ORIGINAL ARTICLE

EVALUATING THE RISK OF OSTEOPOROSIS THROUGH BONE MASS DENSITY

Sayeeda Amber Sayed, Asif Khaliq*, Ashar Mahmood**

Alberta Health Services, Calgary Zone-Canada, Baqai Institute of Health Sciences, *Baqai Medical University, Karachi, **Department of Health & Hospital Management, Institute of Business Management, Karachi-Pakistan

Background: Osteoporosis is a bone disorder, characterized by loss of bone mass density. Osteoporosis affects more than 30% of post-menopausal women. Osteoporosis is often associated with restricted body movement, pain and joint deformities. Early identification and early intervention can help in reducing these complications. The primary objective of this study was to estimate the burden of Osteoporosis in Urban setting of Sindh among women of different age groups and to access the effect of different protective measures that can reduce the risk of Osteoporosis. **Methods:** In this study, 500 women's of 3 major cities of Sindh were approached by non-probability convenience sampling technique. Women bearing age 20 years or more were included. Women who fall under inclusion criteria were screened for BMD (Bone mineral density) test and were classified as Healthy, Osteopenic and Osteoporotic based on their T-score. The association of different protective measures and risk of osteoporosis was assessed by prevalence relative risk (PRR). **Result:** The result of this study indicate that the burden of Osteoporosis is very high among the women of Sindh, only 17.4% (84) women were found to have normal BMD score. The life style of majority of women was sedentary. The PRR calculated for Exposure to sunlight, regular exercise, and use of nutritional supplement was 12.5, 5.19 and 2.72 folds respectively. **Conclusion:** The results of study reveal that exposure to sunlight, regular physical exercise and use of nutritional supplements found to be effective in reducing the risk of osteoporosis among women of all age group. Health education and promotion toward osteoporosis prevention can significantly contribute in reducing the morbidity of osteoporosis.

Keywords: Osteoporosis; Bone Mineral Density; Risk

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INTRODUCTION

Osteoporosis is a condition in which the bones become fragile and porous. Clinically osteoporosis is a condition in which the bone mineral density becomes equal to or greater than -2.5 standard deviations.[1] Osteoporosis is often associated with physical and physiological consequences like restricted body movement, pain and joint deformities.[2]

The burden of Osteoporosis is tremendously increasing in developing countries.[3] Among Asian countries; there is 2–3 folds increase incidence of osteoporotic fracture since last 30 years. In Pakistan, Osteoporosis prevails in 9.91 million people, of whom 72.5% (7.19 million) are women and these figures expected to rise by 2050 to 12.91 million.[4] A myriad of reasons are responsible for osteoporosis, such as female sex, family history, low dietary calcium intake, vitamin D deficiency, illicit life behaviour (smoking & alcohol use) and sedentary life style.[5]

The post-menopausal women are at high risk for Osteoporotic fractures, because osteoporosis affects more than 30% of post-menopausal women.[6] Osteoporosis screening is recommended for all women aged 65 or above but only less than one-third of women received Bone Mineral Density screening.[7] Early identification and early intervention may help in maintaining the bone mass and thus reducing the risk of osteoporotic fractures. Various non-pharmacologic measures aid in reducing the risk of osteoporotic fractures, such as balanced diet and physical activity.[8]

Osteoporosis is among the leading health problem that affect both gender men and women. The incidence and the prevalence of Osteoporosis are more common in women than does men. The primary objective of this study was to estimate the burden of Osteoporosis in Urban setting of Sindh among women of different age groups and to access the effect of different protective measures that can reduce the risk of Osteoporosis.

MATERIAL AND METHODS

The cross sectional study was carried out in 3 major cities of Sindh: Karachi, Hyderabad, and Sukker from May to August 2013. In this study, 500 women's were approached by non-probability convenience sampling technique. Women bearing age 20 years or more were included. However, women having any disability, any chronic disease or not willing to participate were excluded. Women who fall under inclusion criteria were screened for BMD (Bone

mineral density) test and were classified as Healthy, Osteopenic and Osteoporotic based on their T-score. Women who had T-Score ≤ -2.5 were categorized under group as Osteoporotic, those who have T-Score ranges between -1 to -2.5 were grouped under Osteopenic category and with T-score ≥ -1 are grouped under Healthy population.

