



## COMPARATIVE STUDY OF BONE MINERAL DENSITY IN MALE AND FEMALES OF VARIOUS AGE GROUP

### Anatomy

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### KEYWORDS

#### INTRODUCTION

Bone strength is indirectly assessed by Bone mineral density (BMD). Out of many parameters assessing bone strength, BMD accounts for near about 70% of bone strength. So BMD becomes most commonly used parameter to measure bone strength.<sup>1</sup> It is an average concentration of mineral principally calcium hydroxyl apatite per unit area of the bone.<sup>2</sup> Bone mineral density measurements are done in order to determine if there is low bone mass, to predict risk of future fracture to determine which subject may need drug therapy and to monitor subjects on drug therapy.<sup>3</sup> Bone density is highly correlated with bone strength and with fracture risk. Osteoporosis and osteopenia are two most common subclinical states of low level of BMD and these are the greatest predictor of risk for bone fractures as per WHO.<sup>4</sup> In both the genders over the age of 50 years an age dependent decline in BMD is seen.<sup>5</sup> Osteoporosis, the silent thief, usually remains asymptomatic until the weakened bone fractures. India is one of the largest affected countries in the world out of eight males and one out of three females in India suffers from osteoporosis. Bone density measurements are used to screen people for osteoporosis risk and also to identify those who might benefit from measures to improve bone strength.<sup>1</sup> There are multiple options available for the measurement of BMD. Out of which Dual energy X ray absorptiometry (DXA) and scans of axial skeletal sites are standard assessment tools to diagnose low BMD, but its use is limited due to deleterious effects of radiations, high cost, lack of availability in remote areas.<sup>6</sup> Quantitative ultrasound scan (QUS) the ultrasound based bone densitometer known as is relatively cheaper, without radiations, portable, and widely available in India.<sup>7,9</sup>

There are few studies done on BMD. However, the proper data explaining the prevalence of osteoporosis among both men and women is scanty in developed as well as in developing countries.<sup>10,11</sup> The present study was designed and planned with an objective of screening of patients attending orthopedic OPD of Jawaharlal Nehru Medical College, Sawangi (M), Wardha, Maharashtra, India for their BMD using ultrasound scan.

#### AIMS & OBJECTIVES

- 1) To find the association of BMD in both sexes with the various age groups.
- 2) To compare the bone mineral density in male and female.

#### MATERIAL & METHODS

Present study was conducted at Department of Anatomy in collaboration with Orthopedic department, Jawaharlal Nehru Medical College, Sawangi (M), Wardha. This prospective study was designed to include 200 patients of both sexes attending orthopedic OPD. The proforma was structured to include particulars of each subject with name, age, sex, height, weight, registration number and address.

Bone mineral density of each study subject was measured with the help of Ultrasonographic Bone Densitometer. The distal radius and mid shaft of tibia were the sites used for measuring BMD.

The obtained results were analyzed and tabulated. Statistical analysis was done by SPSS software.



**Photograph 01: Measurement of BMD by Bone Densitometer**

#### RESULTS

In the present study we observed BMD of 200 subjects. The results are given in numerical form and tabulated. In the results T score compares bone density of study, with the standard subject considered as control who is 30 years old. This age of control was chosen because at this age human being attains peak bone mass. Comparison to this number allows observer to see how much bone loss has occurred. T scores are given in positive and negative numbers where negative numbers represent the bone mass. Bone goes through various stages of thinning i.e. normal, osteopenia, and osteoporosis. Z-score is the number of standard deviations from the mean a data point lies.

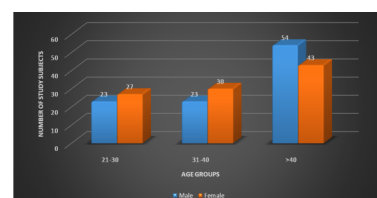
**Table 01: T score interpretation<sup>12</sup>**

T score interpretation	
Above -1	Normal bone mass
Between -1 and -2.5	Osteopenia
Below -2.5	Osteoporosis

With the increase in negative T score of one the risk of fracture increases 1.5 to 3 fold.

