

Relationship of Age and Parity with Bone Mineral Density among Postmenopausal Women- A Study at Dhaka Medical College Hospital

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Abstract:

Low Bone Mineral Density (BMD) leads to osteoporosis and increased bone fracture risk of a menopausal woman. Low Bone Mineral Density (BMD) is a major risk factor for osteoporosis and fragility fractures. Bone loss is accelerated following cessation of ovarian function and menstruation. Menopause is accompanied by estrogen deficiency and associated with bone loss. Generally accepted risk factors for osteoporosis in women are low BMI, age and duration of menopause. The effect of parity is controversial. So the aim of this cross-sectional observational study was to assess effect of parity on BMD. For this purpose total 100 women aged 50-70 years with parity three or more who had natural menopause were studied over the period of one year. All these women underwent measurement of Bone Mineral Density (BMD) at Dhaka Medical College Hospital (DMCH). Among 100 women 64 were para three to five, 30 were para 6-8 and only six were 9-11 para. BMD of L1-4 and total femur measured among para 3-5 women were (.938±.172,.855±.161) and it was (.851±.170,.769±.155) with para six to eight and (.765±.169, .656±.258) with para 9-11 respectively. ANOVA was done within and between groups, F = 3.996/4.959 (P = .021/ .009). Negative correlation was found between parity and BMD of L1-4 and total Femur. This negative correlation was statistically significant. It can be concluded that with increasing parity BMD decreases.

Key words: BMD – Bone Mineral Density, Parity, Post Menopausal Women.

Introduction:

Oestrogen prevents bone loss. During menopause with the loss of oestrogenic effect bone matrix and mineral both are lost, so bone strength becomes less and less with increased incidence of fractures particularly of distal forearm, vertebral bodies and hip. Other causes of osteoporosis are dietary deficiency, malabsorption of calcium or vitamin D, prolonged immobilization, excessive adrenocortical secretion, drug therapy, medical diseases like chronic renal diseases, hyperparathyroidism etc. Peak bone mass and rate of bone loss are genetically

determined, these are also determined by other factors like sex, race, nutrition and environmental factors such as pregnancy and period of lactation.¹ Osteoporosis which means low bone mass or density is an emerging public health problem in developing countries.² Since fractures due to osteoporosis lead to considerable disability and many premature deaths. Pregnancy and lactation involve intense physiologic changes that may have an important effect on bone. Both states cause pronounced changes in sex steroids and other hormones which are involved in calcium homeostasis.³

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With improvement of health status, life expectancy is increased in developing countries like Bangladesh. So, almost one third of life of a woman is spent with menopause. But often this portion of life is not well enough due to body ache or low back pain, which is often ignored by the women and their family members because of lack of knowledge and low socioeconomic condition. The purpose of this study was to investigate the association between parity and BMD and guide the clinician in the evaluation of fracture risk in postmenopausal women. This is an actual social health problem which influences the quality of life, morbidity and even mortality of the post-menopausal women.

Keeping in mind this important health problem the study was designed and subjects selected.

DEXA Machine can measure BMD at the hip and spine. Hip BMD generally refers to BMD of femoral neck. Total femur BMD measures all mean values of femur neck, trochanter and ward's triangle. Spine vertebral L 1 BMD measures through L 3 or L 4. Vertebral bodies are largely made of trabecular bone that because of its high ratio of remodeling surface to bone volume. Results of bone mineral density tests are reported as T-score and Z score.

Aims and Objectives:

To evaluate the relationship between age and parity with bone mineral density in postmenopausal women.

