

# A CROSS-SECTIONAL STUDY ON PREVALENCE OF OSTEOPOROSIS AND ITS ASSOCIATED RISK FACTORS AMONG POSTMENOPAUSAL WOMEN IN NORTH CHENNAI

<sup>1</sup>Madhunishaa K., <sup>2</sup>Muthu Meenakshi P.

<sup>1</sup>Master of Philosophy, Department of Clinical Nutrition and Dietetics and Post Graduate & Research department of Foods and Nutrition, Ethiraj College for Women, Chennai, India

<sup>2</sup>Assistant Professor & Head, Department of Nutrition, FSM and Dietetics, Ethiraj College for Women, Chennai, India

Email - <sup>1</sup>[nishaanandy11@gmail.com](mailto:nishaanandy11@gmail.com), <sup>2</sup>[roshanaa2000@gmail.com](mailto:roshanaa2000@gmail.com)

**Abstract:** *Objective:* The main objective is to assess the prevalence of osteoporosis among postmenopausal women in North Chennai and examine its association with certain risk factors. **Materials and Methods:** A cross-sectional study was conducted by organizing camp, which involved 160 postmenopausal women less than 60 years of age who were willing to participate in the present study. The study participants were selected using purposive sampling technique and screened using quantitative ultrasound bone densitometer to classify the postmenopausal women as normal, osteopenic, and osteoporotic. A structured interview was conducted simultaneously to collect details like age, socioeconomic status, history of comorbidity, history of fractures, and physical activity. **Results:** The prevalence of low BMD levels (osteopenia and osteoporosis) among the study participants was found in more than half of the participants (87%). Postmenopausal women showed a significant decline in the BMD with advancing age. The study participants belonging to a lower-middle-income group and upper lower income group had a significant association with low BMD. History of the comorbid condition and lack of physical activity were found to be significantly associated with low BMD levels. **Conclusion:** Osteoporosis is a life-threatening systemic skeletal disease that is caused by the deterioration of bone tissues and loss of bone strength. This disease progress over time with an increased risk of fractures due to a consequent increase in bone fragility. This disease is most prevalent among postmenopausal women due to the lack of estrogen that occurs during the menopausal transition period. It is associated with various risk factors like age, socioeconomic status, literacy level, history of the comorbid condition, and also lifestyle habits like physical activity, dietary practices, weight management sleep, smoking, and alcohol consumption. Therefore, inculcating healthy lifestyle practices becomes necessary from the age of adolescence to prevent osteoporosis during later years in life.

**Key Words:** Prevalence, osteoporosis, risk factors, postmenopausal women, bone mineral density, bone densitometer.

## 1. INTRODUCTION:

Osteoporosis is a chronic disability that affects more than 200 million people worldwide requiring lifelong management.<sup>[1]</sup> Rapid bone loss that occurs during the menopausal transition, warrants adequate precaution to be taken during menopausal years to prevent osteoporosis during later years.<sup>[2]</sup>

Bone Mineral Density (BMD) is the primary determinant of risk for fractures and its measurement is often essential to make management decisions.<sup>[3]</sup> In asymptomatic postmenopausal women, low bone mineral density is the best indicator of risk for fractures.<sup>[4]</sup>

Dual X-ray Absorptiometry (DXA) is considered to be the gold standard method for bone densitometry.<sup>[5]</sup> This method is used to determine the BMD levels, although it is very rarely used in health care settings because of the need for bulky and expensive equipment. Especially in government hospitals, only very few of these machines are found.<sup>[6]</sup>

Non-invasive Quantitative ultrasound (QUS) machines appear to be developing into an acceptable, low-cost, more portable, and readily accessible alternative to Dual X-ray Absorptiometry (DXA) for measuring the bone mineral density (BMD), making them ideal in primary care settings for the detection and management of osteoporosis.<sup>[7][8]</sup>

The data on the prevalence of osteoporosis among postmenopausal women is lacking or limited especially in North Chennai, where people belong to low socio-economic strata. Hence, there is a felt need to assess the prevalence of osteoporosis and its associated risk factors among postmenopausal women in North Chennai.

