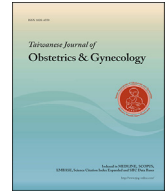




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## Original Article

Bone densitometry status and its associated factors in peri and post menopausal females: A cross sectional study from a tertiary care centre in India<sup>☆</sup>Jaya Chawla<sup>a,\*</sup>, Neena Sharma<sup>b</sup>, Devendra Arora<sup>c</sup>, Manisha Arora<sup>d</sup>, Lovely Shukla<sup>e</sup><sup>a</sup> Department of OB GYN, PGIMER & Dr. RML Hospital, New Delhi, India<sup>b</sup> Department of OB GYN, ACMS & BHDC, New Delhi, India<sup>c</sup> Department of OB GYN, Command Hospital, (SC), Pune, India<sup>d</sup> Department of Community Medicine, ACMS & BHDC, New Delhi, India<sup>e</sup> Army College of Medical Sciences, New Delhi, India

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## ABSTRACT

**Objective:** Osteoporosis is a skeletal disorder characterized by diminished bone strength that increases the risk of fracture at instances of trivial trauma. Asians have a lower bone mass than the west. The present study was designed to add data from India on women above the age of 40 years with respect to low bone mineral density (BMD) and its associated high risk factors.

**Materials and Methods:** After a written informed consent, a detailed history was taken. Basal metabolic index was recorded, and biochemical and endocrine tests were done, followed by dual X ray absorptiometry scan.

**Results:** Average age of the study population was 46.54 years and BMI 26.58. The prevalence of osteopenia in the study was 36%, and that of osteoporosis, 4%; the overall prevalence of low BMD being 40%. Proportion of women with low BMD increased with advancing age and menopausal status. On endocrine evaluation, 53.44% cases with insufficient vitamin D, 62.5% with hyperparathyroidism, 100% with hypothyroidism, 75% with hyperthyroidism suffered from low BMD. Among chronic diseases, 75% women with diabetes, 33.3% with hypertension, 25% with deranged liver function and 50% with rheumatoid arthritis were found to have low BMD. 46.75% women with sun exposure less than one hour daily had poor bone mineralization. The proportion of women with normal BMD decreased from 84.09% to 43.33% with decrease in daily physical work. On logistic regression analysis, insufficient serum vitamin D concentrations, less physical work and inadequate sun exposure were found to be significantly associated with low BMD.

**Conclusion:** Low BMD is not a disorder confined to postmenopausal women alone. It is widely prevalent in women above 40 years of age. Screening women above 40 in the absence of any high risk factors has the potential of nipping this silent killer in the bud.

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## Introduction/background

Osteoporosis is a skeletal disorder characterized by diminished bone strength that increases the risk of fracture at instances of trivial trauma [1]. As per ICD 10 classification (2017) it is classified

as M 81.0. With increased life expectancy, the world is going to witness an unprecedented surge in the geriatric population with its concomitant increase in osteoporosis related morbidity. India currently has 10% of its population over 50 years. Emerging population trends based on 2011 census show, 22% of our people falling in the geriatric age group by 2025, and 33% by 2050. Forty-six million of Indian women above the age of 50 years (20%) are believed to be osteoporotic [2].

Asians have a lower bone mass than Caucasians and Afro-Caribbeans and the peak incidence of osteoporosis is believed to occur 10–20 years earlier in Indians than in the Western population [3–7]. It is possible that a dietary deficiency of calcium, beginning

<sup>☆</sup> We, the authors hereby declare that the material contained in the manuscript titled 'Bone densitometry status and its associated factors in peri and post menopausal females: A cross sectional study from a tertiary care centre in India' has not been previously published and is not being concurrently submitted elsewhere.

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early in life, leads to a lower peak bone mass, and consequently osteoporosis at an earlier age. Malabsorption of calcium due to a subclinical deficiency of vitamin D may lead to osteoporosis, without causing osteomalacia. Dark skin, reduced outdoor activity and conservative dressing have increased Vitamin D deficiency [8]. Women are more prone to have lower bone mass due to pregnancy, childbirth, and later menopause resulting in depletion of bone [5].

Osteoporosis is a condition that can be prevented and treated if diagnosed early. Unfortunately, it is often undiagnosed until a fracture occurs. Therefore, it appears logical to increase the ambit of screening for this ailment.

Dual-energy x-ray absorptiometry (DEXA) is currently the gold standard in the measurement of bone mineral density (BMD). This technique offers several advantages as compared to others. It correlates with risk of fractures at the site evaluated, assess anti fracture treatments and helps in monitoring response to therapy. It reports the subject's bone mineral density as a T-score which is a measure of the subject's BMD compared to healthy controls who are at the peak of their bone mass. Any score upward of  $-1$  is considered normal. Scores between  $-1$  and  $-2.5$  denote osteopenia. Results less than  $-2.5$  suggest osteoporosis [9].