In addition to BMD screening, a closed ended questionnaire was also used, that has 3 major sections. The section one of the questionnaire contains the demographic information that includes age, marital status, level of education and number of children. Similarly the section two of the questionnaire contains information about the life style (diet, exercise, milk consumption, sunlight exposure). However the last section contain information about various factors that predispose a women for osteoporosis like family history, medical history for fracture, osteoporosis, osteopenia, spine curvature, mobility status and also about medication history. All the women participated in this were informed about BMD screening procedure and its purpose and a written consent form was also taken from all women. The data was analysed by using SPSS 19.0.

RESULTS

A total of 500 women were recruited for this study. Out of which 60% women were of Karachi and rest 40% were of Hyderabad and Sukker. Two hundred and thirty-five (47%) women were belong to age group 35–45 years, followed by women having age greater than 45 year, i.e., 42.2% (n=211).

Majority of women, i.e., 73% (n=365) were married and only 10.2% (n= 51) were either divorced or widowed. There were only 17.4% (n=84) women who were normal for BMD test. The consumption of milk among women was very low, because 64.6% (n=323) women responded that they are not using milk in their daily diet.

Table-1: Participants characteristics

Description	Category	Frequency	Percentage
Region	Karachi	300	60
	Hyderabad	120	24
	Sukker	80	16
Age	20–34 year	54	10.8
	35–40 year	109	21.8
	41–45 year	126	25.2
	46–50 year	75	15
	Above 50 year	136	27.2
Marital Status	Unmarried	84	16.8
	Married	365	73
	Divorced/Separated	17	3.4
	Widow/Widower	34	6.8
Education Status	Secondary	54	10.8
	Intermediate	146	29.2
	Bachelors	236	47.2
	Masters/Post-Graduation	64	12.8
No. of Children	No Children	30	6
	1–3 children	106	21.2
	4–7 children	151	30.2
	More than 7 children	129	25.8
	No response	84	16.8

Table-2: Dietary & lifestyle assessment

Description	Category	Frequency	Percentage
BMD Screening Categorization	Normal	87	17.4
	Osteopenia	284	56.8
	Osteoporosis	129	25.8
Milk Consumption	No	323	64.6
	1 glass	160	32
	2 glass	17	3.4
Nutrition Supplement Use	Yes	119	23.8
	No	381	76.2
Exercise	Daily	7	1.4
	Twice in a Week	87	17.4
	Weekly	110	22
	Not at All	296	59.2
Sunlight Exposure	Yes	312	62.4
	No	188	37.6
Family History of Osteoporosis	Yes	366	73.2
	No	134	26.8
Mobility Status	Independent	409	81.8
	Help With one	24	4.8
	Uses Walking Aid	67	13.4

Table-3: Assessment of protective measure effectiveness for reducing osteoporosis

Risk Factor	Normal	Osteoporosis/ Osteopenia	Prevalence Relative Risk (PRR)	Confidence Interval (95% - CI)	*p*-value
Premenopausal age	67	222	2.44	1.53–3.90	<0.001*
Level of Education	84	362	3.81	1.24 –11.69	0.006*
Exercise	68	136	5.19	3.19–8.29	<0.001*
Milk Intake	29	148	1.35	0.91–2.01	0.138
Nutritional Supplements	40	79	2.72	1.86–3.89	<0.001*
Sunlight Exposure	83	229	12.5	4.66–33.5	<0.001*

DISCUSSION

In this study, Bone Mineral Densitometry screening was performed among women of all age groups dwelling in 3 major cities of Sindh: Karachi, Hyderabad and Sukker. The primary reasons for selecting women as study subject; because the risk for Osteoporosis is 2–3 times higher among women.[9]

The risk of Osteoporosis increases with age; thereby post-menopausal women are more prone to develop osteoporosis. In this study, the PRR (prevalence relative risk) for premenopausal women was found to be 2.44, this indicate that Pakistani women after the age of 45 year are 2.5 time more at risk for Osteoporosis. It is the Menopause that induces bone turnover rate to 52% from normal bone turnover rate of 0–10%.[10]

