

AN ASSESSMENT OF OSTEOPOROSIS AND LOW BONE DENSITY IN POSTMENOPAUSAL WOMEN

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Background: Assessment of bone mineral density and other risk factors of osteoporosis in postmenopausal age group of Pakistani population and to compare them with premenopausal group. **Methods:** The risk factors of osteoporosis were studied both in premenopausal and postmenopausal groups. These risk factors can be exogenous or endogenous. Endogenous risk factors are aging, altered menstrual status, low bone mass, positive family history and oestrogen deficiency. Exogenous factors include lack of adequate nutrition (milk, calcium, vitamin D etc.) and lack of physical exercise. These risk factors were evaluated by taking history, recording height and weight, doing blood parameters and checking bone mineral density. Oestrogen level was carried out by the Eliza technique. Bone mass density was carried out by the bone heel densitometer. The data was analysed statistically and the values of two groups were compared. **Results:** The risk factors in postmenopausal group were low BMD, low oestrogen levels, poor intake of milk and calcium and lack of physical exercise. **Conclusion:** All women should get checked their BMD in this age group. Regular exercise and adequate calcium intake can still help in postmenopausal age group.

Keywords: Postmenopausal, BMD, BMI, oestrogen

INTRODUCTION

Osteoporosis is the most common of all bone diseases in adults. 'Bone problem of elderly' brings to mind the stereotype of a victim of osteoporosis, a hunched-over old women shuffling behind her walker, as most often it occurs in aged, particularly in postmenopausal women. The incidence of osteoporotic fractures is constantly increasing due to the increase in life expectancy.¹

Average compact bone contains about 30% matrix and 70% salts. Osteoporosis results from diminished organic bone matrix. The osteoblastic activity in the bone usually is less than normal, and consequently the rate of bone osteoid deposition is depressed. Adult women have less bone mass than adult men, and after menopause they initially lose it more rapidly than men of comparable age do. Consequently, they are more prone to development of serious osteoporosis.²

The reason of the bone loss after menopause is primarily oestrogen deficiency. Estrogens inhibit the secretion of cytokines such as IL-1, IL-6 and TNF, and these cytokines foster the development of osteoclasts. Oestrogen also stimulates the apoptosis of osteoclasts. However it now appears that even small doses of estrogens may increase the incidence of uterine and breast cancer. Therefore, the decision to treat a postmenopausal woman with estrogens depends on careful weighing of the risk-benefit ratio.^{3,4}

Many risk factors are associated with osteoporotic fractures including low peak bone mass, hormonal factors, the use of certain drugs (e.g.,

glucocorticoids), cigarette smoking, low physical activity, low intake of calcium and vitamin D, race small body size and a personal or a family history of fracture.⁵

Relatively little is known about risk factors in women from Indian subcontinent, osteoporotic fractures usually occur 10 to 20 years earlier in Indian/Pakistani men and women as compared with western Caucasian counterparts. The Indian/Pakistani women has lower BMD than American, placing them at greater osteoporotic risk. The shorter hip axis of Indian/Pakistani versus American might also attenuate hip fracture risk in former group.⁶

Menstrual status is an important determinant of peak bone mass as well as the development of bone loss prior to onset of menopause. It has also been reported that the group of postmenopausal women has significantly lower bone mass than pre and perimenopausal women.^{7,8}

Osteoporosis takes a huge toll in the suffering and health care costs; hip fractures are the most serious and costly outcome of this process. There has been considerable debate about the relation of bone mass measurement in the diagnosis of osteoporosis. But several recent studies have clearly shown that low bone mass is predictive of fracture.

MATERIAL AND METHOD

Forty (40) postmenopausal and 30 premenopausal women (who were having normal menstrual cycles) of staff members of Fatima Jinnah Medical College, Lahore were included in the study. Women who were taking Hormone Replacement Therapy (HRT) and

those with a history of total hysterectomy were excluded from the study.