Much attention has been focused on screening postmenopausal females for this disorder. Currently, there are no recommendations for screening perimenopausal women with low risk for fractures, with bone mineral densitometry [10]. The present study was designed to add data from India on perimenopausal and postmenopausal women above the age of 40 years with respect to low bone mineral density and its associated high risk factors.

## Aims and objectives

1. To assess the prevalence of osteoporosis and osteopenia in women over 40 years attending the gynae out patient department (OPD).
2. To study the biochemical parameters related to bone mineral density in peri and postmenopausal females attending the gynecology outpatient department.
3. To study the correlation of endocrine profile of peri and postmenopausal females attending the gynae OPD vis-a-vis their bone densitometry status.
4. To study life style patterns of peri and post menopausal females in relation to bone densitometry status.

## Material and methods

**Type of study:** It is a cross sectional observational study.

**Inclusion criteria:** All patients above 40 years of age who visited the main Gynae Outpatient Department, Department of Obstetrics and Gynecology, of a tertiary care hospital, during the study period (i.e. June to July 2015) for gynecological complaints, were enrolled in the study.

**Exclusion criteria:** Pregnancy, documented osteoporosis or osteopenia, patients not willing for continued follow up and non ambulatory women.

**Time period:** It was a time bound study where participants were recruited from June 1, 2016 to July 31, 2016. Data including history and anthropometry were collected at the time of recruitment. Results of biochemical, endocrine and DEXA scan tests were collected in the following fortnight followed by analysis.

### Procedure

After a written informed consent, a detailed history which included age, obstetric history, history of fractures in the past, any

history of fracture in the parents, history of chronic diseases such as diabetes, hypertension, thyroid disorders etc, drug history specifically with respect to glucocorticoids, daily sun exposure, dietary history and exercise history were elicited. History related to smoking and alcohol intake was also included. History related specifically to common symptoms of menopause and perimenopause such as hot flashes, night sweats, sleep disturbances, vaginal dryness, lack of concentration, mood swings, menstrual disturbances etc. was elicited with leading questions.

The height and weight of all subjects was recorded in the outpatient department by a digital apparatus. The weight in kilograms was divided by the square of the height measured in meters to calculate the Body Mass Index (BMI) for each subject.

The participants were then asked to undergo biochemical testing including liver and kidney function tests, serum calcium and fasting and post prandial blood sugar values; and endocrine evaluation including, thyroid stimulating hormone, follicle stimulating hormone, parathyroid hormone, 25 hydroxyvitamin D3, and glycosylated hemoglobin (in case of deranged blood sugars).

Hemoglobin was measured in the hospital laboratory by automated blood cell counter, Sysmex KX 21. Estimates of liver function test, renal function test, blood sugar, HbA1C and serum calcium were done by fully automated biochemistry analyzer, model EM-360. Serum follicle stimulating hormone (FSH), thyroid stimulating hormone (TSH), parathyroid hormone (PTH) and 25 hydroxyvitamin D3 were done on a fully automated single dose entry immuno analyser, Biomerieux Vidas.

The reference range for TSH was taken between 0.5 and 5.0 IU/ml; Vitamin D was considered insufficient if less than 30 mIU/ml. The cut off for serum parathyroid hormone was taken as, 10–65 ng/ml.

The subjects were then asked to undergo bone mineral densitometry using DEXA scan. The aforesaid scan was performed on, Hologic DXA scan machine. NHANES III data were used as the reference standard to calculate T-scores at the neck of femur [9].

For the purpose of descriptive analysis, the BMI was classified according to the criteria proposed by WHO [11]. The quantum of daily physical activity was assessed to be moderate for subjects performing only domestic chores, heavy for those involved in some form of exercise such as walking, jogging or yoga for at least 30 min a day for at least five days a week, in addition to domestic work. Those responders who were ambulatory but claimed to undertake no significant routine physical activity, were classified as sedentary.

Daily sun exposure was divided into less than one hour, one to five hours and more than five hours of exposure during day time.

A note was made of the usual attire worn by the subjects. This was not included in analysis since all our responders were used to wearing half to full sleeved clothes that exposed only face, neck and a variable area of arms and feet.

### Ethical consideration

Due clearance was obtained from the institutional ethical clearance committee prior to initiation of the study.

### Statistical analysis

Data was expressed as means (SD) and frequencies (%). Chi square test was applied to categorical variables and Student's t-test to continuous variables. SPSS version 20 was used for performing all statistical analysis. A p value  $<0.05$  was considered statistically significant.

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