Materials and Methods:

This cross-sectional study was conducted from January, 2012 to December, 2012 in the Department of Obstetrics and Gynaecology of DMCH. The study population consisted of participants of 50 to 70 years women who had natural menopause. By purposive sampling technique after fulfillment of eligibility criteria only 100 subjects were enrolled for the study. All postmenopausal women who had undergone natural menopause with parity 3 or more were included in the study and who had menopause before 50 years, surgical menopause, chronic medical disorders like chronic renal disease, hypo or hyperthyroidism, medication known to affect the bone mass, e.g., on anticoagulant, anticonvulsant, corticosteroid, hormone replacement therapy were excluded from this study. Informed consent was taken from each patient. They were assured that all information's and records would be kept confidential and the procedure will be helpful for both the investigator and patients

in making rational approach of management of osteoporosis. Consent was taken from every patient. Detailed demographic history of all women were taken. Variables like age in years, BMI, menopausal age, duration of menopause were collected. Age was recorded in nearest full years stated by the subjects. Parity was recorded as number of viable births reported by women. Height was measured by measuring scale and weight was measured by weight machine. BMI or Body Mass Index was measured by body weight in Kg divided by height in meters squared. Bone Mineral Density expressed in gm / cm². For the purpose of the study, Bone mineral density was measured by Lunar Prodigy Advance DXA system (Analysis version: 12.30) of the lumbar spine at the level of L1 to L4 and total femur by the technician of BMD laboratory. The measured BMD was automatically displayed. All the Data were collected, processed and analyzed using SPSS (Statistical Package for Social Sciences) version 13.0. The test statistics used to analyze the data were F test (ANOVA) and Pearson's correlation test. For all analytical tests, the level of significance was set at 0.05 and .01 level was considered significant. Summarized data is presented in the form of tables and diagram.

Observation and Results :

Out of all study subjects 33 were within 56 to 60 years of age range, 23 were within 61 to 65 years and only 21 were within 66-70 years range. Mean age of patients was 60.66 years with a standard deviation of ± 6.25 years. Parity were divided into three groups. Sixty four were para 3-5, 30 were para 6-8 and 6 were para 9 or more (Table-I). Among 100 women, 37 were menopausal for 11-15 years, 23 women for 1-5 years, 15 women for 6-10 years, 7 women for 16-20 years and 18 women over 20 years of menopause. Mean duration of menopause was 12.32 ± 6.9 years. Maximum 52% were normal weight, 24% over weight, 16% were obese and only 8% were underweight. Mean height and weight was about 149 cm and 57 kg and mean BMD value of L1-4 and total femur was 0.905 and 0.822 gm/cm² respectively. Eighty three percent patient had Low BMD and 17% patients had normal BMD whereas their mean T-score was -2.29 for the L1-4 and -1.46 for the total femur. Mean Z-score of L1-4 was -7.7 and Total femur was -2.88. Bone mineral density was more in L1-4 than total femur (Table-II). Average weight of

the patients was 57.19 ± 10.13 kg. T-score of L1-4 and Total Femur were -2.22 (SD=1.4) and -1.4 (SD=.13). Depending on T- score about 35% had normal bone density, 48% had low bone density and 17% had osteoporosis. There was negative correlation between Parity and BMD of L1-4 and total femur and it was statistically significant (Fig-I). With increasing Parity BMD decreases (Table-III). A significant negative association was found between age and BMD value of L1-4 and total femur. With increasing age BMD decreases. There was significant negative correlation between age and duration of menopause with BMD of L1-4 and Total femur. There was significant positive correlation of BMI with BMD value of L1-4 and Total femur. The value of Pearson's coefficient was $+0.285$ and $+0.250$ which indicates positive correlation between two variables and it is highly significant, p value was <0.01 . Significant negative association was found between age and BMD value of total femur. The value of spearman correlation coefficient was -0.354 and $p < .05$ level.(Table-IV)

Table-I
Distribution of parity of the study subjects

Parity	No.	Percentage	Mean±SD
3-5	64	64%	3.90 ± 0.819
6-8	30	30	6.78 ± 0.861
9-11	6	6%	9.25 ± 0.500
Total	100	100	4.95 ± 1.777

Table-II
Distribution of study subjects with their anthropometric data and BMD values

Related factors	Mean±SD
Height(cm)	149.80 ± 6.738
Weight(kg)	57.19 ± 10.93
BMD L1-4(gm/cm ²)	$.905 \pm .176$
BMD Total Femur (gm/cm ²)	$.822 \pm .170$
T-score of L1-4	-2.29 ± 1.455
T-score of Total femur	$-1.46 \pm .132$
Z-score of L1-4	$-.77 \pm 1.25$
Z-score of Total Femur	-2.88 ± 1.1

