Original Research Article

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20170948

Screening of osteoporosis using calcaneal quantitative ultrasound in a rural population of Jammu, Jammu and Kashmir, India

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Received: 11 February 2017 **Accepted:** 27 February 2017

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ABSTRACT

Background: Osteoporosis is a major public health problem, associated with substantial morbidity and socio-economic burden. The objective of the present study was to screen the general population for osteoporosis in a rural area of Jammu region.

Methods: 3 screening camps were conducted at 6 monthly intervals between the time period 2015-2016, at the Accidental Hospital, Chowki Choura, which is a rural area of district Jammu, J&K. A total of 270 subjects in the age group 20 to 80 years were subjected to screening through BMD measurements using calcaneal QUS and they were analyzed on the basis of T-scores.

Results: Out of 270 subjects, 120 were males and 150 were females. Among 120 males, 68 were in the age group of 20 - 49 years, and 52 were above 50 years. In the age group 20-49 years, 26 males (38.2%) had osteopenia, and 4 (5.9%) had osteopenosis. In males above 50 years of age, 35 (67.3%) had osteopenia and 6 (11.5%) had osteopenosis. Out of 150 females, 94 were in the age groups 20-49 years, and 56 were above 50 years of age. In the age group 20-49 years, 51 females (54.3%) had osteopenia and 12 (12.8%) had osteopenosis. In females above 50 years of age, 32 (57.1%) had osteopenia and 15 (26.8%) had osteopenosis.

Conclusions: The overall prevalence of osteoporosis among screened population was 13.7%. It increased with age in both males and females; however the prevalence of osteoporosis was more among females as compared to males (18% vs. 8.3% respectively).

Keywords: BMD, Calcaneal QUS, Osteopenia, Osteoporosis

INTRODUCTION

Osteoporosis is the thinning of bone tissue and loss of bone density over time. Osteoporosis (or "porous bones") is a Greek word where "osteon" means bone, and "poros" means pores. It is a disease of bones leading to an increased risk of fractures. In osteoporosis, bone mineral density is reduced, bone microarchitecture deteriorates, and the amount and variety of protein in bone is altered. Osteoporosis is a major public health problem associated

with substantial morbidity and socio-economic burden worldwide.²

Globally the proportion of elderly population afflicted with osteoporosis is rapidly increasing which raises concerns about disability, dependence, and social costs caused by osteoporosis. Osteoporosis does not have a remarkable clinical presentation except when fractures result. Osteopenia is considered a lesser degree of bone loss than osteoporosis but it is of concern when associated with other risk factors like smoking, steroid

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therapy, rheumatoid arthritis, family history of osteoporosis, etc. ⁴ As age advances, the incidence of osteopenia and osteoporosis increases. Measuring the bone density remains the only important tool in the early diagnosis of osteoporosis, so that effective preventive and therapeutic measures can be initiated at the earliest. Osteoporosis is defined using WHO criteria: a T-score is the number of standard deviations which separate the patient from the mean value of a healthy young population and a Z score is the number of standard deviations which separate the patient from an agematched healthy population. ⁵ The WHO (1994) definition characterizes:

- Osteopenia as a T-score between -1 and -2.5 SD;
- Osteoporosis as a T-score of -2.5 SD or below.

The gold standard for measuring bone density is the dual energy X-ray absorptiometry (DEXA), a useful tool for both the axial and appendicular skeleton as the detection rate of osteopenia and osteoporosis is higher with it in comparison to calcaneal quantitative ultrasound (QUS) method.6 But the commonest used modality of measuring bone density still remains to be calcaneal QUS. It has gained the importance in the situation where tools like DEXA are not available. The calcaneal OUS is cost effective, lacks deleterious effect of radiation and is portable. Thus, it can be useful for an early diagnosis of osteoporosis so that intervention can be done at the earliest to such patients. Similar studies evaluating bone status outside India and within India are present in the literature but still the data is scanty. 8-13 Hence, the present study was planned to screen bone status of adults over 20 years (when peak bone mass is formed) utilizing calcaneal QUS as a diagnostic tool.

METHODS

3 screening camps were conducted at 6 monthly intervals from February 2015 to February 2016 at the Accidental Hospital, Chowki Choura, a rural area of district Jammu, J&K. Out of 270 subjects 120 (44.4%) males and 150 (55.6%) females in the age group 20 to 80 years were subjected to BMD measurements. Patients below 20 years and above 80 years were not included in this study. All the participants were divided into two groups

according to age and sex (20-49 years, and above 50 years) and were screened for BMD measurements. The results of BMD were analyzed on the basis of T- score. T-score is the number of standard deviations above or below the mean for a healthy 20 year old adult of the same sex and ethnicity as the subject. The bone mineral density was measured at the calcaneus by QUS and T-scores were calculated based on WHO criteria. ¹⁴ T-score (Ratio between patients BMD and that of young adult population of same sex and ethnicity) of > -1 was taken as normal, between -1 to -2.5 osteopenic and < -2.5 as osteoporotic. T-score was utilized to find out the prevalence and age wise trend of osteopenia and osteoporosis in the present study.

