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Original Research Article

Study of Assessment of Bone Mineral Density in Women above 45 Years of Age at a Tertiary Care Teaching Centre

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ABSTRACT

Background: Osteoporosis is highly prevalent, with an estimated 30 million women diagnosed to have osteoporosis. A bone mineral density (BMD) test measures how much calcium and other types of minerals are present in a section of bone. The absolute amount of bone as measured by bone mineral density (BMD) testing generally correlates with bone strength and its ability to bear weight. By measuring BMD, it is possible to predict fracture risk in the same manner that measuring blood pressure can help predict the risk of stroke. Hence, we planned this study to evaluate BMD in women above 45 years of age in North-West Rajasthan.

Materials & Methods: The present study was conducted in S.P. Medical College and Associated Group of Hospitals, Bikaner (Rajasthan). A total of 350 women were included in the study, out of which 100 women were controls (30 year of age) and 250 women aged 45 years and above were considered as cases. An informed consent was obtained from all control and cases. BMD was determined by Pronosco X-posure system of hand radiograph to diagnose the osteoporosis and osteopenia in cases. BMD values were measured in terms of T-score and Z-score.

Results: In the patients of age group of 45 to 50 years, 25 had osteopenia while only had osteoporosis. In the patients of age group of 56 to 60 years, 15 had osteopenia while only 4 patients had osteoporosis. Significant correlation was observed while comparing the diagnosis of the patients with the age groups.

Conclusion: Significant correlation exists while comparing the age group of the patients with the diagnosis for BMD.

Key words: Menopause, Osteoporosis, Osteopenia.

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INTRODUCTION

One of the most rapidly emerging global health problems in women above 45 years of age is osteoporosis. In India, osteoporosis is highly prevalent, with an estimated 30 million women diagnosed to have osteoporosis.[1] Bone is the hardest form of connective tissue. It is composed of approximately 25% water, 30% organic fibrous tissue, and 45% inorganic salts (primarily calcium and phosphates). The skeleton has two major functions: mechanical and metabolic. Most of the mineral content of the body is stored in bone and contributes to its second function that of metabolic homeostasis. It is this second function that is primarily the focus of this study although it is acknowledged that changes in the metabolic processes within the bone are of less concern to patients that the physical, mechanical manifestations of osteoporosis; such as pain and fragility fractures.[2,3]

A bone mineral density (BMD) test measures how much calcium and other types of minerals are present in a section of bone. The absolute amount of bone as measured by bone mineral density (BMD) testing generally correlates with bone strength and its ability to bear weight.[4,5] By measuring BMD, it is possible to predict fracture risk in the same manner that measuring blood pressure can help predict the risk of stroke. From birth to age 25 or 30, the body builds more new bone than it breaks down. By age 30, bones become the strongest they will ever be. This phase of bone development is called peak bone mass. The level of bone mass achieved at the peak is determined largely by genetics, but also by nutrition, exercise and menstrual function.[6,7]

After about age 30, our body breaks down old bone faster than it builds new bone. This process speeds up dramatically as menopause approaches and for several years after. In the first five to seven years following menopause, bone lose up to 20 percent of bone mass.[8] In contrast to postmenopausal bone loss, which is associated with excessive osteoclast activity, the bone loss that

accompanies aging is associated with a progressive decline in the supply of osteoblasts in proportion to the demand. This demand is ultimately determined by the frequency with which new multicellular units are created and new cycles of remodeling are initiated.[9,10] Hence, we planned this study to evaluate bone mineral density (BMD) in women above 45 years of age in North-West Rajasthan.

MATERIALS & METHODS

The present study was conducted in S.P. Medical College and Associated Group of Hospitals, Bikaner (Rajasthan). A total of 350 women were included in the study, out of which 100 women were controls (30 year of age) and 250 women aged 45 years and above were considered as cases. An informed consent was obtained from all control and cases. Bone mineral density by A.P. view radiograph of hand was done in total 350 cases, with an average age of (57.41 ± 9.73).

Inclusion criteria

- The patients who suffered from bone and joint pain and reported to hospital for investigation.
- Aged from 45 years and above.

Exclusion criteria

- History of fracture and previously diagnosed osteoporosis.
- History of diseases such as diabetes, hypertension and cardiovascular diseases.
- With medication which may affect the BMD values.