Table-III
Correlation of parity and BMD of different bony sites

Parity	BMD of L1-4	BMD of Total Femur
Mean ±SD	gm/cm ²	gm/cm ²
3-5	$.938 \pm .172$	$.855 \pm .161$
6-8	$.851 \pm .170$	$.769 \pm .155$
9-11	$.765 \pm .169$	$.656 \pm .258$

ANOVA was done
 Between Groups sum of the square=.236/.266 df=2 mean square=.118/.133
 Within groups Sum of the square=2.859/2.597 df=97 mean square=.029/.027
 F= 3.996/4.959 , P = .021 * / .009. **
 * Significant at the level of .05 level with df = 2 and 97 from F- table.
 ** Significant at the level of .01 level with df = 2 and 97 from F- table.

Table-IV
Distribution of study subjects by age, parity, duration of menopause and BMI with BMD of L1-4 and Total femur

	BMD L1-4	BMD	Total Femur
	r value	r value	p value
Age	-.212	-.354	.034/.014*
Parity	-.224	-.266	.021/.009**
Duration of Menopause	-.258	-.264	.010/.008*
BMI	+ .285	+ .250	.004/.000**

*Significant at P < .05 Level.
 ** Significant at < .01 level.

Fig. 1 Correlation of Parity with BMD value of Total Femur Shows a significant negative correlation between parity with BMD value of Total Femur. The value of Pearson's correlation coefficient was $-.266$ and $P < .01$, so it was highly significant.

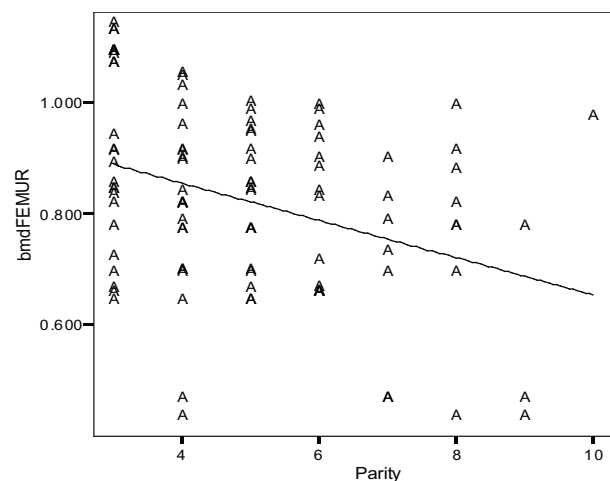


Fig.-1: Correlation of Parity with BMD value of Total Femur

Discussion:

Osteoporosis is a serious and frequent complication of menopause that occurs worldwide. The most important risk factor for osteoporosis is estrogen deficiency, and the increasing life expectancy of women indicates that the problems of osteoporosis will be overwhelming in the coming years. Because the treatment available today can only arrest the progression of the disease, an intervention before the occurrence of fracture is recommended. An estimation of simple clinically evaluable risk factors at this time would thus be an important tool for the future management of the disease.

This cross-sectional study was carried out in postmenopausal women of 50-70 years with parity three or more. The aim of this study was to evaluate the influence of parity on BMD. Among 100 postmenopausal women the mean age was 60 years with SD of ± 6.25 . Differences in Body Mass index (BMI) among menopausal women were observed in this study. Majority (52%) women had BMI within normal range, 24% were overweight, 16% were obese and only 8% women were underweight. Mean (\pm SD) BMI was 24.55 (SD= 4.7).

In a study done by Masazumi⁴ showed that natural menopause did not exert a significant effect on BMI. In this study no significant relation was found between BMI and age which was similar with this study. In this study when para 3-5 BMD of L1-4 was $.938 \pm .172$ and total Femur was $.855 \pm .161$ gm/cm² and in parity 6-8 BMD of L1-4 was $.851 \pm .170$ and total Femur was $.769 \pm .155$ gm/cm² but in 9-11 parity BMD of L1-4 was $.765 \pm .169$ and total Femur was $.656 \pm .258$ gm/cm². So, with increasing Parity BMD decreases and it was highly significant which was supported by study done by Gur A.⁵ They showed significant negative correlation between number of pregnancies and spine, trochanter and Ward's triangle BMD.

