

## A Cross-Sectional Study of Bone Mineral Densitometry Conducted in the Mumbai Metropolitan Region (MMR) on a Single-Day

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### Abstract

**Introduction:** Osteoporosis, characterized by decreased bone mineral density (BMD) and increased fracture risk, is prevalent among postmenopausal women. To address this, the Mumbai Obstetrics and Gynaecological Society conducted a large-scale BMD screening event for 3565 females in the Mumbai Metropolitan Region.

**Materials and Methods:** On October 19, 2022, a cross-sectional, observational study was carried out, encompassing bone mineral density (BMD) screenings at 38 different centres throughout Mumbai. Peripheral DEXA (p-DEXA) machines measured bone density in various body parts. Data was analysed using descriptive statistics.

**Results:** Out of 3565 participants, 5.6% had osteoporosis, and 42.6% had osteopenia. Osteoporosis prevalence was highest (16.6%) in the 81 - 90 age group, while osteopenia was most common (53.9%) in the 51 - 60 age group. Education level, BMI, and dietary habits significantly influenced the prevalence rates.

**Conclusion:** The study underscores the significance of routine BMD screenings, particularly for individuals in high-risk categories. Preventive measures, including adequate nutrition and lifestyle modifications, are crucial in managing and reducing osteoporosis risk in the female population of Mumbai.

**Keywords:** Osteoporosis; Bone Mineral Density (BMD); Peripheral DEXA (p-DEXA)

## Introduction

Osteoporosis is a condition that arises when there is a reduction in bone mineral density and bone mass, or when the bone’s structure and strength undergo alterations. This can result in diminished bone strength, thereby heightening the risk of fractures. Osteoporosis is significantly more prevalent in females than in males, and its occurrence increases after menopause and with aging. Consequently, health-care providers advise bone density testing for individuals who have gone through menopause and are 65 years of age or older.

The Mumbai Obstetrics and Gynaecological Society is a charitable organization established in 1934. On the 19th of October 2022, from 9 am to 6 pm, the society organized an event, marking the first occasion of such an initiative. During this event, 3565 females were screened for osteoporosis in a single day, making it a significant milestone for the organization in a metropolitan city in India.

In the city of Mumbai and its suburbs, this noteworthy event was organized by MOGS President Dr. Niranjn Chavan, with the participation of 38 centers. This initiative resulted in the establishment of a world record for conducting the highest number of Bone Mineral Densitometry (BMD) evaluations in the female population on a single day within a metropolitan city in India.

## Methods

This is an observational cross-sectional study of a survey conducted on 19<sup>th</sup> October 2022 from 9 am to 6 pm, just one day prior to The World Osteoporosis Day. 3565 females were screened for bone mineral density at various tertiary centers, peripheral hospitals, corporate hospitals, and private nursing homes across Mumbai.

## Statistical analysis

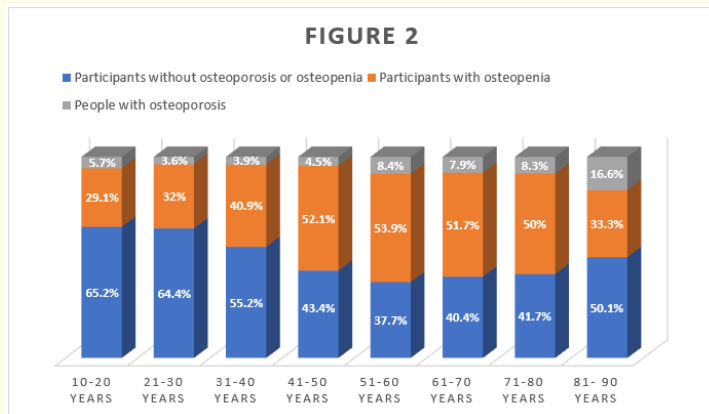
All parameters were examined and analysed using percentage-based methods. Since this was an observational study, all parameters were analysed using descriptive statistics. Percentages and proportions were calculated, and no statistical tests were employed.

## Results

3565 females were screened for bone mineral density at multiple centers of which 184 (5.6%) patients were detected to have osteoporosis and 1522 patients (42.6%) were detected to have osteopenia (Figure 1).



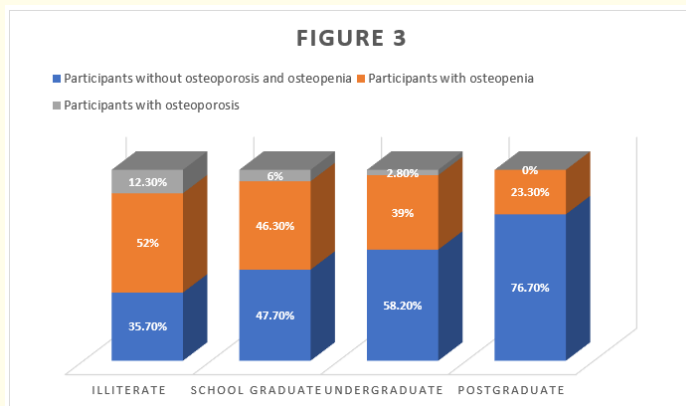
People from age groups of 10 - 90 years were screened. The age-wise distribution of people with osteoporosis and osteopenia is shown in the figure below (Figure 2).