**Table 02: Age wise and sex wise distribution of study subjects**

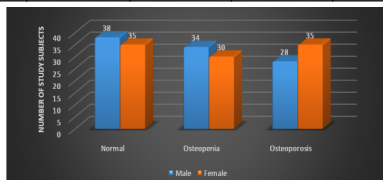
Age Groups (Yrs)	Male	Female	Total	Percentage (%)
21-30	23	27	50	25
31-40	23	30	53	26.5
>40	54	43	97	48.5
<b>Total</b>	100	100	200	100
<b>Mean Age (Yrs)</b>	44.64	40.27	42.44	
<b>SD</b>	14.93	12.73	13.97	
<b>P value</b>				0.005
<b>X2 value</b>				18.51



**Graph 01: Age wise and sex wise distribution of study subjects**

**Table 03: Sex wise distribution of bone mineral density**

BMD	Male	Female	Total	Percentage (%)
Normal	38	35	73	36.50
Osteopenia	34	30	64	32.00
Osteoporosis	28	35	63	31.50
Total	100	100	200	100.00
Z- Test	1.00	1.00		

**Graph 02: Sex wise distribution of bone mineral density****Table 04: Correlation of bone mineral density and sex wise age groups**

Age Groups	Normal		Osteopenia		Osteoporosis	
	Male	Female	Male	Female	Male	Female
20-30	11	11	06	07	06	09
31-40	11	13	08	10	04	07
>40	16	11	20	13	18	19
Total	38	35	34	30	28	35
p value	0.50 (NS as p>0.05)		0.55 (NS as p>0.05)		0.64 (NS as p>0.05)	

## DISCUSSION

In the present study we observed BMD of 200 study subjects. We distributed study subjects according to age groups and according to sex to find association between them.

In the table no.02 we distributed study subjects into various age groups according to sex. We found maximum 97 study subjects (54 male and 43 female) belongs from more than 40 years of age group. Followed by 53 study subjects from 31 to 40 years age group. The mean age of male was 44.64±14.93 years and for female it was 40.27±12.73 years. The total mean age of study population was 42.44±13.97 years. These findings were statistically significant as p value was 0.0051.

In the similar study done by Sharma et. al.<sup>13</sup> they screened total of 215 participants for their BMD. The mean age of sample was 46.93(SD 13.31) with minimum age of 25 years and maximum age of 75 years. In this sample, there were 58.1% (n = 125) female subjects and 41.9% (n = 90) were male. Hamson C et. al.<sup>14</sup> in their study of BMD evaluation they randomly selected subjects by age (20–40 years) and ethnicity. Out of 262 participated volunteers they chosen 201 study subjects (51 white females, 71 Gujarati females, 37 white males, 42 Gujarati males).

In the table no. 03 we discussed sex wise distribution of study subjects explaining in the form of normal, osteopenia and osteoporosis. We found that normal BMD in 73 (38 male and 35 female) subjects, osteopenia in 64 (34 male and 30 female) subjects and osteoporosis in 63 (28 male and 35 female) subjects. Z score for male was 1.00 and for female also 1.00. Table no 04. Explain BMD with sex wise age groups and we found that out of 73 normal BMD subjects more than 40 years of age group consists of maximum i.e. 16 male and 11 female subjects. Out of 64 osteopenia subjects maximum male 20 and female 13 belongs from the more than 40 years of age group. Osteoporosis also consists of maximum study subjects i.e. 28 male and 35 female from more than 40 years of age group. The test of significance was nonsignificant for all three classes in case of male and female as p value was more than 0.005.

Similarly Sharma et al<sup>13</sup> in their study found that out of 215 study subjects 24 with osteoporosis. 121 with osteopenia and 70 were with normal BMD. There was a significant trend of decreasing bone density with an increase in age in both the gender groups. The percentage of osteoporotic female participants (58.8%) was more than male participants in the age group of <55 years whereas in the same age group, the percentage of osteopenic participants was more among males (46.7%) than females (27.5%). One case of osteoporosis was also reported in the age group of 25–35 years among female participants. A significant association ( $\chi^2 = 18.64, P < 0.005$ ) was

reported between the T-score and different age groups. Whereas nonsignificant association exists between gender and the T-score. Packetal<sup>15</sup> systematically measured the BMD of 130 consecutive patients, seen over a 6-month period in 2005 and found a higher than expected prevalence of clinically significant low BMD; 39% of patients had osteopenia and 16% had osteoporosis.

## CONCLUSION

The study of BMD can help in increasing awareness about bone health in developing countries. There is a significant association between various age groups and non-significant association between genders for BMD evaluation. The present study adds to our knowledge of BMD variations between populations that would recommend the use of local reference ranges for reliable interpretations of BMD reports.

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