## 2. RESEARCH METHODOLOGY:

A cross-sectional study was conducted to determine the prevalence of osteoporosis among 160 postmenopausal women below the age of 60 years. The Independent Ethics Committee has reviewed and approved the present study on 21<sup>st</sup> January 2021. A well-organized camp was conducted in various hospitals in North Chennai and only willing postmenopausal women less than 60 years of age were selected using the purposive sampling technique and screened for osteoporosis using a non-invasive quantitative ultrasound bone densitometer (Figure 1). Based on the T scores obtained, postmenopausal women were classified as normal if T score was less than -1 SD, osteopenic or risk of osteoporosis if T-score was between -1 SD and -2.5 SD and osteoporotic if T score was less than -2.5 SD, according to WHO diagnostic criteria for osteoporosis. This was followed by a structured interview to collect information like age, socioeconomic level, comorbidity, history of fractures, and physical activity. Based on the age, participants were categorised as 31-40 years, 41-50 years and 51-60 years. Modified Kuppaswamy 2019 Socioeconomic rating scale was used to categorise the participants based on their socioeconomic level.

### Statistical analysis

Data were calculated as percentages and the Pearson chi-square test was used for studying the association between the risk factors and osteoporosis. Associations were considered statistically significant at  $P < 0.05$  level.

## 3. RESULTS:

Out of 160 postmenopausal women less than 60 years of age in North Chennai, 87% of women had osteopenia (59%) and osteoporosis (28%) with T-score -1 SD to -2.5 SD and  $< -2.5$  SD respectively, whereas only 13% of the study participants were found to be normal with T-score  $> -1$ SD (Figure 2).

Majority (62%) of the study participants were between the age group 51-60 years, among which 60% of the women had low BMD levels and there was a significant association between advancing age and low BMD levels. According to the modified Kuppaswamy 2019 Socioeconomic rating scale, about 28% and 51% of the study participants belonging to lower-middle-income groups and upper-lower income groups were found to have low BMD levels. It was shown that there was a strong significant increase in the prevalence of osteoporosis among low socioeconomic strata.(Table 1)

A total of 73% of the postmenopausal women had comorbidity, among which 71% of them had low BMD levels and there was a highly significant association between the presence of comorbidity and low BMD levels. It was also found that lack of physical activity was more prevalent among the participants (92%), out of which 84% of the women had low BMD levels and there was a strong significant association between lack of physical activity and low BMD levels

## 4. DISCUSSION:

The present cross-sectional study showed a high prevalence of osteoporosis (59%) and osteopenia (28%) among postmenopausal women below the age of 60 years in North Chennai, which might become a serious public health problem soon. Periodic screening for osteoporosis especially after menopause which helps in the prevention of osteoporosis or early diagnosis before it becomes a major health issue. Although DEXA scan is considered as a gold standard method for assessing BMD, there is limited access because of the need for bulky and expensive equipment, also women belonging to low socioeconomic strata cannot afford it.<sup>[6]</sup> Therefore, a non-invasive quantitative ultrasound machine, which is an acceptable, low-cost, more portable, and readily accessible alternative to DEXA, was used in this study. Many studies in various regions in India have also reported a high prevalence of osteopenia and osteoporosis among postmenopausal women due to estrogen deficiency that occurs during the menopausal transition phase.<sup>[8,9]</sup>

Age, height, menarche age, number of years since menopause, BMI, sunlight exposure, dietary calcium intakes, comorbid conditions, socioeconomic status, and physical activity are the modifiable and non-modifiable risk factors of osteoporosis.<sup>[10]</sup> The present study reported that a decline in the BMD levels among the participants was significantly associated with advancing age, low socioeconomic status, presence of comorbidity, and lack of physical activity. A cross-sectional survey on the risk factors for osteoporosis among 273 women in Gujarat showed a significant association between age and the risk of osteoporosis.<sup>[11]</sup> Another study, which determined the bone mineral density and bone turnover markers and factors influencing them in 76 postmenopausal women and their premenopausal daughters in the Vellore district supported the present findings, by pointing out that low socioeconomic status (SES) is one of the associated risk factors that influence BMD.<sup>[12]</sup> Secondary osteoporosis is prevalent among people belonging to high-risk disease subgroups such as chronic glucocorticoid users and participants with rheumatoid arthritis, collagen vascular disease or inflammatory bowel disease, hypogonadism, thyroid dysfunction, type 2 diabetes, and use of aromatase inhibitors in breast cancer survivors.<sup>[13]</sup> The impact of physical activity on bone mineral density was assessed among 200 peri and postmenopausal women in Chandigarh with a mean age of  $52.50 \pm 5.9$ . The results revealed that lack of physical activity was significantly associated with a high prevalence of osteoporosis (53%).<sup>[14]</sup>

The above findings show that there is a magnifying health problem among postmenopausal women, which can be prevented by lifestyle modification like weight management, regular physical activity, maintaining proper sleep patterns, reducing smoking and consumption of alcohol. This warrants intervention strategies aimed at creating awareness about osteoporosis and its risk factors among postmenopausal women.

