



Screening For Osteoporosis And Osteopenia In Rural Population Using Calcaneum QUS – A Camp Based Study

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ABSTRACT

BACKGROUND: Increasing prevalence of osteoporosis and osteopenia in the Indian population is a major community health concern in future. Camp based screening of low bone mineral density (BMD) by using calcaneum quantitative ultrasound scan (QUS) is widely used low cost procedure in India. Hence Calcaneum QUS was used to determine the prevalence of osteoporosis and osteopenia in rural population of Gurukunj Ashram, Dist Amravati (Maharashtra) in present camp based study.

METHODS: In present study total 99 participants aged 25-65 years were included. Each participant was enquired for their demographic details, dietary habit, lifestyle pattern, exercise and menstrual history related information in prescribed format and assessed for BMD (as T score) by using calcaneum QUS. The data were

express in percentages and proportions and results were expressed as descriptive statistics. Chi square test was used to compare the risk factors for categorical variables.

.RESULTS: Out of total participants (n=99), 66.66% (n = 66) were female subjects and 33.3% (n = 33) were male. As per the WHO criteria of BMD, 34.34 % participants were osteoporotic, 56.56% were osteopenic, whereas approximately 9.09% had normal bone density. A significant association ($\chi^2 = 38.50$, $P < 0.00001$) was reported between the T-score and different age groups. Study shows apparent increasing trend in the frequency of osteopenic and osteoporotic participants with age of 35 and 56 years onward respectively.

CONCLUSIONS: Present camp based reports the high prevalence of low bone

mass density in increasing age in rural population.

KEYWORDS: Bone mineral density (BMD), Quantitative ultrasound scan (QUS), T score.

INTRODUCTION

Osteoporosis is the most common of the metabolic bone diseases, which causes a reduction in the mass of bone in affected individual (T score <-2.5). In case of Osteopenia, bone mineral density (BMD) is also decreased but not to the extent of osteoporosis (T score between -1 to -2.5) ¹. The reduction in mass results from either failed to attain optimal skeletal mass during first 30 years of life or due to excessive bone resorption than formation after peak skeletal mass was attained. Normally the ratio between bone formation and resorption maintains skeletal mass. Osteoporosis is histologically characterized by a decrease in cortical thickness and in the number and size of the trabeculae of cancellous bone ².

Osteoporosis is the major global public health problem in the world. In year 2103, it was documented that 50 million population of India was victim of osteoporosis and osteopenia ¹. It is alarming for India that one out of eight men and one out of three women suffers from osteoporosis ³. Previous study point out that working indoor, reduced physical activity, genetic pattern and conservative dressing in India increases the risk of bone loss ⁴. As per trend of growth it is expected that in year 2025 population which is above the age of 50 year will constitute 22% of the population ⁵. Studies show that osteoporosis and osteopenia or low bone mass may occur at a relatively younger age in Indian population ⁶. Hence knowledge

of BMD at younger age is essential for prevention and early management.

Status of BMD is confirmed with techniques such as single and dual photon absorptiometry, quantitative ultrasound scan (QUS), quantitative computed tomography, dual energy x ray densitometry (DEXA) and neutron activation analysis of total body calcium ⁷. Considering the low cost and portability, quantitative ultrasound scan (QUS) is widely available and used in India ⁸⁻¹⁰. QUS of calcaneum is better predictor than clinical risk factors. Therefore, QUS is useful for screening of osteopenia and osteoporosis at community level ^{11,12}.

METHODOLOGY

The present camp based study was conducted on the date April 11th 2019 at Gurukunj Ashram, Dist. Amravati (Maharashtra). Study was approved by institutional ethical committee. Camp based screening was conducted and assessed by clinical teaching staff, medical officers, machine technician and nonteaching staff. On the day of camp, each participant was registered and enquired for their demographic details, dietary habit, lifestyle pattern, exercise and menstrual history related information in prescribed format. Total 99 participants between 25 and 65 years of age were screened. The Sonost 2000 (Osteosis, South Korea), quantitative ultrasound machine was used to assess the level of BMD of the calcaneum as a T score of each participant. The BMD level was used to categorize participants as per WHO osteoporosis definitions ¹³. The data were collected in prescribed proforma and this proforma was analyzed by using MS-Excel 2010 and Epi info-7.0. The data were express in percentages and proportions and results were expressed as descriptive

statistics. Chi square test was used to compare the risk factors for categorical variables. The probability level was 0.05%.