Study conducted by Ozdemir et al⁶ showed that significant negative correlation was found between number of pregnancies and BMD values for the spine and Femur (neck, trochanter). In present study there was negative correlation of parity with BMD of L1-4 and Total Femur. With 3-5 parity BMD of L1-4 and Total Femur was $.938 \pm .172$ and $.855 \pm .161$ and with 9-11 parity $.765 \pm .169$ and $.656 \pm .258$ respectively which is similar to the present study. Nuri Peker⁷ showed that femoral BMD significantly decreased as the number of parity increased which is similar to our study.

Paulo G. Pedreira⁸ had done a case control study with postmenopausal women and showed that mean weight and height of their study population were 59.1 kg (SD = 8.3) and 156.6 cm (SD = 4.4), respectively, and their mean body mass index (BMI) was 24.1 (SD = 3.1). In our study mean weight and height were 57.19 ± 10.93 kg and 149 ± 6.73 cm and mean BMI was 24.55 (SD=4.7). These findings of two studies were almost similar. Their study showed mean calculated overall L1-4 BMD value was 102gm/cm (SD=0.17) and mean T-score and Z-score were - 0.85 (SD=1.42) and - 0.28(SD=1.22) and in our study mean calculated L1-4 BMD value was 0.905 gm/cm (SD =1.76) and Total Femur was .822 gm/cm (SD=1.7). Mean calculated T and Z score were - 0.82 (SD=1.72) and -0.77 (SD=1.25) respectively. Their values were more or less similar to our study. Above study showed that age, postmenopausal length and BMI were all significantly correlated with BMD. In the case of age and duration of menopause, the correlation were negative, suggesting that BMD decreased as these women aged, or as the duration since their menopause increased which was in consistent with our study.

The study done by Gloria Tsvetov et al⁹ with a single-center cohort analysis of BMD among premenopausal and early postmenopausal women showed that prolonged breast feeding but not number of deliveries significantly correlated to a low BMD (p = 0.0008). Influence of parity on bone mineral density and peripheral fracture risk in Moroccan postmenopausal women revealed that BMD of Spine and Hip decreases with an increasing number of pregnancies and this situation varies in different age groups.¹⁰

A study done by Fatima Jesmin et.al published in Journal of Nuclear Medicine in 2015 in Bangladesh showed significant association between parity and BMD at Lumbar spine and femoral neck (p<0.001). T- scores of BMD were decreased with increasing number of parity.¹¹ Carranza et al¹² found no significant correlation between number of gestations, total duration of breastfeeding, time elapsed since last birth with T- score at lumbar spine and Femur. But in this study a significant negative correlation was found between number of gestations with BMD of Lumbar spine and Total Femur which is also consistent with our study.

A systematic Review of 19 published studies reporting the effect of parity on BMD done by Alemayehu Bayray¹³ on 27,434 nulliparous and parous postmenopausal women was conducted and narrative analysis was made. The majority of the studies supports a positive effect of parity on BMD, while six studies support a negative effect of parity on BMD which is similar to our study and five studies did not find any effect.

In our country another study done by Irin Parveen Alam¹⁴ and published in 2015 showed similar result that is negative correlation of parity with BMD values. So, present study revealed a negative and statistically significant correlation between parity and BMD of both spine and hip. BMD value is more, when BMI is more. The study also suggests that weight, age, duration of menopause has an effect on BMD. Further studies are required to investigate the effect of other factors like exposure to sunlight, calcium intake, and other habits like smoking, diet, and so forth.

Conclusion:

This study concluded that Bone Mineral Density of post-menopausal women decreases as number of parity increases. So, women with high parity should have regular calcium intake, measurement of BMD and Menopausal Hormone therapy if BMD is low.

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