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Study of Comparing Reproductive Years and Natural/Surgical Menopause with Bone Mineral Density in Post-Menopausal Women

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Abstract: Worldwide 1 in 3 women over 50 years of age experience an osteoporotic fracture. Measuring bone mineral density is the most important tool in the diagnosis osteoporosis.To compare number of reproductive years, BMI and natural and surgical menopause with bone mineral density in post-menopausal women.Two hundred postmenopausal women were studied at the Department of Obstetrics &Gynaecology, King Georges Medical University, Lucknow from September 2015 to August 2016. A detailed questionnaire was filled which included details of demographic factors of the patient, BMI, Blood pressure, number of reproductive years, whether menopause was natural or surgical and personal history including history of exercise. BMD was measured in each woman at lumbar spine (L1-L4) by lunar Prodigy dual energy X Ray absorptiometry. Mean BMI showed a significant declining trend from normal to osteoporosis BMD status ($p<0.001$). Among overweight and obese patients majority had normal or osteopenic status ($p<0.001$). Prevalence of osteopenia and osteoporosis did not show a significant association with family history of fracture ($p=0.835$). Majority of women with normal BMD status used to climb stairs (60%) as compared to 50% of osteopenia and 41.5% of osteoporosis cases. However, this difference among groups was not significant ($p=0.406$). Among those having natural menopause the proportion of normal BMD, osteopenia and osteoporotic women was 1.1%, 38.3% and 60.6% as compared to 12%, 20% and 69% respectively among those having surgical menopause ($p=0.002$). No significant association of number of reproductive years with BMD was observed.BMI showed a highly significant association with the bone mineral density in the present study. The prevalence of osteopenia and osteoporoticwas higher in women with surgical menopause then natural menopause.
Keywords: Osteopenia, body mass index, surgical menopause, osteoporosis.

INTRODUCTION

According to WHO, Osteoporosis is defined as generalized skeletal disorder of low bone mass (thinning of the bone) and deterioration in its architecture, causing susceptibility to fracture[1]. The National Institute of Health (NIH) defines osteoporosis as a disease characterized by decrease bone strength and propensity to fall[2].

Osteoporosis is initially asymptomatic. An International Osteoporosis Foundation survey (IOF), conducted in 11 countries, showed denial of personal risk of bone loss by postmenopausal women, lack of dialogue about osteoporosis with their doctor and restricted access to diagnosis and treatment before the first fracture resulting in under diagnosis and under treatment of disease[3].

Worldwide 1 in 3 women over 50 will experience an osteoporotic fracture [4, 5]. Bones may weaken to such a degree that a break may occur with minor stress or spontaneously. A woman may remain asymptomatic until a fracture occurs. Fragility fractures account for 80% of fractures in postmenopausal women[6].

Measuring bone density is the most important tool in the diagnosis of osteoporosis. Bone Mineral Density is a good indicator for measuring bone tissue loss in the body [7, 8]. Decreased bone density is associated with an increased risk of fractures. In order for risk assessment to be effective and efficient, the assessment of BMD must be practical and have high predictive value for the identification of risk of fracture. Dual energy X-ray absorptiometry [DEXA] is currently most widely used modality for assessing bone mineral density[9,10].

Hence in present study we tried to compare number of reproductive years and natural and surgical menopause with bone mineral density in post menopausal women.

MATERIALS AND METHODS

ACross sectional study was done on 200 postmenopausal women up to 65 years of age over a period of one year at the Department of Obstetrics &Gynaecology, King Georges Medical University, Lucknow in collaboration with department of Rheumatology.

All post-menopausal women having natural menopause or surgical menopause following bilateral oophorectomy up to 65 years age who attended gynaecology O.P.D were enrolled after taking informed consent.

Women who did not give consent, women with either hysterectomy alone or hysterectomy with unilateral salpingo oophorectomy, women more than 65 years of age as after this age bone loss is more dependant on age as compared to estrogen deficiency, study subjects with medical abnormalities affecting BMD like thyrotoxicosis, malabsorption, liver disease, kidney disease, diabetes mellitus, myeloproliferative disease, hyperparathyroidism, rheumatoid arthritis, women who were not ambulatory and women who were taking or have taken in past 1 year, drugs affecting bone mass like glucocorticoids, hormone replacement therapy, bisphosphonates, heparin, thyroxine, anticonvulsants, thiazides, cytotoxic drugs were xlcuded from the present study.