RESULTS:

In the present study, total 99 participants were screened for their BMD by using calcaneal QUS. Out of total participants, there were 66.66% ($n = 66$) female subjects and 33.3% ($n = 33$) were male. Among them, 15, 16, 27 and 41 participants were in the age group of 25-35yrs, 36-45 yrs, 46-55yrs and 56-65yrs respectively. The mean age of participants was 51.53 (SD 11.58) with minimum age of 25 years and maximum age of 65 years. As per the WHO criteria of bone mineral density, 9 participants (9.09%) had normal bone density (T-score > -1.0), 56 participants (56.56%) were osteopenic (T-score < -1.0 -2.5), whereas 34 participants (34.34 %) were osteoporotic (T-score < -2.5) [Table 1]. The mean bone mass density of the sample as per T score was -2.12 ± 0.73 .

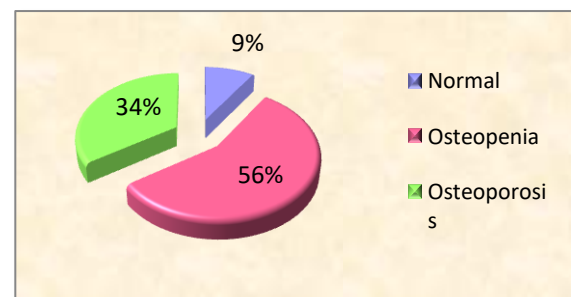
Normal T score was found profoundly in 25- 35 year of age group. The mean age of participants with normal bone density ($n = 09$) was 34 ± 8.81 with a minimum age of 25 and maximum age of 55 years [Table 2].

Among osteopenic population, 57.57 % were female, and 51.51 % were male participants. Out of total osteopenic female population ($n = 38$), 15.78%, 39.47 %, 23.68% and 21.05% participants were in the age groups of 25-35 years, 46-55 years, 36-45 years and 56-65 years respectively. Out of total osteopenic male population ($n = 17$), 41.17% were above the age of 56 years, and in 36-45 years and 56-65 years age group 23.52% and 29.41% were osteopenic respectively. The mean

age of participants with osteopenia ($n = 56$) was 49.57 ± 9.86 with a minimum age of 26 and maximum age of 65 years.

Among osteoporotic population, 33.33 % were female, and 39.39 % were male participants. Out of total osteoporotic female population ($n = 22$), approximately 77.27 % participants were in the age groups of 56-65 years, similarly out of total osteoporotic male population ($n = 13$), 69.23% were above the age of 56 years. The mean age of the participants ($n = 34$) with osteoporosis was 59.41 ± 7.77 with a minimum age of 25, and maximum age of 65 years.

Figure 1: Distribution of participants ($n=99$) according to BMD



Present data shows significant trend of decreasing bone density with an increase in age in both gender groups. The percentage of osteopenic participants was more in both genders i.e. 55.55 % than osteoporosis 35.35% and normal 9.09%. In case of female participants osteopenia was more prominent i.e. 39.47% in 46 -55 yrs age group. Whereas percentage of osteoporotic participants of both genders (Female 77.27%, Male 69.23%) was more in age group of 56-65 years [Table 3].

In present camp based study a significant association ($\chi^2 = 38.50$, $P < 0.00001$) was reported between the T-score and different age groups. Study shows apparent increasing trend in the frequency of osteopenic and osteoporotic participants

with age of 35 and 56 years onward respectively. The frequency of osteopenic and osteoporotic was same in male and

female gender groups. There is non significant association was observed between T score and gender.