These subjects were asked about their age, parity, menstrual status, level of physical activity, intake of milk and calcium and family or personal history of fractures. Heights and weight of these subjects were recorded to calculate their BMI (Body Mass Index). Blood parameters like serum calcium, magnesium, inorganic phosphorus and alkaline phosphate were analyzed by auto analyzer and serum oestradiole by ELIZA. Bone mineral density (BMD) of the heel bone was done by single X-Ray absorptiometry.

RESULTS

The results have been summarized in tabulated form. Mean and standard deviation of these of these values were calculated. The comparison of these parameters between pre and postmenopausal groups is shown in the tables. The student's *t*-test was applied and *p* value was found for BMD, BMI, age at menarche and blood parameters. The percentages of nominal variables like physical activity, H/O fracture in the family, calcium, milk and tea intake.

Mean present age of premenopausal group is about 31 years and of postmenopausal group about 58 years. The mean age of menopause was found out to be 47 years. The mean value of BMI is higher in postmenopausal but it is not showing any significant difference. The women of postmenopausal group are only involved in mild to moderate level of physical activity. The BMD value is more negative in postmenopausal group as compared to premenopausal women (Table-1).

Most of these women are taking one to two cups of milk, which do not fulfil the daily requirement of calcium. Only few ladies are taking calcium supplements. Many women gave the history of fractures in the family, but they were not sure about the nature of injury (Table-2).

The mean values of serum calcium and magnesium are almost same in the two groups. The value of oestradiole shows a great decrease in the postmenopausal group. However mean values of inorganic phosphorus and alkaline phosphate are showing little decrease in this group (Table-3).

Table-1: Comparison of BMD with present age, BMI and Physical activity of pre menopausal with postmenopausal women (Mean±SD)

Subjects	BMD	Age at Menarche	Present Age	Menopausal age	BMI	Physical Activity
Premenopausal women (n=30)	-0.91 ±0.81	13.07 ±1.27	30.96 ±4.15		27.90 ±5.84	12 (mild) 14 (moderate) 4 (severe)
Postmenopausal women (n=40)	-1.22 ±1.13	12.97 ±1.24	58.18 ±5.85	47.03 ±7.10	32.12 ±3.87	17 (mild) 23 (moderate) 00 (severe)

P value, not significant in the above parameters

Table-2: Relationship of history of fractures and milk, calcium and tea intake in both the groups

Subjects	H/O Fracture	Milk intake	Tea intake	Calcium intake
Premenopausal women (30)	19/30 63.3%	17/30 56.6%	4/30 (1-2 cups) 13.3% 13/30 (3-4 cups) 43.3%	6/30 20%
Postmenopausal women (n=40)	12/40 30%	26/40 65%	13/40 (1-2 cups) 32.5% 26/40 (3-4 cups) 65%	8/40 20%

Table-3: Comparison of Blood parameters of menstruating and postmenopausal women (Mean±SD)

Subjects	Oestradiole (pg/ml)	Calcium (mg/dl)	Magnesium (mg/dl)	Inorganic phosphorous (mg/dl)	Alkaline Phosphatase (mg/dl)
Premenopausal women (n=30)	84.83±75.04	8.30±0.52	2.35±0.23	4.32±0.54	214.23± 65.64
Postmenopausal women (n=40)	47.27±62.23**	8.40±0.63	2.28±0.25	4.19±0.67	211.03±51.82

***p*<0.001 (highly significant between premenopausal and postmenopausal)

DISCUSSION

Osteoporosis refers to a group of diseases in which bone absorption outpaces bone deposition. Bone becomes incredibly fragile that something as simple as hearty sneeze or stepping off a curb can cause them to break. Though it affects the whole skeleton

but the spongy bones of vertebra, wrist and femur neck are more vulnerable.¹

This study reveals the risk factors of osteoporosis in postmenopausal age group. The mean age of menopause came out to be 47 years which may be earlier. A study reported that women having early menopause develop low bone mineral density at an earlier age. Their results indicate that early

menopause is a risk factor for osteoporosis.⁹ However another study found that baseline age was not associated with BMD or bone loss.¹⁰

