



PREVALENCE OF OSTEOPOROSIS IN THE URBAN POPULATION OF DEHRADUN

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ABSTRACT Osteoporosis is a silent metabolic bone disease because of micro architectural deterioration of bone tissue with a consequent increase in risk of fracture. The BMD scan is an essential diagnostic tool for early diagnosis of osteopenia and osteoporosis and estimation of patient's risk of fracture. So the aim of present study is to find out the prevalence of osteoporosis and osteopenia in the urban population of Dehradun. The study was a cross-sectional study conducted over the duration of two months in-clinic screening camps. After taking general information and physical parameters, assessment of bone mineral density of all participants were done by portable ultrasonic bone densitometer. Results are made based on statistical analysis using SPSS version 23.0. The main finding of the present study was the high prevalence of osteopenia in our participants and osteoporosis in elderly participants were significantly higher as compared to adults.

KEYWORDS : Bone mineral density, osteoporosis, osteopenia

INTRODUCTION

Osteoporosis is a silent disease that appears later in life. It is a condition of skeletal fragility characterized by reduced bone mass and micro architectural deterioration of bone tissue with a consequent increase in risk of fracture. Globally it becomes an important public health problem, with nearly 200 million people suffering from the disease (1). The average risk of osteoporotic fracture for people at 50 years of age has been estimated to be 40% for women, and 13% for men (2). Women suffers more and early osteoporotic changes due to their smaller peak bone mass, earlier onset of bone loss, and lower calcium intake. Postmenopausal osteoporosis occurs in women within 15–20 years after menopause and is thought to result from factors related to or exacerbated by estrogen deficiency (3).

WHO identifies that there is relative lack of quantitative data from developing countries on incidence and prevalence of osteoporosis (4). In India, by using different X-ray radiometry tools and criteria, studies have reported osteoporosis prevalence ranging from 8.5% among men to about 53% among postmenopausal women (5). These studies have shown a steady decline in BMD with increasing age. Lifestyle and dietary behavior are important factors for the health of bone. Cigarette smoking, physical inactivity, alcohol abuse, underweight, and family history of osteoporosis are the important risk factors. Deficiency of calcium and vitamin D contributes to alterations of bone remodeling and bone integrity (6). Dietary calcium has significant positive association with higher BMD at all sites of our body (7).

The BMD scan is an essential diagnostic tool for early diagnosis of osteopenia and osteoporosis and estimation of patient's risk of fracture. Dual-Energy X-ray Absorptiometry (DEXA) scan is considered as the gold standard. However, the commonest used modality still remains to be quantitative calcaneal ultrasound as it is cost effective, portable, easily available and lacks the deleterious effect of radiation unlike DEXA (8).

Bone Mineral density scan refers to the degree to which a radiation beam is attenuated by a bone, as judged from a two dimensional projection image (areal bone density) (9). There is a statistical association between poor bone density and higher probability of fracture (10). World Health Organization (WHO) provided the following classification based on T-scores, which represent the number of standard deviations below or above the average BMD: normal (>-1.0), osteopenic (-1.1 to -2.5), and osteoporotic (≤ -2.5) (11).

Given the substantial presence of bone loss in Indian population with differing lifestyle habits, there can be regional differences in rates of osteopenia and osteoporosis in India. To explore the prevalence of bone loss i.e., osteopenia and osteoporosis in a nationally representative sample and to find the association of lifestyle with BMD among people living in urban city, we performed this study.

MATERIALS AND METHODS

The study was a cross-sectional study conducted over the duration of two months from March 2023 to April 2023 in-clinic screening camps. The study was approved by the Institutional Ethics Committee. Apparently healthy, adults (≥ 18 years) participants of either gender who were not suffering from any disorder known to affect bone health were evaluated for BMD examination. After getting written informed consent, the purpose of the study and details of procedure were explained to the participants.

