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Prevalence of Osteoporosis and Osteopenia among Adults Attending a Tertiary Care Hospital in Berhampur, Odisha: A Hospital-Based Cross-Sectional Study

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ABSTRACT

Background: Osteoporosis is a common metabolic bone disorder characterized by reduced bone mass and increased fracture risk. In India, the burden of osteoporosis is rising and tends to occur at a younger age. Rural and tribal populations, such as those in Berhampur district, may be at higher risk due to undernutrition, low calcium intake, and limited access to diagnostic facilities. However, data from this region are limited. To assess the prevalence of osteoporosis and osteopenia among individuals aged 40 years and above attending a tertiary care hospital in Berhampur, Odisha.

Methods: A hospital-based cross-sectional study was conducted in the Department of Orthopaedics at MKCG Medical College and Hospital, Berhampur, from August to November 2021. A total of 280 participants aged more than 40 years were included. Bone mineral density (BMD) was assessed using calcaneal quantitative ultrasound (QUS). Participants were categorized as normal, osteopenic, or osteoporotic based on WHO T-score criteria. Data were analyzed using descriptive statistics.

Results: Out of 280 participants, 178 (63.6%) were females and 102 (36.4%) were males, with a mean age of 49.8 years. Osteopenia was observed in 149 (53.2%) participants, while 37 (13.2%) were found to have osteoporosis, and 94 (33.6%) had normal bone density. Osteoporosis was more prevalent among females (18.0%) compared to males (4.9%). Most participants belonged to the 40–49 years age group (49.6%), indicating early onset of bone loss.

Conclusion: Osteoporosis and osteopenia are highly prevalent among adults attending a tertiary care hospital in Berhampur, with a greater burden among females. Calcaneal QUS is a feasible screening tool in resource-limited settings. Early detection and integration of bone health services into primary healthcare are essential to reduce future fracture risk.

Key-words: Osteoporosis; Osteopenia; Bone mineral density; Calcaneal ultrasound; Cross-sectional study; Berhampur; Odisha; India

INTRODUCTION

Osteoporosis is a metabolic bone disorder characterized by decreased bone mass and deterioration of bone microarchitecture, leading to increased bone fragility and a higher risk of fractures [1].

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Bone loss is a physiological process associated with ageing and occurs in both men and women after peak bone mass is reached, typically in the third decade of life [2]. Osteoporosis is generally classified into two types: Type 1 (postmenopausal osteoporosis), predominantly affecting women due to estrogen deficiency, and Type 2 (senile osteoporosis), which occurs in both men and women with advancing age [3,4].

According to the International Osteoporosis Foundation (IOF) Asian Audit (2013), nearly 50 million individuals in India are estimated to have osteoporosis or low bone mass (T-score < -1) [5]. Furthermore, the Indian population tends to have lower bone mineral density at a

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younger age than global populations [6]. A hospital-based study conducted in Delhi in 2011 among adults found that a considerable proportion had low bone density, with many being either osteoporotic or osteopenic [7].

Despite its clinical significance, osteoporosis in males remains underdiagnosed and is often detected only after the occurrence of fractures [8]. Additionally, most of the existing research has focused on postmenopausal women, resulting in limited evidence regarding the burden of osteoporosis among men [9,10].

Bone mineral density (BMD) is assessed using the World Health Organisation (WHO) criteria, in which osteoporosis is defined as a BMD value 2.5 standard deviations or more below the mean peak BMD of young adults, and osteopenia is defined as a BMD between −1 and −2.5 standard deviations [11]. Dual-energy X-ray absorptiometry (DEXA) is considered the gold standard for measuring BMD; however, its high cost and limited accessibility make it less feasible in many settings across India [12,13].

Calcaneal quantitative ultrasound (QUS), introduced in 1984, has been widely used as an alternative screening tool in several studies [14]. Compared to DEXA, QUS is portable, cost-effective, and does not involve exposure to ionizing radiation. It is a reliable and practical method for preliminary assessment of bone mineral density, especially in resource-limited settings [15,16].