The mean weight of postmenopausal women was more than that of premenopausal, which lead to an increase BMI in this group. Increased body weight was also observed by a study. They reported that there is increase risk of ankle fractures with elevated BMI. Increased weight generates greater force during a fall, twist or turn, resulting in a greater probability of fracture.¹¹

Lack of physical is also found in this age group. Most of the women both professional and non professional are doing only routine household work having no walk or gym. Our study is agreed with a study¹² who reported that the lack of physical activity or weight bearing exercises is an important risk factor for osteoporosis. The study suggested that menopausal women can benefit from nonpharmacological interventions to reduce the risk of fractures, including a balanced diet and regular exercise.¹³

Family history of fracture especially the maternal history, significantly increase the likelihood of osteoporosis. Inherited characteristics of proximal femur may count for this familial predisposition.¹⁴ In our study, the data did not clearly indicate the nature of the fractures, whether they were spontaneous (occurring at routine physical activity) or traumatic.

The calcium intake results are poor also and only few are taking supplements. It is reported that after menopause, effectiveness of exercise to increase bone mineral density depends heavily adequate availability of dietary calcium. The limitation of the capacity of skeleton to adapt to mechanical stress of exercise is due to altered hormonal status and inadequate intake of specific nutrients.¹² However, another study reported that calcium intake and physical activity were not associated with BMD or bone loss.¹⁰

The standard value of BMD between -1 to -2.5 is considered as osteopenia and more than -2.5 reflected osteoporosis.¹⁵ Our study observed that bone mass density is less in postmenopausal women as compared to women with premenopausal status. Our study agreed with a study who determined the BMD value of women with different menstrual status. The study stated that the individual with low BMD leads to diagnosis of osteopenia and osteoporosis.¹⁵

Another study stated that about 50% of our postmenopausal women were osteopenic and 6/40 were osteoporotic. They affirmed that decrease bone mineral density associated with menopause progress for at least ten years. They also observed that aging increase the risk of osteoporosis.¹⁶

Present study observed a decreased level of oestradiol in post menopausal women as compared to

women with premenopausal status. According to a study the reason of decreased level of oestradiol in postmenopausal group is that the bone osteoblasts are more sensitive to age-related oestrogen loss than are the osteoclasts, so the homeostasis of this bone remodelling eventually shifts.¹⁷ Another study stated that oestrogen deficiency promotes bone loss at every age, it increases the life span of osteoclasts and decreases the life span of osteoblasts, the final unit balance is negative and less bone is formed.¹⁸ Level of calcium was slightly increased in post menopausal as compared to premenopausal. According to a study that when the menstrual cycles get irregular toward menopause, the serum calcium level rises rapidly and reaches maximum in 2-5 years after menopause, and then slight decrease afterwards. Level of serum inorganic phosphorus, magnesium and alkaline phosphatase were decreased in post menopausal groups as compared to the women with pre menopausal status. According to a study¹⁹ the level of serum magnesium was associated with change in BMD. Another study found that risk factors like increased serum phosphate, alkaline phosphatase were independently associated bone alkaline phosphatase.²⁰

CONCLUSION

Many factors are known to be associated with osteoporosis, but major clinical consequences and economic burden of the disease are fractures. For general public concern all peri- and postmenopausal women should be evaluated, probably followed by BMD. There are limited facilities for diagnostic purposes in Pakistan and there have been no epidemiological studies done in this area. Postmenopausal osteoporosis has the potential for becoming one of the leading gynaecological problems of Pakistan in the coming decade. The key lies in prevention, tools for early detection and subsequent management of the underlying cause.

