

SCREENING FOR OSTEOPOROSIS AND RISK ASSESSMENT BY USING BONE DENSITOMETRY AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To identify the people having risk of osteoporosis using a bone densitometer and assess individual risk factors. **Methods:** we enrolled 120 patients and used the BMD tool to detect osteoporosis based on the following classifications: 1 to 0 is normal, -1 to -2.5 is osteopenic and ≤ -2.5 as osteoporosis. Additionally, we conducted a risk factor assessment. **Results:** The study analyzed data from 120 patients, including both men and women, based on their T-scores and risk assessments. The findings indicated that individuals aged 55-60 had a higher likelihood of developing osteopenia, whereas those aged 70-80 were at a greater risk of osteoporosis. The results showed that 67% of osteoporosis cases occurred in females, while males accounted for 33%. This suggests that women are 34% more likely to develop osteoporosis than men. The results showed on the basis of severity, osteopenia is more severe than the osteoporosis. **Conclusion:** Our findings concluded that, a postmenopausal women or man over 50 years of age who has QUS-T-score of less than -1.40 or -1.80 on a QUS device may be higher risk of osteoporotic fractures. On the basis of severity osteopenia is more severe than the osteoporosis. On the basis of gender females has higher risk of osteoporosis than the males

Key words: QUI (quantitative ultrasound imaging), osteoporosis, BMD (bone mineral density), Postmenopausal women, T-score, Heel bone densitometer

1. INTRODUCTION

The two primary features of osteoporosis are a reduction in mineral bone density and worsening bone micro architecture.^[1] And two basic types of osteoporosis are - Primary and secondary. Growing older and decreasing sex hormones concentrations within the body is among the primary causes of age related osteoporosis.^[2]

It is divided into two types associated with age related osteoporosis: Type 1 and Type 2. Women reaching the age of 45 and 70 are typically impacted with type 1 osteoporosis, which is additionally known as postmenopausal osteoporosis, but individuals over 70 years old are more probable to develop - Type 2 osteoporosis, also described as age- associated osteoporosis. Cortical and also the trabecular bone structures are both affected by type 2, however, underlying physiological conditions or undesirable effects of certain medications may lead to secondary osteoporosis.^[2]

Osteoporosis occurs when the natural balance between bone resorption and formation is disrupted, leading to excessive mineral loss and weakened bones that become fragile over time. In healthy adults, bone strength is maintained through a continuous process called bone remodeling, where old bone is resorbed, and new bone is deposited in equal measure. However, when resorption outpaces formation, bones become brittle and more susceptible to fractures.^[3]

Bone densitometer uses QUS (Quantitative Ultrasound) to evaluate bone density by evaluating the structural and elastic characteristics of the calcaneus bones using high- frequency sound waves.^[4] The heel's bone mineral density (BMD) can be measured with a portable, non-invasive tool called a heel bone densitometer. The following is a detailed guide on the process:^[5]

The densitometer will analyze the scan data and provide a T-score and/or a Z- score. As it is cost - effective, portable, ionising radiation- free, quick and easy to use, it has become a crucial resource for primary care osteoporosis diagnosis. In addition, QUS can report the structure of bones both in terms of quality and quantity. ^[6]

2. METHODOLOGY

STUDY AND METHODOLOGY

A prospective observational study was conducted to screen individuals for osteoporosis and assess associated risk factors using a bone densitometer.

STUDY METHOD

This study was conducted in "MALLA REDDY NARAYANA MULTI- SPECIALITY HOSPITAL" It was carried out over 6 months i.e. from August 2024 to January 2025. A total of 120 samples has been observed in out- patient of orthopedic department. Results of T-Score by using BMD machine were collected.