In this study women of different educational background were targeted so that it could help researcher in analysing the relationship between the education and literacy with osteoporosis. There were 10.2% (n=54) women, who had basic education while other 89.8% (n=446) had intermediate, graduate or master level education. The prevalence relative risk

among educated women for Osteoporosis was 3.39 and this value reflects that the women who are educated can prevent Osteoporosis to 3.4 times more than does uneducated women, because lack of education act as a significant barrier to health information and health accessibility.[11]

The prevalence relative risk among women who were not involved in aerobic exercises, walking and related movement activities was 5.19. This reveals that exercise can prevent the risk for osteoporosis 5 times among physically active women than does the women who physically lazy and immobile. Different studies has reveal that physical activity, sports, and household chores all are associated to reduce the risk of osteoporotic fractures,[12] because it is the exercise that improves strength and prevent the fragility of bones among post-menopausal women[13]. Moreover, CDC and American college of Sports Medicines recommends 30 minutes physical exercise, in order to restore health, prevent disease and to promote healthy lifestyle.[14]

The PRR for milk intake and nutritional supplement was found to be 0.91 and 2.72 respectively. These values indicate that the intake of milk is not associated to reduce the risk of osteoporosis, while the intake of nutritional supplements of Calcium and Vitamin D reduces the risk of osteoporosis to 3 folds. In Pakistan, there is a common practice of milk adulteration and because of which quality of milk sold by different milk agencies and milk shops is low.[15] Moreover, a prospective study on intake of Calcium, Vitamin D, Milk intake and hip fracture among post-menopausal women also showed that increase consumption of milk is not associated to reduce the risk of fractures, but adequate consumption of Vitamin D is associated to reduce the risk of fractures among post-menopausal women.[16] Sunlight is the best source of Vitamin D. The results of this study indicate that the exposure to sunlight can prevent the risk of osteoporosis to 12.5 folds. Besides vitamin D, intake of calcium containing diet is also associated to reduce the risk of osteoporosis.[17]

The results of this study are very alarming because there were only 17.4% (n=87) women who had normal BMD at the time of screening, this may be due to their sedentary life style. There were 64.6% (n=323) women who were not using milk in their diet. Beside that only 1.4% (n=7) were involve in physical exercise on daily basis. If the life styles of women of Pakistan remain as such, then there would be more cases of Osteoporosis and Osteopenia among women. There is need for continuous health education, health awareness and change in life style. This is the only cost effective measure that could reduce the incidence and burden of osteoporosis from community in future[18]

This study was conducted in three major cities of Sindh: Karachi, Hyderabad and Sukker. The data collected from 500 women but the sample size of the study is not representing the proportionate size of any city population.

The study design adopted in this study was cross-sectional and the study respondents were not asked about the duration of dietary habits and exercise. BMD is a screening tool for osteoporosis and we did not perform further confirmatory tests due to financial constraints.

CONCLUSION

Osteoporosis is a bone disorder characterized by loss of bone mass density. Aging and menopause accelerates the risk for the incidence of osteoporosis. As per the results of current study, the prevalence of osteopenia and osteoporosis is high among the women of Sindh. Different factors like sunlight exposure, exercise, milk and supplements intake were lower in the respondents.

Osteoporosis and its consequent fractures cause significant morbidity and mortality among both men and women. Various preventive measures and treatment options can strategically help to reduce the morbidity of the disease and its burden on society. Adequate dietary calcium intake, good nutrition, exercise and hormone sufficiency all contribute to this goal. The assessment of bone mineral density is the single best predictor of risk for osteoporotic fractures and contributes to clinical decision-making. Periodic measurements of bone mass, using modern bone densitometry may alert the physician to a progressive bone loss before clinical or x-ray evidence of osteoporosis occurs.