A standardized Performa was filled which included age, family history, year since menopause, smoking, alcohol and socioeconomic status by a general questionnaire. After that all subjects were referred for bone mineral density test. BMD was determined by Pronosco X-posure system of hand radiograph to diagnose the osteoporosis and osteopenia in cases. BMD values were measured in terms of T-score and Z-score.

T-score: It is the difference between the individual patients bone mineral density and the mean results obtained in young adult population expressed in units of young population standard deviation.

Z-score: It is the difference between the individual patient's results and the mean results obtained in an age matched population expressed in units of the age matched population standard deviation.

According to WHO osteoporosis definition, based on T-score results the categories are:[11]

Normal bone mass: T-score greater than –1.0

Osteopenia: T-score between –1 and –2.5

Osteoporosis: T-score less than –2.5

Severe osteoporosis: T-score less than –2.5 with at least one osteoporotic fracture

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 Statistical Analysis Software. Chi-square test was used for the assessment of level of significance.

Table 1: Cross tabulation and relation of age groups with diagnosis categories.

			Diagnosis			Total	Chi-square value	p-value
			Normal	Osteopenia	Osteoporosis			
Age group	**45 to 50**	**Count**	39	25	6	70	**60.365**	**0.000**
		% of Total	15.6	10.0	2.4	28.0		
	51 to 55	**Count**	15	21	3	39		
		% of Total	6.0	8.4	1.2	15.6		
	56 to 60	**Count**	21	15	4	40		
		% of Total	8.4	6.0	1.6	16.0		
	61 to 65	**Count**	8	13	9	30		
		% of Total	3.2	5.2	3.6	12.0		
	66 to 70	**Count**	3	20	17	40		
		% of Total	1.2	8.0	6.8	16.0		
	71 and above	**Count**	2	15	14	31		
		% of Total	.8	6.0	5.6	12.4		
Total		**Count**	88	109	53	250		
		% of Total	35.2	43.6	21.2	100.0		

RESULTS

Table 1 and Graph 1 shows the cross tabulation and relation of age groups with diagnosis categories. In the patients of age group of 45 to 50 years, 25 had osteopenia while only had osteoporosis. In the patients of age group of 56 to 60 years, 15 had osteopenia while only 4 patients had osteoporosis.

Significant correlation was observed while comparing the diagnosis of the patients with the age groups. Table 2 shows the correlation of age, T score, BMI and BMD of patients groups.

Graph 2 shows scatter plot showing correlation between T score and year since menopause. When comparing the mean age of the patients with mean T score, significant results were obtained.

Significant correlation as obtained while comparing the mean BMD with mean age of the patients. While comparing the mean BMI with the average year since menopause, significant correlation was obtained. Graph 2 shows the scatter plot showing correlation between T score and year since menopause.