A detailed questionnaire was filled which included the demographic factors of the patient, BMI, Blood pressure, number of reproductive years, whether menopause was natural or surgical, personal history including history of exercise, smoking, alcohol intake. Any prior history of low trauma fracture or family history of low trauma fracture was noted. BMI was calculated for each woman.

All women were subjected to a routine gynecological examination. BMD was measured in each woman at lumbar spine (L1-L4) by lunar Prodigy dual energy X Ray absorptiometry.

All the data analysis was performed using IBM SPSS ver. 20 software. Quantitative data was expressed as mean ± standard deviation (SD) whereas categorical data was expressed as percentage. Cross tabulation and frequency distribution was used to prepare the table and Microsoft excel 2010 was used to prepare the required graph. Level of significance was assessed at 5% level.

RESULTS

Table-1: Association between Number of Reproductive Years and BMD Status

No. of Reproductive Years	Normal n=5		Osteopenia n=72		Osteoporosis n=123		Total n=200	
	No.	%	No.	%	No.	%	No.	%
<30 Years	0	0.0	6	23.1	20	76.9	26	13
>30 Years	5	2.9	66	37.9	103	59.2	174	87

χ^2=3.289 (df=2); p=0.193 (NS)

Mean duration of breastfeeding was 6.20±0.84, 6.18±1.79 and 6.20±1.54 years respectively among normal, osteopenic and osteoporotic groups (p=0.996).

Among the 5 women with normal BMD, the mean BMI was 30.54 Kg/m2. Mean BMI was 28.17 and 24.12 Kg/m2 in women with osteopenia and osteoporosis. Mean BMI showed a significant declining trend from normal to osteoporosis BMD status (p<0.001).

Among underweight and normal weight women none had normal BMD, and more than four-fifth had osteoporosis. However, among overweight and obese patients majority had normal or osteopenic status and only 46.6% of overweight and 39.6% of obese women had osteoporosis (p<0.001).

Family history of fracture was positive in 4 (2%) cases. Among these 1 (25%) had osteopenia and 3 (75%) had osteoporosis. Statistically, prevalence of osteopenia and osteoporosis did not show a significant association with family history of fracture (p=0.835).

Cases with normal BMD used to walk as compared to 98.6% of osteopenia and 98.4% of osteoporosis cases. Statistically, there was no significant difference among groups with respect to habit of walking (p=0.953). However, with respect to duration of walking, a significant difference among groups was observed (p=0.015). It was seen that mean duration of walking was maximum in women with normal BMD status and minimum in women with osteoporosis. Majority of women with normal BMD status used to climb stairs (60%) as compared to 50% of osteopenia and 41.5% of osteoporosis cases. However, this difference among groups was not significant (p=0.406).

A total of 25 (12.5%) women had surgical menopause. Among those having natural menopause the proportion of normal BMD, osteopenia and osteoporotic women was 1.1%, 38.3% and 60.6% as compared to 12%, 20% and 69% respectively among

those having surgical menopause. Statistically, this difference was significant (p=0.002).

Table-2: Association of L1-L4 T-score with Number of Reproductive Years among women with different BMD status

SN	Rep. Yrs	Total			Normal			Osteopenia			Osteoporosis		
		N	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1.	<30	26	-2.83	1.14	5	-0.220	0.61	6	-1.37	0.23	20	-3.27	0.91
2.	>=30	174	-2.40	1.23	-	-	-	66	-1.53	0.59	103	-3.07	1.06
P value		0.095			-			0.514			0.431		

DISCUSSION

Bone mineral density has been shown to have association with age at menopause and age at menarche. Many studies have shown this correlation but there are limited studies on correlation of BMD with the number of reproductive years. Reproductive years defined as the years between menarche and menopause taken into account a woman's standing on both of these dimensions. In the present study among the women with reproductive years < 30, 76.9% and in women with reproductive years>=30 years 59.2% had osteoporosis and this difference is not statistically significant (p=0.193).