Berhampur district of Odisha is predominantly rural and tribal, with populations exposed to multiple risk factors such as undernutrition, low dietary calcium intake, high levels of physical activity, and limited access to diagnostic facilities. These factors may contribute to a higher burden of osteoporosis; however, data from this region are scarce. Therefore, the present study aims to assess the prevalence of osteoporosis and osteopenia among individuals aged 40 years and above attending the outpatient department of a tertiary care hospital, MKCG Medical College, Berhampur.

MATERIALS AND METHODS

Study Design & Setting- The hospital-based cross-sectional study was conducted in the Department of Orthopaedics at MKCG Medical College and Hospital, Berhampur, Odisha, India, over a 4-month period from August 2021 to November 2021.

Study Population- A total of 280 participants aged more than 40 years attending the Orthopaedic outpatient department were included in the study after obtaining informed consent, of whom 178 were females and 102 were males.

Inclusion Criteria- Individuals aged above 40 years of either sex who were willing to participate and did not have any known major systemic illness were included.

Exclusion Criteria- Participants aged below 40 years, those with a history of calcaneal fractures, prolonged immobilization, use of medications affecting bone metabolism including long-term steroid therapy, or presence of major systemic disorders were excluded.

Data Collection Method- Bone mineral density (BMD) of all participants was assessed using calcaneal quantitative ultrasound (QUS). Although the World Health Organization (WHO) T-score criteria for osteoporosis and osteopenia are based on dual-energy X-ray absorptiometry (DEXA), equivalent heel T-scores obtained through QUS be useful for screening and identifying individuals at risk, thereby reducing the need for DEXA in resource-limited settings [17]. Previous studies have also demonstrated that QUS is a reliable and cost-effective screening tool when applying similar T-score thresholds [18,19]. The BMD measurements were taken from the right calcaneum of each participant and the corresponding T-scores were recorded.

Diagnostic Criteria- Participants were categorised according to WHO criteria as normal (T-score ≥ −1), osteopenic (T-score between −1 and −2.5), or osteoporotic (T-score ≤ −2.5). Although the WHO criteria are based on DEXA, equivalent heel T-scores obtained by QUS were used for screening.

Statistical Analysis- Statistical analysis was performed using appropriate methods, with categorical variables expressed as percentages and continuous variables presented as mean values.

Ethical Considerations- The purpose of the study was explained to all participants and written informed consent was obtained before their inclusion in the study.

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RESULTS

A total of 280 participants aged above 40 years were included in the study, of whom 178 (63.6%) were females and 102 (36.4%) were males. The participants' ages ranged from 40 to 78 years, with a mean of approximately 49.8 years. The study population was categorized into three age groups: 40–49 years, 50–59 years, and 60 years and above. As shown in Table 1, most participants belonged to the 40–49 years age group (139; 49.6%), followed by the 50–59 years age group (72; 25.7%) and the ≥60 years age group (69; 24.6%). Among females, most participants were in the 40–49 years age group (84; 47.2%), whereas among males, the largest proportion was also in this age group (55; 53.9%) (Table 1).

Table 1: Age-wise Distribution of Study Participants (n=280)

Age Group (years)	Females (n=178)	Males (n=102)	Total (n=280)
40–49	84	55	139
50–59	54	18	72
≥60	40	29	69
Total	178	102	280

Assessment of bone mineral density using calcaneal QUS revealed that 149 participants (53.2%) had osteopenia, 94 (33.6%) had normal bone density, and 37 (13.2%) had osteoporosis, as shown in Table 2. Thus, more than half of the study population had reduced bone mass (osteopenia), while a considerable proportion had established osteoporosis (Table 2).

Table 2: Distribution of Bone Mineral Density (n=280)

BMD Category	Number of Patients	Percentage (%)
Normal	94	33.6
Osteopenia	149	53.2
Osteoporosis	37	13.2
Total	280	100

Sex-wise distribution of bone mineral density is depicted in Table 3. Among females, osteopenia was the most common finding (102; 57.3%), followed by osteoporosis (32; 18.0%) and normal bone density (44; 24.7%). In contrast, among males, a higher proportion had normal bone density (50; 49.0%), while 47 (46.1%) were osteopenic and only 5 (4.9%) were osteoporotic. Overall, osteoporosis was more prevalent among females than among males (Table 3).