Graph 1: Relationship of age groups with diagnosis categories

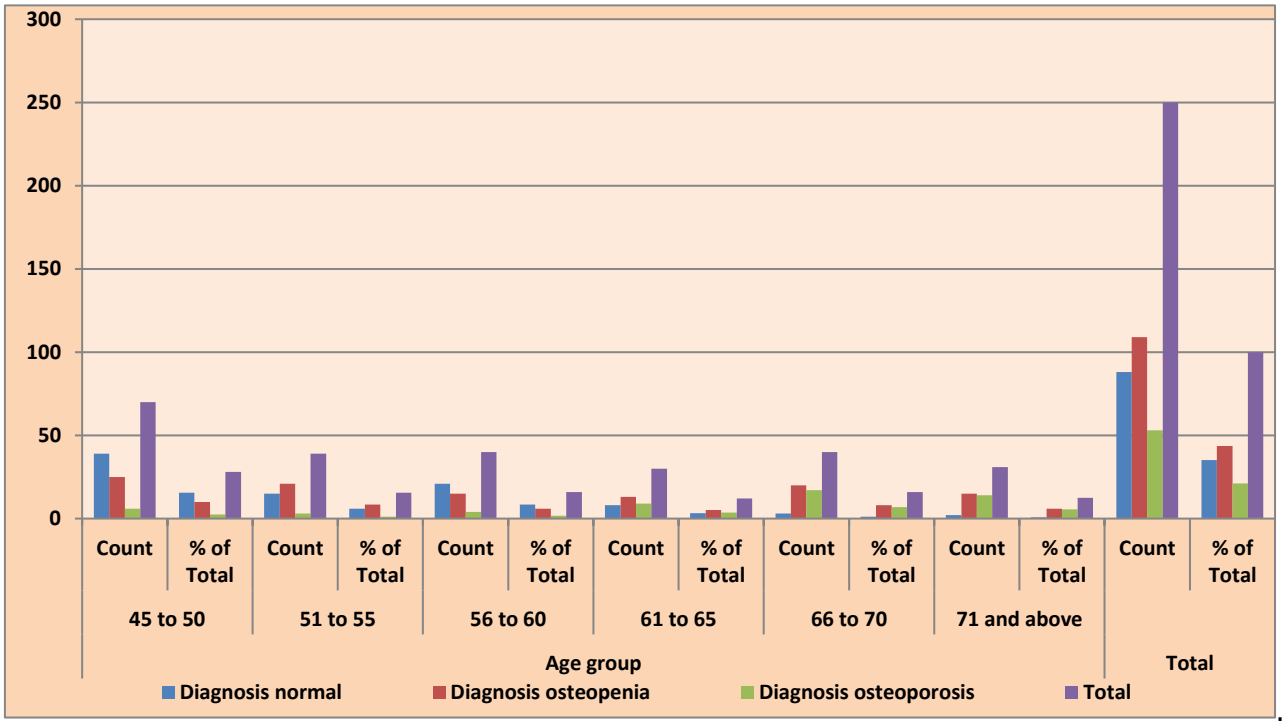
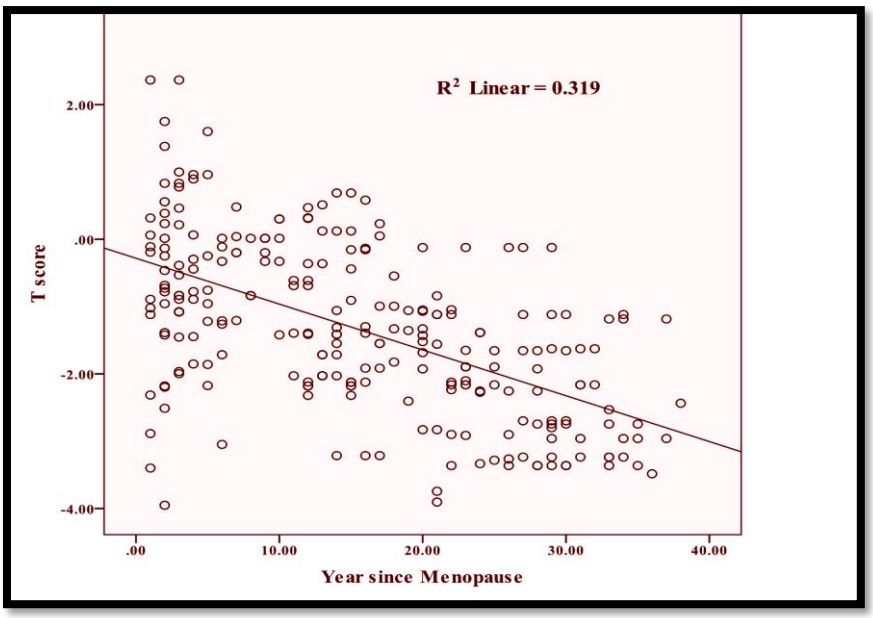


Table 2: Correlation of age, T score, BMI and BMD of patients groups.

		Age	T score	BMD gcm2	BMI	Year since Menopause
Age	Pearson Correlation	1	-.460**	-.462**	.219**	.951**
	Sig. (2-tailed)		.000	.000	.000	.000
T score	Pearson Correlation	-.460**	1	.944**	-.146*	-.565**
	Sig. (2-tailed)	.000		.000	.021	.000
BMD gcm2	Pearson Correlation	-.462**	.944**	1	-.146*	-.557**
	Sig. (2-tailed)	.000	.000		.021	.000
BMI	Pearson Correlation	.219**	-.146*	-.146*	1	.218**
	Sig. (2-tailed)	.000	.021	.021		.001
Year since Menopause	Pearson Correlation	.951**	-.565**	-.557**	.218**	1
	Sig. (2-tailed)	.000	.000	.000	.001	

**. Correlation is significant at the 0.01 level. *. Correlation is significant at the 0.05 level.

Graph 2: Scatter plot showing correlation between T score and year since menopause