In the present study, the sample size had to be limited or restricted due to the pandemic situation that happened during the year 2020. Other risk factors like BMI, dietary behaviours, family history, age of menopause, the intensity of physical activity, etc., has not been taken into consideration for finding its impact on bone mineral density.

## 5. CONCLUSION:

Osteoporosis is a common, serious, and sometimes a life-threatening systemic skeletal disease that requires lifelong management in postmenopausal women. Periodic screening for osteoporosis especially after menopause helps in early diagnosis and treatment. Further, developing calcium-rich and low-cost food products using staple foods is a promising and most cost-effective intervention to manage osteoporosis, especially among low-income strata, who rely on starch and bulky foods to meet their daily nutrient requirements. Along with nutritional interventions, addressing modifiable risk factors like weight management, regular physical activity, maintaining proper sleep patterns, reducing smoking and consumption of alcohol in early life may help to minimise the burden of this devastating disease.

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TABLES AND FIGURES

FIGURE 1: Assessment of Bone Mineral Density using Densitometry



FIGURE 2: Prevalence of osteoporosis

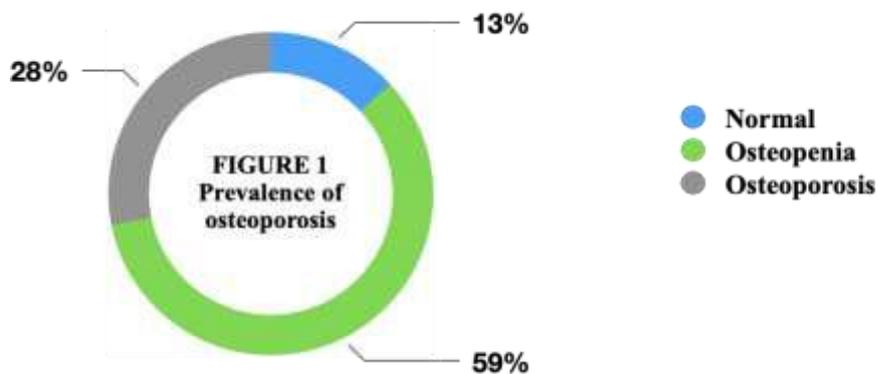


Table 1 - Association of age and socioeconomic status with osteoporosis

| Risk factors                | Percentage of study participants (%) |                            |                        | Level of significance |
|-----------------------------|--------------------------------------|----------------------------|------------------------|-----------------------|
|                             | Normal (>-1 SD)                      | Osteopenia (-1 TO -2.5 SD) | Osteoporosis (<2.5 SD) |                       |
| <b>AGE</b>                  |                                      |                            |                        |                       |
| 31-40 years                 | 5                                    | 4                          | 0                      | 0.00                  |
| 41-50 years                 | 6                                    | 22                         | 1                      |                       |
| 51-60 years                 | 2                                    | 33                         | 27                     |                       |
| <b>SOCIOECONOMIC STATUS</b> |                                      |                            |                        |                       |
| Upper income group          | 0                                    | 0                          | 0                      | 0.00                  |

|                           |   |    |    |
|---------------------------|---|----|----|
| Upper middle income group | 3 | 1  | 0  |
| Lower middle income group | 4 | 14 | 14 |
| Upper lower income group  | 5 | 40 | 11 |
| Lower income group        | 1 | 4  | 3  |

**Table 2 - Association of comorbidity and physical activity with osteoporosis**

| Risk factor                                 | Percentage of study participants (%) |                            |                        | Level of significance |
|---|--------------------------------------|----------------------------|------------------------|-----------------------|
|   | Normal (>-1 SD)                      | Osteopenia (-1 TO -2.5 SD) | Osteoporosis (<2.5 SD) |                       |
| Participants with comorbidity               | 2                                    | 50.5                       | 20.5                   | 0.00                  |
| Participants without comorbidity            | 11                                   | 8                          | 8                      |                       |
|   |                                      |                            |                        |                       |
| Participants engaged with physical activity | 5                                    | 1                          | 2                      | 0.00                  |
| Lack of physical activity                   | 8                                    | 58                         | 26                     |                       |