

OSTEOPENIA IN THE YOUNGER FEMALES

RIFFAT JALEEL, FARAH DEEBA NASRULLAH, AYESHA KHAN

ABSTRACT

Objective To find out the frequency of osteopenia in young females and compare the bone mineral density (BMD) in females of different age groups.

Study design Cross-sectional study.

Place & Duration of study This study was conducted by the Department of Obstetrics and Gynaecology, Unit V, Lyari General Hospital during Dow University of Health Sciences Health Expo at Expo Centre, Karachi, held on October 12, 2009.

Methodology All females visiting our stall were offered BMD testing, irrespective of age group and parity. Pregnant ladies were excluded. Age, marital status, parity and occupation were noted. BMD was tested using calcaneal quantitative ultrasound (BMD Sahara Hologic G 4262). WHO criteria were used for defining BMD. Data was entered and analyzed using SPSS version 15. Chi Square test was used to compare various groups. Results were considered significant if p value was < 0.05 .

Results A total of 170 women were included in the study, with mean age of 37.89 ± 12.6 years. BMD was found decreased in 64% of women of < 30 years, in 55% of women between 31–45 years and in 73.9% of women > 45 years. Osteoporosis was more frequent in women with parity > 4 . Non-working women were found to have lower BMD as compared to working women and students.

Conclusions Majority of young female population had osteopenia. Steps should be taken to address this problem at an earlier age so as to prevent its complications later in life.

Key words Bone mineral density, Osteopenia, Osteoporosis.

INTRODUCTION:

Osteoporosis is a skeletal disease characterized by reduced bone mass and deterioration of bone micro-architecture, which results in compromised bone strength, increased fragility and susceptibility to fractures.¹ Osteoporosis is an important public health problem. It affects more than 200 million people worldwide, mainly

older adults.² The gravity of this problem is well explained by a WHO report stating that the number of individuals aged 60 years and above is expected to grow to almost 2 billion by 2050, of whom 54% will be Asians.³

Bone mass during adult life is a measure of amount of bone accumulated from prenatal stages until maturity, along with that lost during aging. Peak bone mass is achieved around the age of 30 years.⁴ The most important determinant of peak bone mass is heredity. Others include hormonal status, nutrition, general health, physical activity and smoking.⁵ Female sex and Asian race have been found to be risk factors for osteoporosis.¹ Smaller body size, low dietary calcium, vitamin D deficiency, lesser weight bearing activity, multiparity

Correspondence:

Dr Riffat Jaleel
Department of Obstetrics & Gynaecology, Unit V
Dow University of Health Sciences & Lyari General Hospital,
Karachi.
E mail: driffatjaleel@yahoo.com

and prolonged lactation are presumably responsible for this higher risk in Asian women.⁶ Recent studies have reported reduced BMD in younger population. In India, osteoporotic fractures occur 10-20 years earlier in men and women as compared to Caucasians in the West.³ In a study from Saudi Arabia, females with mean age of 35 years had lower BMD than US counterparts due to high parity and prolonged lactation.⁷ A study in Iran indicated low peak bone mass in age group 20-39 years.⁴ In a study conducted in NWFP of Pakistan, 47.7% females were osteopenic and 24.7% were osteoporotic.⁸ Additional risk factors of lower peak bone mass in young females as evident from these studies include childbearing at early age, repeated pregnancies and lactation, oligo or amenorrhoea, malabsorption, excessive use of caffeine, alcohol and drugs such as glucocorticoids, antiepileptics, thyroid hormones and anticoagulants.^{1-3, 7, 9, 10}

Determining the disease burden in local population is important to institute preventive strategies at younger age, leading to delay in onset or prevention of the disease, thus related morbidity and mortality in older life can be reduced. This study was conducted to determine the frequency of osteopenia in young females and to compare the BMD in different age groups.