Figure 2: Distribution of BMD according to different age groups

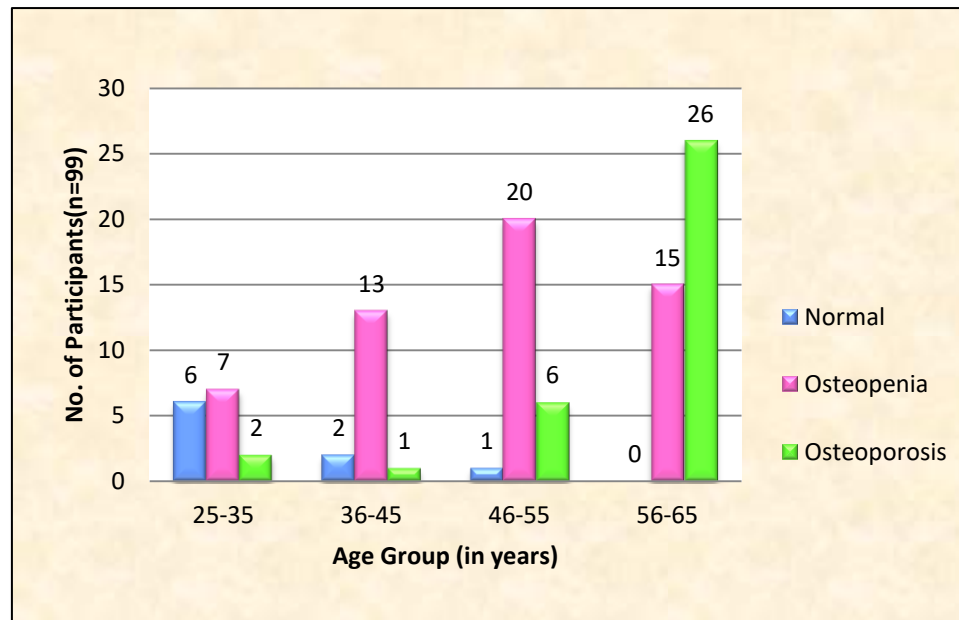
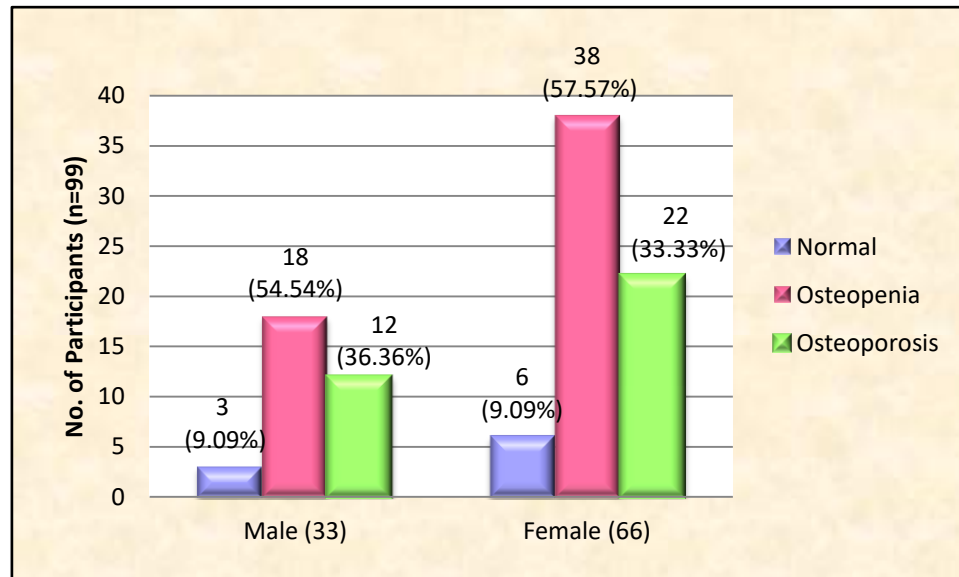


Figure 3: Distribution of BMD according to gender of the participants



DISCUSSION

Present camp based study reports prevalence of osteopenia and osteoporosis among total 99 screened participants, were 55.55% and 35.35% respectively.

Age: Prevalence of osteopenia and osteoporosis in present study is increasing with age as above 36 and 56 year respectively. This is comparable to other Indian studies^{14, 15}.

Gender: Among total participants, approximately 9%, 57% and 34%

participants were normal, osteopenic and osteoporotic respectively. Same percentages of distributions were observed in both male and female participants. These suggest that both genders were equally affected with osteopenia and osteoporosis.

Body mass index: In present study, 69.69% participants were normal weight (BMI<24.9), 24.24% were overweight (BMI 25-29.9) and only 6.06% participants were obese (BMI >30).

Among normal weight participants, 27.53% were osteoporotic, 59.42% were osteopenic and 13.04% had normal T score. Among both over weight and obese participants, osteoporotic and osteopenic were 50 % each and no one had normal T score. In present study normal weight participants were approximately 70 %, which might be due to rural background population. But despite normal body mass index prevalence of osteopenia and osteoporosis is more in these participants.