RESULTS

A total of 270 subjects were screened in the camps. Out of the 120 males included in the study, 68 males were in age group 20-49 years, and 52 males were above 50 years. In the age group 20-49 years, 26 males (38.2%) had a low BMD which was in the range of osteopenia, and 4 (5.9%) had osteoporosis, and 38 (55.9%) had normal BMD values. In males above 50 years of age, 35 (67.3%) had osteopenia, 6 (11.5%) had osteoporosis, and 11 (21.2%) had normal BMD values.

Out of the 150 females included in the study, 94 females were in the age groups 20-49 years, and 56 females were above 50 years of age. In the age group 20-49 years, 51 females (54.3%) had low BMD which was in the range of osteopenia, 12 (12.8%) had osteoporosis, and 31 (32.9%) had normal BMD. In females above 50 years of age, 32 (57.1%) had osteopenia, 15 (26.8%) had osteoporosis and 9 (16.1%) had normal BMD. Among the screened population, only 33% of population had normal T scores. While the prevalence of osteopenia was reported as 53.3%, prevalence of osteoporosis was reported as 13.7%. Females were more osteoporotic as compared to males as the prevalence of osteoporosis in females was 18% (27/150) as compared to 8.3% (10/120) in males. Females were also more osteopenic as compared to males (55.3%vs 50.8% respectively). The results indicate an increased prevalence of osteoporosis with age in both males and females and more prevalence of osteoporosis in elderly females than males as given in Table 1.

Table 1: Age and sex wise distribution of BMD.										
	Females: 150		To							
Above 50 years	20-49 years	Above 50 years								

Sex	Male	Males: 120			Femal	Females: 150				Total: 270	
Age	20-49	20-49 years		Above 50 years		20-49 years		Above 50 years			
	n	%	n	%	n	%	n	%	n	%	
Total	68	100	52	100	94	100	56	100	270	100	
Normal	38	55.9	11	21.2	31	32.9	9	16.1	89	33	
Osteopenia	26	38.2	35	67.3	51	54.3	32	57.1	144	53.3	
Osteoporosis	4	5.9	6	11.5	12	12.8	15	26.8	37	13.7	

DISCUSSION

Osteoporosis is a metabolic bone disorder characterized by decreased bone density and deterioration in microarchitectural framework of bone leading to fragility fractures. ¹⁵ In the present study the prevalence of osteopenia was reported as 53.3%, prevalence of osteoporosis was reported as 13.7%. These findings confirm to the study by Chul Hee-Kim et al who reported that 46% of the subjects had low quantitative ultrasound values; T-score <-1.0 (osteopenia) and 11.8% among them had T-scores of less than 2.5 (osteoporosis). ¹⁶

However our study does not confirm to the findings of Pande KC who revealed that 29.9% of women and 24.3% of men between the age of 20 and 79 years had low bone mass using digital X-ray radiogrammetry. In our study, in females above 50 years of age, 57.1% had osteopenia and 26.8% had osteoporosis. These observations are comparable to the study conducted by Neema A et al who reported the prevalence of postmenopausal osteoporosis as 34% and 27% in rural and urban areas of Wardha. Women are always at higher risk of developing osteoporosis particularly at post-menopausal age which has also been observed in our study as well as studies conducted by others. Advancing age also increases the risk of osteoporosis in both genders as revealed in our study. Similar observations were also recorded by Sharma S et al and Chibber G et al. 19,20

With an increase in the geriatric population worldwide, osteoporosis is the commonest bone problem of the elderly. As the age advances, the incidence of osteopenia and osteoporosis (the silent disease) increases with a resultant increase in osteoporotic fractures. This could be due to an increased imbalance between bone resorption and formation with aging, which is an important cause of osteoporosis in the elderly. Due to this demographic change, it is estimated that the risk of hip fractures will increase approximately 6-folds till 2050.21 Hui et al conducted a study on 521 women and found that increasing age was predictive of increased fracture risk.²² Osteoporosis is a major public health threat which afflicts 55% of Americans aged 50 and above. Of these, approximately 80% are women.²³ In Australia, women have a 50% chance of having osteoporosis before they die. Data suggests that peak incidence of osteoporosis occurs at 70-80 years of age; in India it may afflict those 10-20 years younger at age 50-60 years.²⁴ The goal of treatment of osteoporosis is prevention of bone fractures by reducing bone loss or by increasing bone density and strength. Early detection and timely treatment of osteoporosis can substantially decrease the risk of future fractures. It is difficult to completely rebuild bone that has been weakened by osteoporosis; therefore prevention of osteoporosis is as important as treatment. Lifestyle changes like quitting cigarette smoking, curtailing alcohol intake, exercising regularly and consuming balanced diet with adequate calcium and vitamin D are important for maintaining bone density and strength. The

present study has some limitations as ultra-sonography method is not a gold standard for screening of osteoporosis but it is an attractive screening tool because of the low cost and feasibility. It also helps in identifying osteopenia and osteoporosis in a population which otherwise shall remain undiagnosed and face the complications and menace of osteoporosis. Thus confirmation of osteoporosis may be done on the basis of DEXA.