Table 3: Sex-wise Distribution of Bone Mineral Density

BMD Category	Females (n=178)	Males (n=102)
Normal	44 (24.7%)	50 (49.0%)
Osteopenia	102 (57.3%)	47 (46.1%)
Osteoporosis	32 (18.0%)	5 (4.9%)
Total	178 (100%)	102 (100%)

DISCUSSION

The present hospital-based cross-sectional study, conducted at MKCG Medical College, Berhampur, assessed the prevalence of osteoporosis and osteopenia in individuals aged 40 years and above using calcaneal quantitative ultrasound. The findings of this study demonstrate a substantial burden of low bone mineral density in the study population.

In the present study, the prevalence of osteoporosis was found to be 13.2%, while 53.2% of participants had osteopenia. These findings are comparable to previous hospital-based studies conducted in India. A study from North India reported osteoporosis in approximately 13% of participants and osteopenia in more than half of the study population, indicating a similar pattern of high prevalence of reduced bone mass [20]. Another study from central India also observed that osteopenia constituted many cases, followed by osteoporosis, suggesting that a large proportion of individuals remain in a pre-osteoporotic stage [21].

The higher prevalence of osteopenia compared to osteoporosis observed in this study is of public health importance, as individuals in this category are at increased risk of progression to osteoporosis if timely interventions are not initiated. This highlights the need for early screening and preventive strategies at the community and primary healthcare levels.

In the present study, osteoporosis was more prevalent among females (18.0%) compared to males (4.9%). Similar findings have been reported in multiple Indian studies, where postmenopausal women are at

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significantly higher risk due to hormonal changes, particularly estrogen deficiency [22]. Furthermore, sociocultural factors such as inadequate nutrition, lower calcium intake, and limited health-seeking behaviour among women may further contribute to this increased burden [23].

The age-wise distribution in this study showed that a considerable proportion of participants belonged to the 40–49 years age group, indicating that bone loss begins relatively early in this population. This is consistent with previous studies reporting that Indians tend to develop lower bone mineral density at a younger age than Western populations [24]. Early onset of bone loss may be attributed to factors such as poor nutritional status, vitamin D deficiency, and high levels of physical labour, especially in rural and tribal populations.

The use of calcaneal quantitative ultrasound (QUS) in the present study proved to be a practical and feasible method for screening osteoporosis in a resource-limited setting. Previous studies have demonstrated a good correlation between QUS and DEXA measurements, supporting its utility as a screening tool [25]. Given the limited availability and high cost of DEXA in many parts of India, QUS can serve as an effective alternative for large-scale screening programs.

Berhampur district has a predominantly rural and tribal population, where multiple risk factors such as undernutrition, low dietary calcium intake, and limited access to healthcare services may contribute to poor bone health. Although this study was hospital-based, the findings reflect a potentially high burden of undiagnosed osteoporosis and osteopenia in the community. These results underscore the need for integrating osteoporosis screening into existing healthcare services, particularly at Health and Wellness Centres and outpatient departments.

However, this study has certain limitations. Being a hospital-based study, the findings may not be generalizable to the entire community. Additionally, the use of QUS instead of DEXA may have some limitations in precision, although it remains a valid screening tool.

CONCLUSIONS

Osteoporosis and osteopenia are highly prevalent among individuals above 40 years of age attending a tertiary care hospital in Berhampur, with a higher burden observed among females. The large proportion of individuals with osteopenia highlights the need for early detection and preventive interventions. Calcaneal QUS can be effectively utilized as a screening tool in resource-limited settings. Strengthening awareness, improving nutritional status, and integrating bone health screening into primary healthcare services are essential to reduce the future burden of osteoporotic fractures.

CONTRIBUTION OF AUTHORS

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