DISCUSSION

Osteoporosis affects over 20 million Americans and leads to approximately 1.5 million fractures each year, making it one of the leading public health problems in the United States.[12] The most important risk factor for bone loss in midlife women is the menopause. Women lose about 50% of their trabecular bone and 30% of their cortical bone during the course of their lifetime, about half of which is lost during the first 10 yr after the menopause. Approximately 40% of all postmenopausal women eventually experience fractures. In 2001, the National Osteoporosis Foundation estimated that the annual cost of health care and lost productivity related to osteoporosis was $17 billion.[13]

In the present study, we observed that 70 patients out of total of 250 (28 percent) belonged to the age group of 45 to 50 years. We also observed that osteopenia was present in 43.6 percent of the patients. A significant correlation was observed between the distribution of patients in various age groups and diagnosis of the patients (p-value < 0.05). Our results were in correlation with the results of Gandhi AB et al who in their study observed that 34 percent of the patients in their study were affected by osteopenia.[14]

The influence of obesity on BMD is believed to be mediated by mechanical loading of BMI on bone formation. Nonetheless, lean body mass has been considered as an independent predictor of femoral neck and lumbar spine BMD, whereas the fat component of obesity did not exert any protective effect on bone mass. In a study of obese or overweight African-American women, lean body mass was an independent predictor of total body, hip, spine, and total radius BMD, whereas fat mass in overweight and obese women with metabolic syndrome was a negative predictor of BMD.[15- 19]

Our results showed a linear increase of osteopenia and osteoporosis with advancing age. In addition to the effects on bone mass, the aging also increases the risk of fractures, regardless of the bone mass, and an increase of 20 years of age means a fourfold risk of fractures. Published studies show that low body weight (less than 58 kg) is associated with an increased risk of osteoporosis and fractures. Weight losses after the age of 50 in women increases the risk of hip fracture, while weight gains decreases this risk.[20]

Gur et al. reported that BMD decreased with an increase in the 'period of menopause'. These results could be inferred from the relationship between estrogen and BMD. Notelvitz reported that osteoblasts indirectly regulate the resorption activity of osteoclasts under the influence of estrogen. Simm et al. reported that estrogen produces growth factors and contributes to bone formation. Based on these findings, hormone replacement therapy has been used in the treatment of osteoporosis. The results of study of Kim et al showed that participants taking female hormones for more than 1 year had a greater number of teeth present than those not taking female hormones. Again, this result can be inferred from the decreased estrogen secretion occurring in the latter group. According to Hunziker et al., a decrease in estrogen secretion may lead to BMD loss in the mandible in patients with periodontitis. Tezal et al. reported that systemic bone resorption affected periodontal tissues and that a common pathway for destruction exists between systemic and periodontal bone.[21- 25]

The gynecologist plays an important role in establishing a biological zero in each perimenopausal patient and in controlling the rate of bone loss during postmenopausal period. They also plays an important role in early detection, and in giving advice regarding diet, exercise, calcium supplementation and drugs.[10] Carranza-Lira S et al analyzed how the number of pregnancies and total breast-feeding time influence bone mineral density. 50 healthy women aged 35 to 40 years were studied. Weight, height, number of term pregnancies, time since last pregnancy and breast-feeding time were analyzed. They were divided in three groups as follows: I: nulligravidas; II: with term pregnancies, but no breast-feeding; III: with term pregnancies, with breast-feeding. Bone absorptiometry was done on all, at lumbar column and femur. The WHO criteria were used to define osteopenia and osteoporosis. Comparison among the groups was done with Student's t-test for independent samples, and simple regression analysis was done for number of gestations, total breast-feeding time, time since last birth, and T-score at lumbar column and femur. The women were divided as follows: 15 in group I, 15 in group II, and 20 in group III. The average age was 37.7 +/- 1.5 years. No differences were found among the three groups in analyzed variables, when comparing bone mineral density, T- and Z-scores in L1-L4 average, femoral neck, trochanter, and Ward's triangle. There was no correlation among the number of gestations, total breast-feeding time, time since last birth, or T-scores at lumbar column and femur. The number of pregnancies and breast-feeding time do not affect bone mineral density.[26]

CONCLUSION

From the above results, the authors conclude that significant correlation exists while comparing the age group of the patients with the diagnosis for BMD. However, future studies are recommended.

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