AUTHORS' CONTRIBUTION

SAS has generated the idea of this study, constructed the questionnaire, design the methodology, review and supervise the entire project protocols. AK has worked on writing introduction, data analysis and partly worked on discussion writing. AM has collected and entered the data. Partly worked in discussion writing with AK and also assist SAS in designing of project

REFERENCES

1. Looker AC, Orwoll ES, Johnston CC Jr, Lindsay RL, Wahner HW, Dunn WL, *et al*. Prevalence of low femoral bone density in older US adults from NHANES III. J Bone Miner Res 1997;12(11):1761–8.
2. Gold DT. The clinical impact of vertebral fractures: quality of life in women with osteoporosis. Bone 1996;18(3):S185–9.

3. Woolf AD, Pfleger B. Burden of osteoporosis and fractures in developing countries. Curr Osteoporos Rep 2005;3(3):84–91.
4. Mithal A, Kaur P. Osteoporosis in Asia: a call to action. Curr Osteoporos Rep 2012;10(4):245–7.
5. Akhtar A, Shahid A, Jamal Ar, Naveed Ma, Aziz Z, Barkat N, Wazir A, Ali F. Knowledge About Osteoporosis In Women Of Child Bearing Age (15-49 Years) Attending Fauji Foundation Hospital Rawalpindi. Pak Armed Forces Med J 2016;66(4):558–63.
6. Marshall D, Johnell O, Wedel H. Meta-analysis of how well measures of bone mineral density predict occurrence of osteoporotic fractures. BMJ 1996;312(7041):1254–9.
7. Lafata JE, Kolk D, Peterson EL, McCarthy BD, Weiss TW, Chen YT, *et al*. improving osteoporosis screening: results from a randomized cluster trial. J Gen Intern Med 2007;22(3):346–51.
8. Delaney MF. Strategies for the prevention and treatment of osteoporosis during early postmenopause. Am J Obstet Gynecol 2006;194(2 Suppl):S12–23.
9. Bliuc D, Alarkawi D, Nguyen TV, Eisman JA, Center JR. Risk of subsequent fractures and mortality in elderly women and men with fragility fractures with and without osteoporotic bone density: the Dubbo Osteoporosis Epidemiology Study. J Bone Miner Res 2015;30(4):637–46.
10. Garnero P, Sornay-Rendu E, Chapuy MC, Delmas PD. Increased bone turnover in late postmenopausal women is a major determinant of osteoporosis. J Bone Miner Res 1996;11(3):337–49.
11. Johansen KS, Bjørge B, Hjellset VT, Holmboe-Ottesen G, Råberg M, Wandel M. Changes in food habits and motivation for healthy eating among Pakistani women living in Norway: results from the InnvaDiab-DEPLAN study. Public Health Nutr 2010;13(6):858–67.
12. Gregg EW, Cauley JA, Seeley DG, Ensrud KE, Bauer DC. Physical activity and osteoporotic fracture risk in older women. Study of Osteoporotic fracture research group. Ann Intern Med 1998;129(2):81–8.
13. Carter ND, Khan KM, McKay HA, Petit MA, Waterman C, Heinonen A, *et al*. Community-based exercise program reduces risk factors for falls in 65-to 75-year-old women with osteoporosis: randomized controlled trial. CMAJ 2002;167(9):997–1004.
14. Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, *et al*. Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. JAMA 1995;273(5):402–7.
15. Javaid SB, Gadahi JA, Khaskeli M, Bhutto MB, Kumbher S, Panhwar AH. Physical and chemical quality of market milk sold at Tandojam, Pakistan. Pak Vet J 2009;29(1):27–31.
16. Feskanich D, Willett WC, Colditz GA. Calcium, vitamin D, milk consumption, and hip fractures: a prospective study among postmenopausal women. Am J Clin Nutr 2003;77(2):504–11.
17. Heaney RP. Calcium, dairy products and osteoporosis. J Am Coll Nutr 2000;19(2 Suppl):S83–99.
18. Stokols D. Establishing and maintaining healthy environments: toward a social ecology of health promotion. Am Psychol 1992;47(1):6–22.

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Address for Correspondence:

Asif Khaliq, House number B-210, Gulshan-e-Iqbal Block 6, Karachi, 75300-Pakistan
Cell: +92 332 824 5582
Email: asif.khaliq@hotmail.com