Diet: In present study, 66 participants were vegetarian and 33 were of mixed diet. Normal T score were found more in mixed diet participants (21.21%) than vegetarian (3.03%). It suggests nutritional support is necessary for healthy bone status. Among all participants, only 36 participants were consuming milk daily and 63 were not. Present study only confirms about the milk consumption in yes or no aspect, but didn't record the daily quantity of milk consumption. Hence it is impractical to conclude that milk consumption has additional benefit in maintaining bone health.

Exercise: In present study, 11 participants were doing exercise and 88 were not. Among not doing exercise participants, 51 were osteopenic, 30 were osteoporotic and only 7 participants had normal T score. It

suggests that exercise has positive role for maintaining bone health.

Menstruation: Among female participants, 71.21% participants were of menopausal group and 28.78% were still in menstruating age. Among menstruating group, approximately 32 % shows normal T score, 68 % were osteopenic and none were osteoporotic. But in menopausal group, approximately 53% were osteopenic, 47% were osteoporotic and none had normal T score. Finding suggests that osteopenia and osteoporosis were more common in menopausal age.

In present study statistically significant association was found between reduced bone mineral density and increasing age, physical inactivity, mixed diet and menopause. Similar findings were reported by Bala S et al study in 2016 ¹⁶. Present study reported no significant association between gender, BMI and milk consumption. Prevalence of osteoporosis and osteopenia was found to be statistically high (35.35% and 55.55% respectively) in present study. Rural Indian population has average socio economic status which directly affects nutritional support and healthy practices like exercise, sun exposure etc. Poor nutritional diet along with heavy hard working without healthy exercise is the reason behind low body mass index (BMI) but at the same it is the causative factors for osteopenia and osteoporosis in rural population of India. Study suggests there is need of awareness in rural population regarding milk consumption, Vitamin D and calcium supplementation, proper sun exposure and active life style practices. But large rural epidemiological studies needed in future for assessment of risk factors.

CONCLUSION: Prevalence of osteopenia and osteoporosis is raising high in Indian both rural as well as urban population. Present camp based study shows statistically significant association between reduced bone mineral density and increasing age, physical inactivity, mixed diet and menopause among rural population. Thus it is essential to conduct camp based screening for BMD and address the society for preventive and treatment measures.

ETHICAL APPROVAL: The study was approved by the Institutional Ethics Committee.

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Table 1: Distribution of Participants according to T Score

| Parameter | Sample (n) | Mean Age | Standard Deviation |
|--------------|------------|----------|--------------------|
| Normal | 9 | 34 | 8.81 |
| Osteopenia | 56 | 49.57 | 9.86 |
| Osteoporosis | 34 | 59.41 | 7.77 |

Table 2: Characteristics of data

| Parameter | Sample | Minimum | Maximum | Mean±SD |
|-----------|--------|---------|---------|--------------|
| Age | 99 | 25 | 65 | 51.53 ±11.58 |
| Male | 33 | 25 | 65 | 52.42±12.73 |
| Female | 66 | 25 | 65 | 51.01±10.86 |
| T score | 99 | -3.7 | -0.1 | -2.12 ± 0.73 |

SD=Standard deviation

Table 3: Age wise distribution of Bone Mass Density Score of participants

| Age in years | Male (n=33) | | | Female (n=66) | | |
|--------------|-------------|-----------------|-------------------|---------------|-----------------|-------------------|
| | Normal n(%) | Osteopenia n(%) | Osteoporosis n(%) | Normal n(%) | Osteopenia n(%) | Osteoporosis n(%) |
| 25-35 | 3(9.09) | 1(3.03) | 2(6.06) | 3(4.54) | 6(9.09) | 0(0) |
| 36-45 | 0(0) | 4(12.12) | 1(3.03) | 2(3.03) | 9(13.63) | 0(0) |
| 46-55 | 0(0) | 5(15.15) | 1(3.03) | 1(1.51) | 15(22.72) | 5(7.57) |
| 56-65 | 0(0) | 7(21.21) | 9(27.27) | 0(0) | 8(12.12) | 17(25.75) |
| Total | 3(9.09) | 17(51.51) | 13(39.39) | 6(9.09) | 38(57.57) | 22(33.33) |

Conflict of Interest: Non

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