SELECTIONCRETERIA

INCLUSION CRITERIA

- a. Post- menopausal women
- b. Men above 50

EXCLUSION CRITERIA

- c. Men below 50 year of age were excluded
- d. Pregnancy and breast feeding women
- e. Patients taking osteoporosis preventive therapy

3. RESULTS

Based on age

The study involved 120 patients of varying ages. Among those diagnosed with osteoporosis, the age distribution was as follows: 5% each were aged 50-55 and 55-60, 16% were aged 60-65, 21% were aged between 65-70 years, 27% were in the 70-75 age range, and 26% were aged 75-80. For patients with osteopenia, the age distribution was: 15% were aged 45-50, 19% were in the 50-55 age group, 29% were aged 55-60, 18% were aged 60-65, 13% were aged 65-70, and 3% each were aged 70-75 and 75-80.

Table No 1: Percentage of osteoporosis and osteopenia based on age

Age groups	Osteoporosis	Osteopenia
45-50	0%	15%
50-55	5%	19%
55-60	5%	29%
60-65	16%	18%
65-70	21%	13%
70-75	27%	3%
75-80	26%	3%

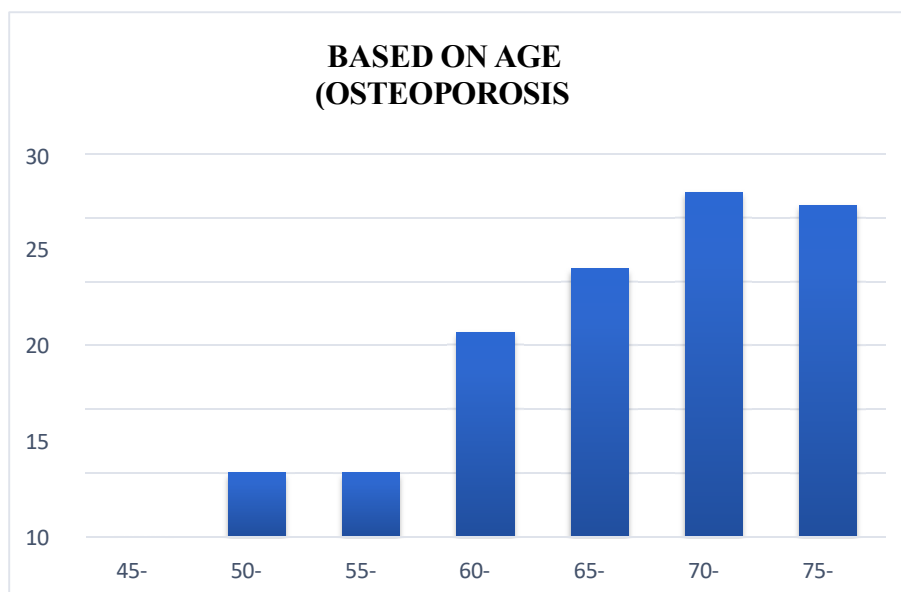


Fig 2: Bar graph showing osteoporosis based on age

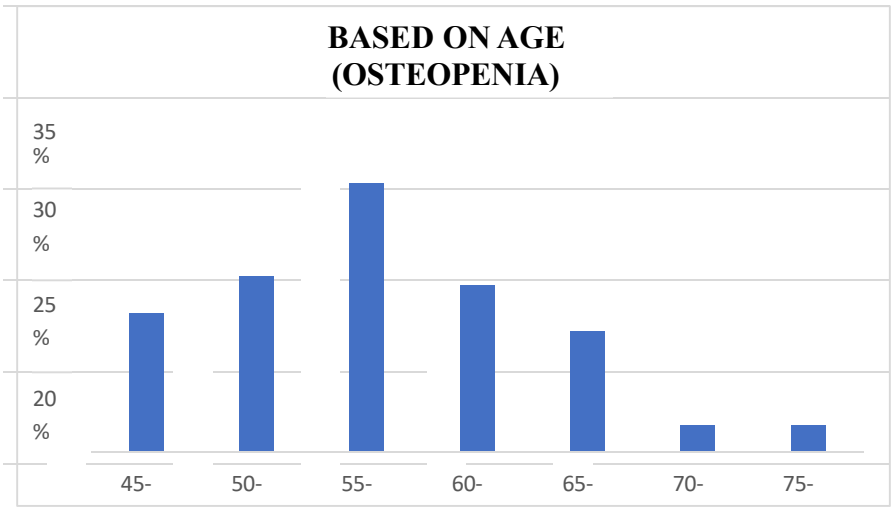


Fig 3: Bar graph showing osteopenia based on age

Based on gender

The study involved 120 patients, comprising 80 females and 40 males. Among them, 67% of the females and 33% of the males were at risk of developing osteoporosis