METHODOLOGY:

This observational cross sectional study was conducted by the Department of Obstetrics and Gynaecology, Unit-V during DUHS Health Expo at Expo Centre Karachi, in October 2009. Facility was provided for testing BMD from 9:00 am to 9:00 pm on 12th October, 2009. All females visiting Obstetrics and Gynaecology stall were offered this test. The procedure was verbally explained. Those who consented were included in the study. Inclusion criteria were female of any age and parity, while pregnant ladies were excluded. Data was collected by postgraduate trainee doctors on pre-designed performas. Age, marital status, parity and occupation were noted. Subject were divided into two

age groups i.e. age upto 45 years and >45 years. The "younger group" was further divided into age upto 30 years and 31-45 years for comparison. BMD was tested using calcaneal quantitative ultrasound (BMD Sahara Hologic G 4262). No amount was charged from any person, as per cost of machine or test. WHO criteria were used for defining BMD⁵, as follows:

Osteopenia: BMD between -1.0 and -2.5 SD below the norm for young healthy adult of same sex (T score < -1.0 and > -2.5).

Osteoporosis: BMD -2.5 SD or below (T score < -2.5)

Data was entered and analyzed using SPSS version 15. Means with standard deviation were calculated for continuous variables, while frequencies were calculated for categorical variables. Chi square test was used to compare various groups. Results were considered significant if p value was < 0.05.

RESULTS:

A total of 170 women were included in the study, with mean age of 37.89 ± 12.6 years (range 18 years 80 years). Of these, 64 were < 30, 60 were between 31-45 and 46 were > 45 years of age. Sixty seven percent women were married and mean parity was 2.12 ± 2.1 (maximum up to 9). Frequency of non working women was 49%, while working women and students were 34% and 16% respectively. Frequency of decreased BMD was 64% in women < 30 years, 55% in women between 31 - 45 years and 73.9% in women > 45 years (table I). Osteoporosis was more frequent in women with parity > 4. Non-working women were found to have lower BMD as compared to career women and students (table II).

DISCUSSION:

The aim of screening for and treating osteoporosis is to prevent osteoporotic fractures and accompanying disability. BMD is a predictor of fracture risk. The risk

Table I: Frequency of Decreased BMD In Various Age Groups

Age Groups (Years)	Age Group Comparison (1)			Age Group Comparison (2)		
	< 45 (n=124)	> 45 (n=46)	p Value	< 30 (n=64)	31 - 45 (n=60)	p Value
Normal n (%)	50 (40.3%)	12 (26.1%)	0.087	23 (35.9%)	27 (45%)	0.304
Osteopenia n (%)	67 (54%)	22 (47.8%)	0.472	36 (56.3%)	31 (51.7%)	0.609
Osteoporosis n (%)	7 (5.6%)	12 (26.1%)	0.000	5 (7.8%)	2 (3.3%)	0.247

Table II: Comparison of Parity and Occupation With BMD

	PARITY				OCCUPATION			
	0 (n=65)	1 – 4 (n=81)	> 4 (n=24)	p value	Non-Working (n=84)	Working Women (n=59)	Students (n=27)	p. value
Normal n (%)	25 (39%)	30 (37%)	7(29%)	0.725	28 (33%)	21 (36%)	13 (48%)	0.389
Osteopenia n (%)	36 (55%)	40 (49%)	13 (54%)	0.759	45 (54%)	31 (52%)	13 (48%)	0.894
Osteoporosis n (%)	4 (6%)	11 (14%)	4 (17%)	0.217	11 (13%)	7 (12%)	1 (4%)	0.485

of fracture increases approximately 1.5 fold for each SD decrease in age adjusted BMD.⁵ The best way to test BMD is DEXA (Dual Energy Xray Absorptiometry),² while QUS (Quantitative Ultrasound) is an alternative. QUS is a small portable equipment, free of radiation and cost effective. The results of the two can be reliably correlated.¹¹

We have found a high frequency of reduced BMD in all age groups studied. In particular, osteopenia was found in 56% of women < 30 years and in 54% of women < 45 years as compared to 47% in women > 45 years of age. Higher frequency of osteopenia in the present younger population signifies that they are at a greater risk of developing osteoporosis in later life. The modern family trends towards consumption of fast food and carbonated beverages and sedentary living due to greater hours spent indoors with computers and television could be responsible.