Among the various age groups, the adolescent population exhibits the highest percentage (65.2%) without either osteopenia or osteoporosis. In the age range of 51 to 60 years, there is a predominant occurrence of osteopenia (53.9%), while the age group spanning 81 to 90 years demonstrates the highest incidence of osteoporosis (16.6%).

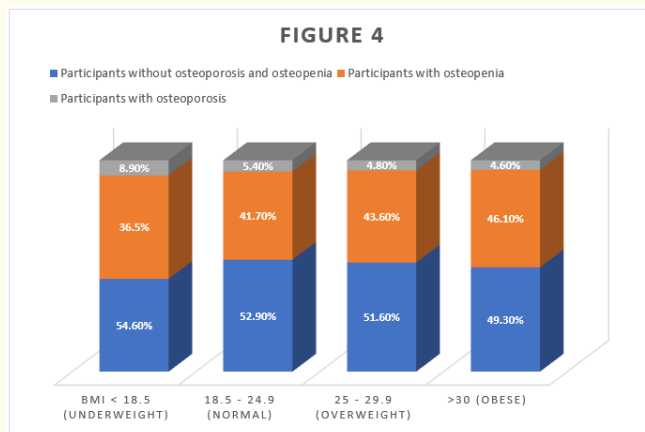
Individuals with diverse educational backgrounds, including those without formal education, school graduates, and postgraduates, underwent screening for osteoporosis.

The data shows that the uneducated population is most prone to develop osteopenia (52%) and osteoporosis (12.3%) as compared to postgraduates which have the lowest incidence of osteopenia (23.3%) and osteoporosis (0%) (Figure 3).



The impact of osteoporosis can vary across individuals with diverse body mass indices, highlighting the significance of considering varying BMI levels in understanding and managing this condition (Figure 4).

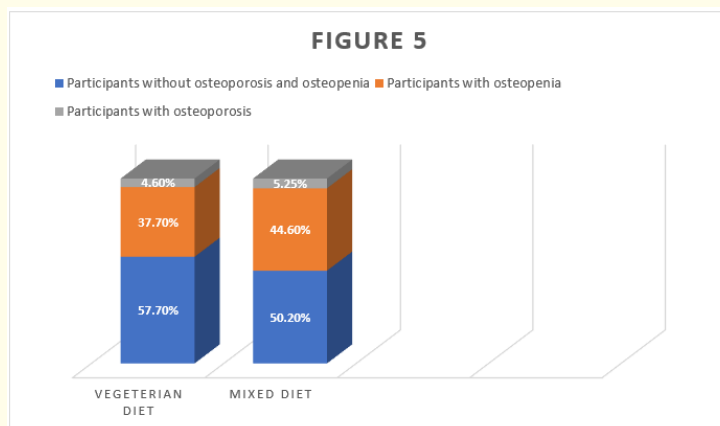
Our study shows that obesity is associated with the lowest incidence of osteoporosis (4.6%).



A higher body mass index (>30 kg·m<sup>2</sup>) was identified as a significant protective factor against osteoporosis (95% CI: 0.26 - 0.68) and osteopenia (95% CI: 0.19 - 0.52).

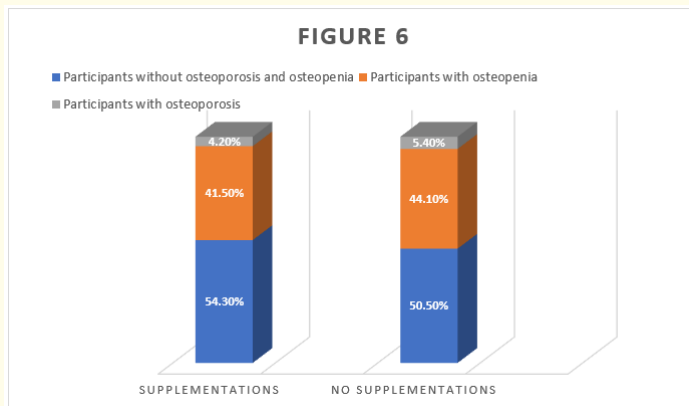
A well-balanced diet is essential for sustaining strong, healthy bones and can impact the risk of developing osteoporosis. Sufficient consumption of calcium and vitamin D from dietary sources is vital for maintaining bone health and preventing osteoporosis. Excessive consumption of caffeine, alcohol, and high-sodium foods may negatively impact bone health and increase the risk of osteoporosis.

This data illustrates that a lower incidence of osteopenia (37.7%) and osteoporosis (4.6%) is seen in people who consume a vegetarian diet (Figure 5).