Table No 2: Percentage of osteoporosis based on gender

Gender	No. of patients	Risk of osteoporosis
Females	80	67%
Males	40	33%

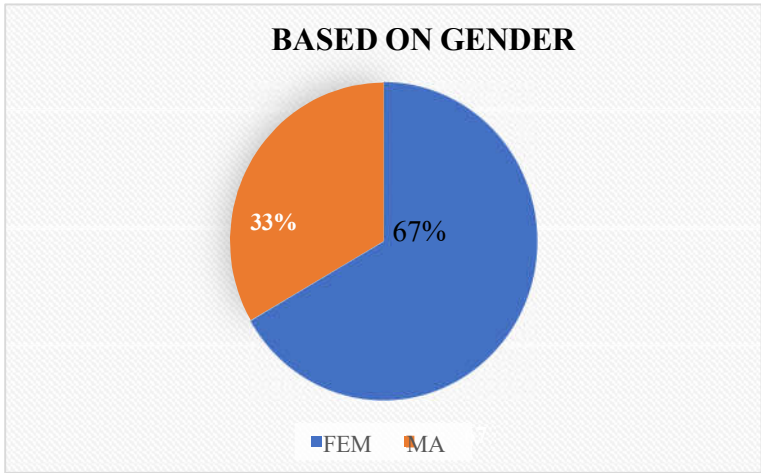


Fig 4: Pie chart showing risk of osteoporosis based on gender

Based on severity

The study presents the distribution of a sample of 120 individuals. Using T- scores, the data is categorized into normal, osteopenic, and osteoporotic groups

Table 3: Frequency and percentage of disease based on severity

Description	Frequency	Percentage
Normal	34	28%
Osteopenia	67	56%
Osteoporosis	19	16%

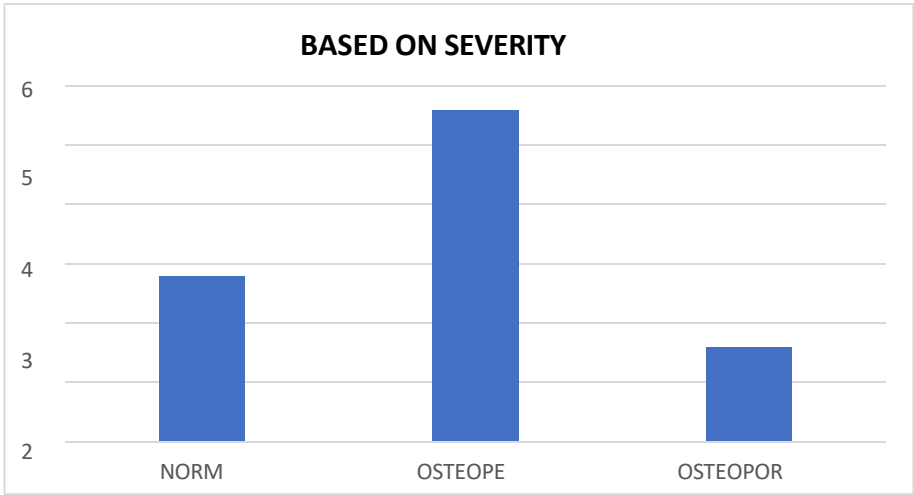


Fig 5: Bar graph showing severity of the disease

4. DISCUSSION

This research aims to minimize the risk of osteoporosis by utilizing a bone densitometer, a non-invasive and painless device that provides a quick and simple method for assessing bone density. The procedure typically involves measuring bone density at a specific location in the body, making it an efficient screening tool. However, this device is not recommended for individuals experiencing severe heel pain or deformities, as these conditions may interfere with accurate measurements. When compared to a DXA (Dual-energy X-ray Absorptiometry) scan, the bone densitometer stands out as a more cost-effective alternative, making it particularly beneficial for early osteoporosis screening in resource-limited settings.