REFERENCES

1. Elaine N. Bones and Skeletal Tissues, Human Anatomy and Physiology, India: Pearson Education Inc. 2006;193-4.
2. Guyton C, Hall E. Bone and Teeth. In: Textbook of Medical Physiology, India: Elsevier Inc. 2006;pp.981-2.
3. Seifert-Klauss V, Link T, Heumann C, Lupp P, Haseitl M, Laakmann J, *et al.* Influence of pattern of menopausal transition on the amount of trabecular bone loss. Results from a 6-year prospective longitudinal study. *Maturitas* 2006;55(4):317-24.
4. Ganong WF. Hormonal Control of Calcium Metabolism & the Physiology of Bone. In: Review of Medical Physiology, Singapore: McGraw-Hill. 2005;pp.386-7.
5. Grazio S [Epidemiology of osteoporosis] *Rheumatism*. 2006;53(2):18-31.
6. Alekel DL, Mortillaro E, Hussain EA. Lifestyle and biologic contributors to proximal femur bone mineral density and hip axis length in two distinct ethnic groups of premenopausal women. *Osteoporos Int* 1999;9(4):327-38.

7. Khan AA, Syed Z. Bone densitometry in premenopausal women, synthesis and review. *J Clin Densitom* 2004;7(1):85–92.
8. Usmani SZ, Shahid Z. An overview of postmenopausal osteoporosis. *Pak J Med Sci* 2004;20(3):270–5.
9. Gallagher JC. Effect of early menopause on bone mineral density and fractures. *Menopause* 2007;14(3 Pt2):567–71.
10. Bainbridge KE, Sowers M, Lin X, Harlow SD. Risk factors for low bone mineral density and the 6-year rate of bone loss among premenopausal and perimenopausal women. *Osteoporos Int* 2004;15(6):439–46.
11. Valtola A, Honkanen R, Kroger H, Tuppurainen M, Saarikoski S, Alhava E. Lifestyle and other factors predict ankle fracture in perimenopausal women: a population-based prospective cohort study. *Bone* 2002;30(1):238–42.
12. Delaney MF. Strategies for the prevention and treatment of osteoporosis during early postmenopause. *Am J Obstet Gynecol* 2006;194(2 Suppl):S12–23.
13. Borer KT. Physical activity in the prevention and amelioration of osteoporosis in women: interaction of mechanical, hormonal and dietary factors. *Sports Med* 2005;35(9):779–830.
14. Cummings S, Nevitt M. Risk factors for hip fracture in white women. *N Engl J Med* 1995;323:767–73.
15. Jarupanich T. Prevalence and risk factors associated with osteoporosis in women attending menopause clinic at Hat Yai Regional Hospital. *J Med Assoc Thai* 2007;90(5):865–9.
16. Garton M, Martin J, New S, Lee S, Loveridge N, Milne J, *et al.* Bone mass and metabolism in women aged 45–55. *Clin Endocrinol (Oxf)* 1996;44(5):563–73.
17. Luigi M, Loredana M. Utility of dietary phytoestrogen in preventing postmenopausal osteoporosis. *Curr Topics in Nutraceutical Res* 2005;(3)15–28.
18. Ohta H, Sugimoto I, Masuda A, Komukai S, Suda Y, Makita K, *et al.* Decrease bone mineral density associated early menopause progress for at least ten years: cross-sectional comparison between early and normal menopausal women. *Bone* 1996;18(3):227–31.
19. Macdonald HM, New SA, Golden MH, Campbell MK, Reid DM. Nutritional associations with bone loss during the menopausal transition: evidence of a beneficial effect of calcium, alcohol, and fruit and vegetable nutrients and of a detrimental effect of fatty acids. *Am J Clin Nutr* 2004;79(1):155–65.
20. Sornay-Rendu E, Munoz F, Garnero P, Duboeuf F, Delmas PD. Identification of osteopenic women at high risk of fracture: the OFELY study. *J Bone Miner Res* 2005;20(10):1813–9.

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