This is a variation from studies by Melton *et al.* [11] and Vico*et al*. [12] where number of reproductive years was significantly and positively associated with bone mineral density. This variation can be explained by the fact that the reporting of age at menarche by the postmenopausal women in our country is unreliable as most of them are illiterate and from rural background.

Osteoporosis has been shown to have a large genetic componentin various studies like by Johnell*et al.* [13] and Seeman*et al.* [14]. A parental history of fracture confers an increased risk of fracture that is independent of bone mineral density. In this study out of the 200 postmenopausal women, only four had family history of fracture and among these three cases had osteoporosis and one had osteopenia. Statistically, no significant association between family history of fracture and bone mineral density was seen (p=0.835).

Mean BMI of women showed a significant decline from normal to osteoporosis (p<0.001). Among the underweight and normal weight women none had normal BMD, and more than four/fifth had osteoporosis. However, among overweight and obese patients majority had normal or osteopenic status and only 46.6% of overweight and 39.6% of obese had osteoporosis (p< 0.001).Similar results were shown in a retrospective study by Shukla*et al*. [15]in 2013, which was done to investigate association among age , body mass index and BMD in postmenopausal women. The mean bone mineral density of obese and severely obese postmenopausal women was found to be significantly higher (p value< 0.001) as compared to the mean BMD of normal weight women. Significant negative correlation was found between the age and BMI except in severely obese group (p<0.05). The study revealed that with advancing age BMD is lowered and that higher BMI might have a positive influence on the BMD. Another study by Farzaneh*et al.* [16] on the effect of age, weight and BMI on BMD showed the mean BMD of women older than 50 years compared to those younger than 50 years was significantly different (p<0.05). The mean weight and BMI were found to be significantly lower in women with low BMD as compared to the normal group (p<0.0001). In the present study it was also seen that that BMI had significant correlation with BMD at individual sites like at L1-L4, left neck femur, left forearm but no significant correlation was seen between BMD at right neck femur and BMI.

Physical inactivity and sedentary lifestyle are known risk factors for developing fragility fractures. In 2013, the effect of regular physical activity on bone mineral density in postmenopausal women was studied in a retrospective analysis by Muir*et al.* [17]. The results indicate that an increase in the amount of physical activity performed each day resulted in a positive effect on bone mineral density at the hip. In the present study, all the cases with normal BMD had the habit of walking as compared to 98.4% of osteoporosis cases and 98.6% of osteopenia. Statistically, there was no significant difference among groups with respect to habit of walking (p =0.953). However, with respect to duration of walking, a significant difference among groups were observed (p=0.015). It was seen that mean duration of walking was maximum (14.60 hrs) in women with normal BMD and minimum (12.34hrs) in women with osteoporosis.

Surgical menopause differs from natural menopause owing to the abrupt cessation of estrogen secretion.In the present study, 25 women had surgical menopause and 175 women had natural menopause. Among the women with natural menopause 60.6% had osteoporosis and in women with surgical menopause 68% had osteoporosis. Statistically, this difference was significant (p=0.002).This significance is seen due to early age at menopause in women with surgical menopause (mean=43.20 years) than in women with natural menopause (mean= 44.65 years). In a study by Ozdemir*et al*. [18] on the effect of surgical menopause and natural menopause on osteoporosis it was shown

that osteoporosis was significantly higher among woman with surgical menopause. Similarly another study by Hadjidakis*et al*. [19] on the type and time of menopause as decisive factors for bone mass changes showed lower values of T scores in women with surgical menopause than natural menopause($p<0.001$).

In the present study, the mean BMD has shown a declining trend from being lowest at the left forearm followed by L1-L4, right neck femur and then left neck femur. This explains the observation that in postmenopusal women wrist fracture are first to occur followed by vertebral and lastly by neck femur[13].

CONCLUSION

The present study was aimed at finding the prevalence of osteoporosis and correlation between the number of reproductive years with BMD and also to compare BMD in women with natural and surgical menopause. The prevalence of osteoporosis was 61.5% which was higher as compared to the world prevalence and in range of Indian prevalence (8% -62%) but to the higher side. BMI showed a highly significant association with the bone mineral density in the present study.

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