Data collection:

A standard questionnaire was used to collect information about sex, age (years), weight (kg), height (cm). Physical measurements were obtained according to standardized protocol. Weight was measured on an electronic digital scale with only light clothing to the nearest 0.1kg and standing height was measured using a portable stadiometer without shoes to the nearest 0.1cm. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2).

The data on, history of smoking, alcohol consumption, exercise status (presence/absence for all) and dietary habits (vegetarian/non vegetarian diet) were recorded.

Inclusion criteria :

1. Body mass index between 20-30 kg/m square.
2. History of smoking, alcohol and caffeine intake.
3. History of milk intake.
4. History of any type of fracture.
5. Women taking calcium or a calcium with vitamin D

Exclusion criteria:

1. Known case of osteoporosis.
2. Use of bone enhancing and bone reducing medication within the past 6 months.

Based on the data, participants were grouped as adults (18 to 49 years) and elderly (≥ 50 years). All females above the age of 50 years were considered as postmenopausal women.

Assessment of bone mineral density of all participants were done by portable ultrasonic bone densitometer. It was performed using heel ultrasound of left foot in each participant. After applying sterile solution over the feet and lower leg, participants were asked to place their left foot in the groove on ultrasound machine. A trained assistant helped with assessment of BMD. After placing the foot on machine, assessment was performed automatically by the machine within 20 seconds. The machine automatically converted the BMD values of the patients into T-Scores. Based on T-score of BMD obtained, participants were labeled as normal (T-score <-1 SD), osteopenia (T-score -1 to -2.5 SD) and osteoporosis (T-score <-2.5 SD) (11). As a simple, non-invasive method without risk of radiation exposure, the

calcaneal quantitative ultrasound (QUS) is considered as promising tool for detecting osteoporosis in routine clinical practice .

The main study objective of this analysis is to determine the prevalence of osteoporosis and osteopenia in apparently healthy urban population. Secondary objectives include assessing differences in prevalence of osteopenia and osteoporosis in males and females, to see any associations of life style factors with changes in bone mineral density.

Statistical analysis:

Statistical analysis were done using SPSS version 23.0. Data was presented as frequency and percentages for qualitative variables and as mean and standard deviation for quantitative variables. Chi-square test was applied to determine the statistically significant differences in qualitative variables in different groups. P-value of <0.05 was considered statistically significant.

RESULTS

After applying inclusion and exclusion criteria among many participants, 155 participants were included in the study, 84(54.19%) were males and 71(45.8%) were female participants. The mean age of participants were 47.94 ± 13.3 years. The characteristics of participants are described in (Table 1)

Table 1: Characteristics of Participants (n= 155)

Variables	Mean ± SD
Age(Years)	47.94 ± 13.3
Height(cms)	151.56 ± 6.32
Weight(kgs)	61.01 ± 10.6
BMI(kg/m2)	25.74 ± 5.10
BMD(T score)	1.86 ± 0.64

The prevalence of osteoporosis was 14.08% and osteopenia was 67.6%. The frequency of osteoporosis in males were 10.7% and in females were 14.08% while the frequency of osteopenia in males were 85.7% and in females were 67.6%. The distribution was statistically significant (P value = 0.000). Out of 155 participants, 63 participants were more than 50 years of age and 92 were less than 50 years of age. The frequency of osteoporosis in participants of > 50 years of age were 20.6% and in < 50 years were 6.5% while the frequency of osteopenia in > 50 years were 77.7% and in < 50 years were 77.1%. Osteoporosis in elderly participants were significantly higher as compared to adults(P value = 0.006)(Table 2)

Table 2: Prevalence of Osteoporosis(n=155)

Participants		Normal	Osteopenia And Frequency (%)	Osteoporosis And Frequency (%)	Total
Age (Years)	< 50	15	71(77.1%)	6(6.5%)	92
	>50#	1	49(77.7%)	13(20.6%)	63
Sex	Males	3	72(85.7%)	9(10.7%)	84
	Females	13	48(67.6%)	10(14.08%)	71