The National Osteoporosis Risk Assessment Study (NORA) showed that the risk of osteoporosis was 1.56 times greater for Asian women as compared to Caucasian women.¹² In a study conducted in Tehran, osteopenia was found in 17.4% (femur neck) in 20 – 29 year old girls and in 8.3% in 30 – 39 year old group. Their mean BMD was 5.6% lower, while peak bone mass was 4.48% lower than the American women.⁴ Another study in California compared ethnically diverse population of sedentary young women and found that BMD in forearm, femoral neck and hip remained lower in Asians than Hispanics, even after adjustment for height and weight.¹³

Frequency of osteoporosis was higher, while that of normal BMD was lower in women with parity >4, although statistically insignificant. This is compatible to other reports, where multiparity is a risk factor for osteoporosis.^{1,3} We found that non working women

had a higher frequency of osteopenia and osteoporosis as compared to working women and students, although the difference was not statistically significant. Low education and being housewife were found risk factors for osteoporosis in Iranian and Indian women after adjustment for age and BMI.³ Larijani B et al suggested although genetics was the most important determining factor for reduced BMD in Tehran population, vitamin D deficiency up to 80% in some areas as well as reduced physical activity in girls especially 20 -29 years, were responsible for low BMD.⁴ In Howard University Hospital 68% physicians had low bone mass (12% had osteoporosis and 56% had osteopenia) of whom around 30% were between 30 -39 years of age, again suggesting the importance of physical activity. In this study, osteopenia was commonest in Asians. Their mean age was 48 years and 61% of them had osteopenia. The author strongly felt that osteopenia in this young group will progress to osteoporosis at a later age.¹⁴ Conversely, a study in Poland showed that there was no statistical difference between BMD of farmers in rural areas and other occupations such as nurses, teachers and retired workers in urban areas.¹² Probably, lifestyle factors are only secondary to genetic predisposition.

The ultimate goal for prevention of osteopenia / osteoporosis should be to attain peak bone mass and then to maintain it. Bone mineral content, which is the total amount of bone material, is determined by the peak bone mass that occurs between 20 – 30 years of age and the velocity of age associated bone loss. This could be achieved through non-pharmacologic interventions, such as balanced diet rich in calcium and vitamin D, regular weight bearing and muscle strengthening exercises and cessation of smoking and alcohol. Maternal nutrition, physical activity and smoking appear to modulate bone mass acquisition during intrauterine life.¹⁵ Prevention should therefore start

there and then followed during childhood, adolescence and adulthood. Pregnant women should be educated and encouraged to acquire these healthy habits with a hope that their off-springs will have greater bone mass.

Regular physical activity, done during childhood, increases the peak bone mass to its maximum as the human skeleton before puberty is sensitive to mechanical stimulation elicited by physical activity.¹⁶ A study revealed that weight bearing exercise for six months increased bone parameters by 5.5% approximately, around puberty, which fell to 1.5% in late puberty.¹⁷ Girls who exercise during years of peak bone acquisition have higher bone mass and this appears to have lasting benefits for BMD in later life.¹⁸ Dietary calcium and weight bearing exercise have been shown to improve or maintain BMD in osteopenic subjects.¹⁹ Calcium supplementation, healthy balanced diet and exercise were shown to be protective factors for osteoporosis in India and Iran.³ Hingorjo MR has also recommended regular weight bearing exercise as of paramount importance in osteoporosis prevention.¹⁶

High frequency of reduced BMD in women less than 30 years is thought provoking and invites further research. Large scale community education on bone healthy habits throughout life need to be promoted through electronic and print media and at all levels of healthcare in rural as well as urban setups. While the genetic predisposition can not be changed, emphasis on prevention can be expected to result in lesser women suffering from osteoporotic morbidity and thereby reduction in the cost of its management.

CONCLUSIONS:

Majority of our young female population has osteopenia. Steps should be taken to address this problem at an earlier age so as to prevent its complications in later life.

DISCLOSURE:

GETZ Pharma, Pakistan provided BMD Sahara Hologic G 4262 in BMD testing.

