2.49 to –1 and 38 cases were in the BMD group >–1. In the age group 71–80 years, there were total 38 cases out of which 4, 18 and 16 cases in BMD group $\leq$ –2.5, –2.49 to –1 and >–1 respectively. In the age group >80 years there were 9 cases out of which 2 case each in BMD range $\leq$ –2.5, 5 cases in the BMD range –2.49 to –1 and 2 cases were in the BMD range >–1 group. (As shown in Table 1). With BMI, <24, there were 11 cases in BMD range $\leq$ –2.5, 25 cases in the BMD range –2.49 to –1 and 17 cases were in the BMD group >–1. In the BMI group 24.01–29, there were 6, 35 and 32 cases in BMD group $\leq$ –2.5, –2.49 to –1 and >–1 respectively. In the BMI group >29 there were 3 cases in BMD range $\leq$ –2.5, 4 cases in the BMD range –2.49 to –1 and 7 cases were in the BMD group >–1 (As shown in Table 2). There were total 51 diabetic cases, out of which 7 were in BMD range $\leq$ –2.5, 25(17.86%) cases were in BMD range –2.49 to –1 and 19 cases were in BMD range >–1. While in non diabetic group there were 89 cases, out of which 13 were in BMD range of $\geq$ –2.5, 30 cases were in BMD range –2.49 to –1 and 37 cases were in BMD range >–1. (As shown in Table 3).

Table 1. Distribution of Cases according to BMD in relation to age

Age Group	BMD							
	≤ -2.5		-2.49 to -1		> -1		Total	
	No.	%	No.	%	No.	%	No.	%
60-70	14	15.1	41	44.1	38	40.9	93	66.4
71-80	4	10.5	18	47.4	16	42.1	38	27.1
>80	2	22.2	5	55.6	2	22.2	9	6.4
Total	20	14.3	64	45.7	56	40.0	140	100
χ^2							1.894	
p							>0.05	

Table 2. Distribution of Cases according to BMD in relation to BMI

BMI	BMD							
	≤ -2.5		-2.49 to -1		> -1		Total	
	No.	%	No.	%	No.	%	No.	%
≤ 24	11	20.8	25	47.2	17	32.1	53	37.9
24.01-29	6	8.2	35	47.9	32	43.8	73	52.1
>29	3	21.4	4	28.6	7	50.0	14	10.0
Total	20	14.3	64	45.7	56	40.0	140	100
χ^2							6.388	
p							<0.05	

Table 3. Distribution of Cases according to BMD in relation to Diabetes Mellitus

Diabetes Mellitus	BMD							
	≤ -2.5		-2.49 to -1		> -1		Total	
	No.	%	No.	%	No.	%	No.	%
Diabetic	14	24.1	25	43.1	19	32.8	58	41.4
Non diabetic	6	7.3	39	47.6	37	45.1	82	58.6
Total	20	14.3	64	45.7	56	40.0	140	100
χ^2							8.174	
p							<0.05	

DISCUSSION

Osteoporosis is emerging as important disease among elderly men as life expectancy is increasing. Various studies so far has focused mainly on osteoporosis in females. Specific definition for male osteoporosis is needed and also cost effective guidelines for investigation and treatment. The role of BMD measurement in diagnosis also needs to be clarified. Ours is population based study done in elderly men ≥ 60 years age, at Bikaner city. IHD 140 subjects were included. Using WHO criteria, prevalence of osteoporosis and osteopenia was 14.3% (≤–2.5) and 45.7% (T –2.5 to –1) respectively. 40% of subjects had normal BMI (>–1). In 2002, Pongchaiyakul *et al*. (2002) conducted study for prevalence of osteoporosis in Thai men in population >50 years. Prevalence of osteoporosis was 12.6% which is comparable to present study. Both the present study and study by Pongchaiyapula *et al*. (2002) showed increasing prevalence of osteoporosis with age. In present study prevalence of osteoporosis increased from 15% in 60–70 years age group to 22% in >80 years age group as it also increased in study by Pongchaiyapula et al[7] from 19% in men >50 years of age to 32% in men over 70 years of age.

Melton *et al.* (2001) in 2001 reported prevalence of osteoporosis ranged from 0–36% among men >50 years of age and older and 2%–45% among post menopausal women. This wide range was explained on different sites measured, various adjustments done for bone size and various patterns of age related bone loss. BMD is positively influenced by increasing BMI. In our study prevalence of osteoporosis was 20.8% in subjects with BMI ≤ 24 and it was 8.2% in subjects with BMI in range 24–29. In subjects with BMI >29 prevalence of osteoporosis was 21.4% but risk of osteopenia is far less (28.6%) than osteopenia in subjects with (47.2%) normal BMI. Hence risk of osteoporosis was decreasing with increasing BMI, this relation was significant (p<0.05). These results were comparable to finding of study by Rishaug *et al*. 1995). They measured BMI in NIDDM patients using dual X–ray absorptiometry and sonography measurement of right calcaneous in 21 men and 15 post menopausal women. They also found positive correlation of BMI with BMD (r=0.66) which is comparable to our study (r =0.64). Similar results were found in study by Abrahamsen *et al.* (2000).