The methodology of this study is based on the use of small, portable equipment that does not require specialized staff for operation, thus increasing its accessibility and ease of use. This makes the quantitative ultrasound (QUS) screening method a practical solution in environments where DXA scanning is either unavailable or unaffordable. QUS technology assesses bone quality through ultrasound waves, which are transmitted through the bone, providing insights into bone density and structural integrity. Although DXA remains the gold standard for osteoporosis diagnosis, QUS offers a viable preliminary screening tool, enabling healthcare providers to identify at-risk individuals and recommend further diagnostic evaluations if necessary.

For this study, data was collected from 120 patients, including both male and female participants, through an assessment of their T-scores and associated risk factors. Analysis of the data revealed that individuals between the ages of 55 and 60 are more prone to developing osteopenia, a condition characterized by lower than normal bone mineral density, which can eventually progress to osteoporosis if left untreated. Furthermore, those aged between 70 and 80 demonstrated a significantly higher risk of developing osteoporosis, a condition that weakens bones and increases the likelihood of fractures. The study also found that 67% of osteoporosis cases were identified in females, while 33% were observed in males, indicating that women are 34% more susceptible to developing osteoporosis than their male counterparts.

In India, osteoporosis and osteopenia are widespread health concerns, primarily due to inadequate intake of essential nutrients such as calcium and vitamin D. A predominantly vegetarian diet, which may lack sufficient amounts of these nutrients, further exacerbates the risk of bone-related disorders. Additionally, limited exposure to sunlight, a natural source of vitamin D, contributes to the widespread prevalence of vitamin D deficiency, weakening bone health across various age

groups. Men over the age of 50 and postmenopausal women are at an increased risk of developing primary osteoporosis, which occurs due to aging and hormonal changes. Secondary osteoporosis, on the other hand, can develop as a result of specific medications, such as corticosteroids, or underlying medical conditions, including thyroid disorders, rheumatoid arthritis, and chronic kidney disease.

Given these findings, it is imperative to promote QUS screening in healthcare facilities as an early detection strategy for osteoporosis. Early identification of individuals at risk can facilitate timely intervention through dietary modifications, supplementation, physical activity, and lifestyle changes to enhance bone health. Healthcare professionals should encourage routine screenings, particularly for postmenopausal women and older adults, to prevent osteoporosis-related fractures and improve overall quality of life. By integrating QUS as a preliminary screening tool, medical practitioners can bridge the gap in osteoporosis diagnosis, ensuring that more individuals receive the necessary preventive care and treatment before the condition progresses to a severe stage.

5. CONCLUSION

A pre-screening approach for screening of osteoporosis. Pilot research studies to assess the utilization of population-based peripheral healthcare providers for osteoporosis detection could be accomplished once population-particular explanations have been developed.

According to our findings, a postmenopausal woman or man over 50 years of age who has a QUS T-score of less than -1.40 or -1.80 on an QUS device may be at higher risk of osteoporotic fractures and should be referred for additional central DXA exams. Although the clinical diagnosis of osteoporosis may still need the measurement of bone mineral density by DXA, QUS is still superior to DXA as a clinical case-finding technique in number of ways.

Conflict of interest

The authors declare that they have no conflict of interest.

ACKNOWLEDGEMENT

The authors are thankful to Principal and staff members of Malla Reddy Institute of Pharmaceutical Sciences, Maisammaguda, Secunderabad, India, for their technical assistance and the facilities provided for carrying out this work.

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