Table 3: Association of different variables with BMD (n=155)

Participants		Normal	Osteopenia	Osteoporosis	Total	Chi square, p value	Odds Ratio*, p value	Odds Ratio**, p value
Age (Years)	< 50	15	71	6	92	13.92, 0.000	10.35, 0.032	32.5, 0.003
	>50#	1	49	13	63			
Sex	Males	3	72	9	84	10.08, 0.006	0.15, 0.221	0.25, 0.15
	Female s#	13	48	10	71			
BMI	Under Weight	0	0	0	0	-	-	-
	Normal #	9	38	12	55			
	Over Weight	7	82	11	100			

* odds ratio will be calculated for Normal VS Osteopenia

** odds ratio will be calculated for Normal VS Osteoporosis

Reference category

The above table depicts association of different variables with BMD. Finding reveals that BMD is associated with age and sex (p < 0.05).

1. Age group < 50 years has 10 times (OR=10.35, P= 0.032) more chances of having osteopenia while age group > 50 years have 32 times (OR=32.5, P= 0.03) more chances of having osteoporosis.
2. Males have 85% (OR= 0.15, p= 0.221) less chances of having osteopenia as compared to females and also males have 75% (OR= 0.25, p= 0.215) less chances of having osteoporosis as compared to females.
3. As per BMI, overweight people have 2.7 times (OR= 2.77, P= 0.143) more chances of having osteopenia as compared to normal weight people. Also there are 17% more chances of having osteoporosis in overweight people as compared to reference category.

DISCUSSION

In the present cross sectional study, among apparently healthy men and women, with mean age of 47.94 ± 13.3 years , the BMD was found to be 1.86 ± 0.64 as per T score that lies within the range of osteopenia. The main finding of the present study was the high prevalence of osteopenia in the participants (77%) . Many studies have also shown the importance of detecting osteopenia in the middle age group, as osteopenia could lead to osteoporosis in old age (12, 13). The increased prevalence of osteopenia in present study and the other Indian studies, could be explained by genetic susceptibility of Indian population for osteoporosis, high risk of hypovitaminosis D in Indians due to higher 25(OH)-d-24-hydroxylase enzyme and dark pigmentation of their skin which reduces the effect of sunlight exposure (14).

Osteoporosis is considered a disease of the elderly. Out of 155 participants, 63 participants were more than 50 years of age and 92 were less than 50 years of age. The frequency of osteoporosis in participants of > 50 years of age were 20.6% and in < 50 years were 6.5% . Osteoporosis in elderly participants were significantly higher as compared to adults (P value = 0.006). There is a homeostatic balance between the naturally occurring processes of bone formation and resorption among healthy humans with ages of 20–45 yrs; afterwards, in older ages an imbalance state occurred via a slight increase in the resorption process, which in turn resulted in bone loss and a lower bone density (15). The frequency of osteoporosis were more in females as compared to males. In males were 10.7% and in females were 14.08% while the frequency of osteopenia in males were 85.7% and in females were 67.6%. Low BMD is more common in elderly women than in men due to the fact that women have lower BMD to begin with, and the bone loss that occurs with ageing occurs more rapidly, especially after menopause when the protective effect of oestrogen starts to fade (16). Consistently, osteopenia was seen in greater proportion of males than females and adults than elderly. Similar finding reported by Chitten and James with high prevalence of osteopenia in 35-55 years men and women (54 and 51%).19 It indicates bone loss starts much earlier in Indian population which can be explained by genetic susceptibility, and nutritional deficiencies including high risk of hypovitaminosis (8).

A study from North India by Agrawal and Sharma observed osteoporosis in 8.5% and osteopenia in 42% adult males above 50 years of age (17). We observed highest prevalence of osteopenia in North Indian males (56.9%). In young females from North India, osteoporosis was reported in 18% by Acharya et al which is similar to our finding of 19.7% osteoporosis in females of this region (18).

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