Our study had also shown that BMD was significantly decreased in diabetics. BMD decreased with increasing sugar levels. Among total of 58 diabetic subjects prevalence of osteoporosis is 24.1% compared to prevalence of 7.3% in rest of subjects. This difference was highly significant. This also supports the results of previous studies by Kothari and Hindonia (2002); Levin *et al.* (1976) had also demonstrated that diabetes mellitus causes significant bone loss. Isaia *et al.*(1999) had also found that osteoporosis is possible complication of diabetics and may even appear in absence of its classical complication.

Physical activity had shown favorable effect on BMD in our study but statistical analysis did not show significant result. Similarly alcohol and smoking had negative correlation with BMI ($p>0.05$), however insignificant. Hence it is seen that metabolic bone disease of osteoporosis is prevalent in elderly men also. Further large scale studies are needed in India in this regard as some studies had also show higher incidence and early age of presentation in population of developing countries where there are still higher incidence of malnutrition, obesity, diabetes mellitus, smoking with increased westernization of life style.

Conclusion

The present study was a population based randomized study of elderly male age 60 or more than 60 years in highly dense population of Bikaner city. We measured bone mineral density by ultrasound of femur neck (in form of T score) in 140 cases. Following are the result that were concluded for the study

1. The prevalence of osteoporosis in study population is 14.3%.
2. There is negative correlation between BMD and age ($p>0.05$).
3. There is positive correlation between BMD and BMI ($p<0.05$).
4. There is negative correlation between BMD and glycemic status in diabetes mellitus ($p<0.01$).

REFERENCES

Abrahamsen, B., Rohold, A., Henriksen, J. E., Beek-Nielson, H. 2000. Correlation between insulin sensitivity and bone mineral density in non diabetic men. *Diabetic Medicine,* 17(2) : 124-9.

Assessment of fracture risk and its application to screening for postmenopausal osteoporosis. Report of a WHO Study Group. *World Health Organ Tech Rep Ser.,* 1994; 843: 1-129.

Consensus Development Conference: prophylaxis and treatment of osteoporosis. *Am J Med.,* 1991; 90: 107-10.

Cummings, S. R., Melton LJ. 2002. Epidemiology and outcomes of osteoporotic fractures. *Lancet,* 359: 1761-7.

Eastell, R., Boyle, I. T., Compston, J., Cooper, C., Fogelman, I., Francis, R. M., *et al*. 1998. Management of male osteoporosis: report of the UK Consensus Group. QJM 91: 71-92.

Isaia, G.C., Ardissone, P., Di Sefano, M., Ferrari, D., Martina, V., Porta, M., Tagliabue, M., Molinatti, G.M.1999. Bone metabolism in type 2 diabetes mellitus. *Acta Diabetol.,* 36(1-2) : 35-8.

Kothari, R. P., Hindonia, M. L. 2002. The evaluation of bone mineral density by osteosonography in patients with type-2 diabetes. Thesis Submitted to University of Rajasthan for degree of Doctor of Medicine.

Levin, M. E., Boisseau, V. C., Avioli, L. V. 1976. Effects of diabetes mellitus on bone mass in juvenile and adult onset diabetes. *N Engl J Med.,* 294 : 241-5.

Melton, L. J. III. The prevalence of osteoporosis: gender and racial comparison. Calcif Tissue Int 2001; 69: 179-81.

Pande, I., Francis, R. M. 2001. Osteoporosis in men. *Best Pract Res Clin Rheumatol.,* 15: 415-27.

Pongchaiyakul, C., Rojroongwasinkul, N., Chotmongkol, R., Kosulwat, V., Charoenkiatkul, S., Rajatanavin, R. 2002. Bone mineral density in rural Thai adults living in Khon Kaen province. *J Med Assoc Thai.,* 85: 235-44.

Rishaug, U, Birkeland, kI, Falch, J.A. et al. 1995. Bone mass in non insulin dependent diabetes mellitus. *Scand J Clin Lab Invest.,* 55(3) : 257-62.

Sen, I., Ravishankar, U. 2000. Bone densiometry in clinical practice. Medicine Update, API,10 : 640-45.

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