The initial approach to preventing or managing osteoporosis involves consuming foods and beverages rich in calcium, a crucial mineral for bone strength, and vitamin D, which supports the breakdown and absorption of calcium.

The data presented demonstrates a reduced occurrence of osteopenia (41.5%) and osteoporosis (4.2%) in females who incorporate calcium and vitamin D supplementation, in contrast to those who do not, showing incidences of 44.1% for osteopenia and 5.4% for osteoporosis in the latter group (Figure 6).



Osteoporosis in different areas of Mumbai has been shown in the following chart: The highest prevalence of osteoporosis is observed in Mira Bhayander and Navi Mumbai at 7.7%, while South Mumbai records the lowest incidence at 3.9%. Central Mumbai, including Dharavi, the largest slum in Asia, exhibits the highest incidence of osteopenia at 67.1%. In South Mumbai, which predominantly comprises an upper-class population, the majority of participants (81.1%) display neither osteoporosis nor osteopenia.

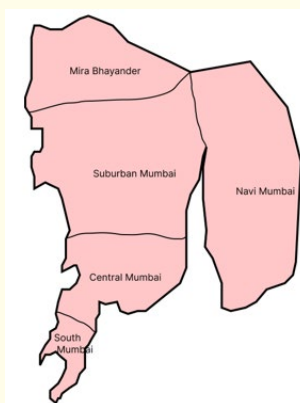
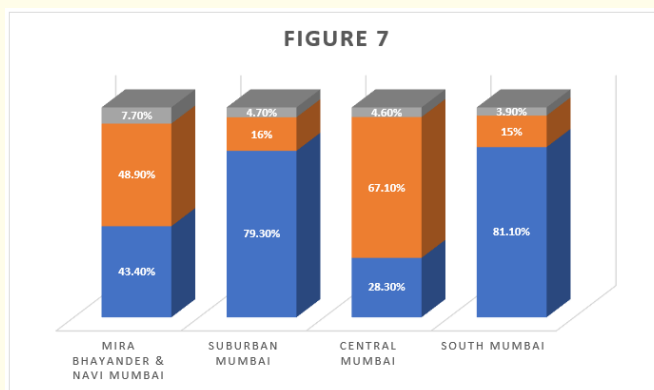


Figure 8: Representational map of areas studied.

## Discussion

This study investigated the prevalence and risk factors for osteoporosis and osteopenia among 3,565 females in Mumbai, India. This is the first study from this region of India, which has revealed that the prevalence rate of osteoporosis (5.6%) is approximately 37.4% lower than that of osteopenia (43%).

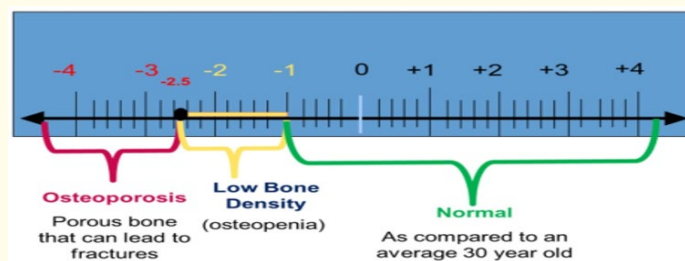
Osteoporosis often remains asymptomatic, so individuals may not realize they have the condition until they experience an unexpected fracture. Spinal and hip fractures can result in long-term pain, deformity, depression, disability, and, in severe cases, can be life-threatening. Additionally, about 50% of individuals who suffer a hip fracture may never regain the ability to walk independently, and 25% may require long-term care [1].

A bone mineral density (BMD) test assesses the concentration of calcium and other minerals in a specific bone area, providing an indirect measure of fracture risk. The most common and precise method involves a dual-energy X-ray absorptiometry (DEXA) scan, which utilizes low-dose X-rays.

We used Peripheral DEXA (p-DEXA) machines that measure the bone density in the wrist, fingers, leg, or heel [2].

The T-score on a bone density report indicates how your bone mass compares to that of an average healthy 30-year-old. A T-score is measured in standard deviations, which quantify how much a result deviates from the mean. According to the World Health Organization's 1994 definition, osteoporosis is characterized by a T-score that is 25% lower than that of an average 30-year-old, or 2.5 standard deviations below the mean, corresponding to a T-score of -2.5 or lower.

Osteopenia, as defined by the WHO, is a T-score ranging from -1.0 to -2.5 standard deviations below the average of a healthy 30-year-old, representing a 10% to 25% decrease [3].



Figure

## Conclusion

It is reported that 61 million people in India have osteoporosis, with 80 percent of these individuals being women. Osteoporosis in India tends to peak 10 - 20 years earlier than in Western countries, significantly impacting both health and economic resources [4].

Bone density tests assist healthcare providers in detecting bone loss in individuals who might otherwise be asymptomatic. These tests are quick, painless, and safe, enabling the identification of bone loss before fractures occur.

This information highlights the significant role that educational background, occupational factors, and nutritional status play in assessing the risk of osteoporosis.

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