REFERENCES:

1. Riaz M, Abid N, Patel J, Tariq M, Khan MS, Zuberi L. Knowledge about osteoporosis among healthy women attending a tertiary care hospital. *J Pak Med Assoc April 2008; 58:190-4.*
2. Wilkins CH. Osteoporosis screening and risk management. *Clinical interventions in aging 2007; 2:389-94.*
3. Keramat A, Patwardhan B, Larijani B, Chopra A, Mithal A, Chakravarty D, et al. The assessment of osteoporotic risk factors in Iranian women compared with Indian women. *BMC Musculoskeletal Disorders 2008; 9:28* doi 10.1186/1471-2474-9-28. Available at: <http://www.biomedcentral.com/1471-2474/9/28>
4. Larijani B, Nezhad AH, Mojtahedi A, Pajouhi M, Bastanagh MH, Soltani A, et al. Normative data of bone mineral density in healthy population of Tehran, Iran: A cross sectional study. *BMC Musculoskeletal Disorders 2005;6:38* Available at: <http://www.biomedcentral.com/1471-2474/6/38>
5. Bonura F. Prevention, Screening and Management of Osteoporosis: An overview of current strategies. *Postgrad Med 2009;121:5-17.*
6. Brooke-Wavell K, Khan AS, Taylor R, Masud T. Lower calcaneal bone mineral density and broadband ultrasonic attenuation, but not speed of sound, in South Asian than White European women. *Ann Hum Biol 2008; 35:386-93.*
7. Ghannam NN, Hammami MM, Bakheet SM, Khan BA. Bone mineral density of the spine and femur in healthy Saudi females: relation to vitamin D status, pregnancy and lactation. *Calcif Tissue Int 1999; 65:23-8.*
8. Arif M, Inam M. Frequency of osteopenia and osteoporosis in different parts of North West Frontier Province. *J Postgrad Med Inst 2006; 20:196-202.*
9. Phabphal K, Greater A, Leelawattana R, Sathirapunya P, Sattawatcharawanich S, Limapichat K. Prevalence and risk factors of low bone mineral density and 25-hydroxyvitamin D status in young healthy epileptic adult patients in a tropical Asian country taking antiepileptic drug. *Bone 2009; 45:232-7.*
10. Yeap SS, Fauzi AR, Kong NC, Halim AG, Soehardy Z, Rahimah S et al. Influences on bone mineral density in Malaysian premenopausal systemic lupus erythematosus patients on corticosteroids. *Lupus 2009; 18:178-81.*
11. Rhee Y, Lee J, Jung JY, Lee JE, Park SY, Kim YM et al. Modifications of T-scores by Quantitative ultrasonography for the diagnosis of osteoporosis in Koreans. *J Korean Med Sci 2009; 24:232-6.*

12. Siris ES, Miller PD, Barrett-Connor E. Identification and fracture outcomes of undiagnosed low bone mineral density in post-menopausal women results from the National Osteoporosis Risk Assessment. *JAMA* 2001; 286:2815-22.
13. Liang MTC, Bassin S, Dutto D, Braun W, Wong N, Pontello AM, et al. Bone mineral density and leg muscle strength in young Caucasian, Hispanic and Asian women. *J Clin Densitom.* 2007; 10:157-64.
14. Reyes MO, Archer JA, Nunlee-Bland G, Daniel G, Morgan OA, Makambi K. Bone Mass in Physicians: A Howard University Hospital Pilot Study. *J National Med Assoc* 2004; 96:299-305.
15. Cooper C, Westlake S, Harvey N, Javaid K, Dennison E, Hanson M. Review: developmental origins of osteoporotic fracture. *Osteoporosis Int.* 2006;17:337-47.
16. Hingorjo MR, Syed S, Qureshi MA. Role of exercise in osteoporosis prevention – current concepts. *J Pak Med Assoc* 2008;58:78-81.
17. Hind K, Burrows M. Weight bearing exercise and bone mineral accrual in children and adolescents: a review of controlled trials. *Bone* 2007; 40:14-27.
18. Rideout CA, McKay HA, Barr SI. Self-reported lifetime physical activity and a real bone mineral density in healthy post-menopausal women: the importance of teenage activity. *Calcif Tissue Int.* 2006; 79:214-22.
19. Anjum N, Dar NR. Role of calcium supplement and exercise in management of women having osteopenia and osteoporosis. *Pak Armed Forces Med J* 2008; 58:132-5.