CONCLUSION

The prevalence of osteoporosis and osteopenia is high in the sample screened in our study. Thus, simple screening programs for osteoporosis will be a valuable tool to screen the population because it could potentially help identify those at risk of osteoporosis and proper intervention or recommendation could be offered. Prevention by changing one's lifestyle and early treatment if necessary will decrease the incidence of osteoporosis at an early age.

ACKNOWLEDGEMENTS

The authors are thankful to all the people who have participated in the study.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- Alldredge BK, Koda-Kimble MA. Applied Therapeuctics: the clinical use of drugs. Philadelphia: Wolters Kluver Health/Lippincott Williams and Wilkins; 2009: 101-103.
- 2. Fatima M, Nawaz H, Kassi M, Rehman R, Kasi P M, Kassi M, et al. Determining the risk factors and prevalence of osteoporosis using quantitative ultrasonography in Pakistani adult women. Singapore Med J. 2009;50(1):20-8.
- 3. Krittathanmakul S, Thaksinawisut K, Boonjaroen Y, Doungrak N. Thai Pharm Health Sci J. 2007;2(3):252-6.
- 4. Gehlbach SH, Burge RT, Puleo E, Klar J. Hospital care of osteoporosis-related vertebral fractures. Osteoporosis Int. 2003;14(1):53-60.
- 5. Kanis JA. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis: synopsis of a WHO report. WHO Study Group. Osteoporos Int. 1994;4:368-81.
- Syed Z, Khan A. Bone densitometry applications and limitations. J Obstet Gynaecol Canada. 2002:24:476-84.
- 7. Mohr A, Barkmann R, Mohr C, Romer FW, Schmidt C, Heller M, et al. Quantitative ultrasound for the diagnosis of osteoporosis. Rofo. 2004;176:610-7.

- 8. Sallin U, Mellstrom D, Eggertsen R. Osteoporosis in a nursing home, determined by the DEXA technique. Med Sci Monit. 2005;11:67-70.
- 9. Sadat-Ali M, Al-Habdan IM, Al-Mulhim FA, El-Hassan AY. Bone mineral density among postmenopausal Saudi women. Saudi Med J. 2004;25:1623-5.
- Deplas A, Debiais F, Alcalay M, Bontoux D, Thomas P. Bone density, parathyroid hormone, calcium and vitamin D nutritional status of institutionalized elderly subjects. J Nutr Health Agin. 2004;8:400-4.
- Pande KC. Prevalence of low bone mass in healthy Indian population. J Indian Med Assoc. 2002;100:598-602.
- 12. Shatrugna V, Kulkarni B, Kumar PA, Rani KU, Balakrishna N. Bone status of Indian women from a low-income group and its relationship to the nutritional status. Osteoporos Int. 2005;16:1827-35.
- 13. Anburajan M, Rethinasabapathi C, Korath MP, Ponnappa BG, Kumar KS, Panicker TM, et al. Agerelated proximal femur bone mineral loss in South Indian women: a dual energy X-ray absorptiometry study. J Assoc Physics India. 2001;49:442-5.
- 14. WHO Scientific Group on the prevention and management of Osteoporosis: WHO Technical Report Series 921, WHO 2000.
- 15. Consensus Development Conference V, 1993. Diagnosis, Prophylaxis and treatment of osteoporosis. Am J Med 1994; 90: 646-50.
- 16. Chul-hee K, Kim YI, Choi CS. Prevalence and risk factors of low quantitative ultrasound values of calcaneus in Korean elderly women. Ultrasound in Med Biol. 2000;26(1):35-40.

- 17. Pande KC. Prevalence of low bone mass in healthy Indian population. J Indian Med Assoc. 2002;100(10):598-600, 602.
- 18. Neema A, Shweta V, Inamdar S. Prevalence of osteoporosis using quantitative ultrasound for menopausal women in rural and urban area. The Int J Gynaecol Obstet. 2010;13(1):1735-40.
- 19. Sharma S, Tandon VR, Mahajan A, Kour A, Kumar D. Preliminary screening of osteoporosis and osteopenia in urban women from Jammu using calcaneal QUS. Indian J Med Sci. 2006;60:183-9.
- 20. Chibber G, Roy R, Eunice M, Srivastava M, Ammini AC. Prevalence of osteoporosis among elderly women living in Delhi and rural Haryana. IJEM. 2007:(1&2):11-4.
- 21. Cooper C, Campian G, Melton IJ. Hip fractures in the elderly: a worldwide projection. Osteoporosis Int. 1992;2:285-9.
- 22. Hui SL, Slemenda CW, Johnston CC Jr. Age and bone mass as predictors of fracture in prospective study. J Clin Invest. 1988;81:1804-9.
- 23. America's Bone Health: The state of osteoporosis and low bone mass in our Nation. Washington, DC: National Osteoporosis Foundation 2002.
- 24. Osteoporosis risk-high in India. India's National Magazine 2004.

Cite this article as: Gupta R, Mahajan S, Dewan D, Gupta R. Screening of osteoporosis using calcaneal quantitative ultrasound in a rural population of Jammu, Jammu and Kashmir, India. Int J Community Med Public Health 2017;4:940-3.