

A Comprehensive Study on the Effectiveness of BMD Camp in the Screening of Patients for Osteoporosis

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Abstract:

Background: Osteoporosis is a major disease which has significant implications on public health. Osteoporosis is three times more common in women as compared to men. The main purpose of our study was to determine the effectiveness of BMD camp in the screening of patients for osteoporosis in males and females in the 18 – 77 years of age group.

Methodology: This was a prospective cross-sectional study carried out in the OPD of Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangalore. Apparently healthy relatives of patients attending the Orthopaedics OPD were selected. BMD was tested using calcaneal quantitative ultrasound.

Results: Out of 180 participants 62 were male and 118 were females. Out of 180 participants 35% of study participants were having normal BMD, while 42.7% and 22.2% were osteopenic and osteoporotic respectively. Out of 62 males 48.3% were having normal BMD, while 32.2% and 19.3% were osteopenic and osteoporotic respectively. Out of 118 females, 27.9% were having normal BMD, while 48.3% and 23.7% were osteopenic and osteoporotic respectively. Out of all females osteopenia is predominantly seen in 18-27 years of age group.

Conclusion: In our study it was observed that frequency of osteopenia and osteoporosis was quite significant. It is therefore necessary to create awareness among men and women in Indian subcontinent and educate them regarding preventive measures to avoid further complications secondary to osteoporosis.

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I. Introduction

Osteoporosis is defined as a progressive, systemic, skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissues with a consequent increase in bone fragility and susceptibility to fracture.⁽¹⁾ Studies have shown that bone loss start from the age of 30-40 years in both men and women. In women, it has been postulated that menopause is followed by an immediate decrease in bone mass and density within a year. This increased rate of bone loss reaches equilibrium approximately 10 years after menopause and then merges into a continuous age-related loss.⁽²⁾ While type 1 or postmenopausal osteoporosis generally occurs before the age of 65 years and affects women, type 2 osteoporosis is universal after peak bone mass has been attained and is found in both men and women.⁽²⁾ While women experience marked increase in bone loss during perimenopause and postmenopause, in men a small longitudinal bone loss is observed throughout life.^{(3),(4)} Thus women in addition to age-related bone loss also experience menopausal bone loss. Although it is said that bone loss is a universal phenomenon that starts from the time peak bone mass is achieved, most studies have assessed bone health status in postmenopausal women and men above 50 years of age. Therefore, studies in apparently healthy men and women are required.

Worldwide, it is estimated that 1 in 3 women above the age of 50 will experience osteoporotic fractures, as well as 1 in 5 men.⁽⁵⁾ India with a population of 1.2 billion people is the second most populated country in the world, with approximately 10% of population (more than 100) over 50 years of age.⁽⁶⁾ In 2013, sources estimate that 50 million people in India are either osteoporotic (T-score lower than -2.5) or have low bone mass (T-score between -1.0 and -2.5).⁽⁷⁾ Studies indicate that osteoporosis and osteopenia or low bone mass may occur at a relatively younger age in Indian population.^{(8),(9)} A study in Delhi estimated the prevalence of osteoporosis are 24.6% in men and 42.5% in women above 50 years of age.⁽¹⁰⁾

Dual-energy X-ray absorptiometry (DXA) has been established as the reference “gold standard” technique for measuring bone mineral density (BMD).⁽¹¹⁾ However, inaccessibility and high cost factor of DXA make it unavailable for the majority of Indians, resulting in very little population based research on osteoporosis in India.⁽¹²⁾

Pathogenesis: The pathogenesis of Osteoporosis is complex. In childhood and adolescent period bone formation exceeds resorption, resulting in continued skeletal growth and denser, longer and heavier bones. This

process slows down in adulthoods and peak bone mass is attained at about 30 years of age. After this, resorption begins to exceed formation. Normal bone loss averages 0.7 per cent per year. It gets accelerated at the time of menopause to 2-5 per cent per year, which may continue for upto 10 years. Since cancellous bone is much more metabolically active than cortical bone, in periods of accelerated bone loss cancellous bone loss is 3-fold greater. Osteoporotic fracture, therefore commonly occurs in vertebrae. Peak bone mass is primarily determined by genes but may be modified to a considerable extent by certain factors like physical activity, calcium, vitamin D nutrition, smoking, alcohol, concurrent illness and medications (glucocorticoids, antiepileptics).⁽¹³⁾ The level of peak bone mass is achieved at puberty is a major determinant of bone mass in later life and hence an important factor in the ultimate development of osteoporosis.

Risk factors: Human beings of all races and ethnicity are prone to osteoporosis and fracture. Several risk factors like female sex, old age, small thin built, Caucasian/Asians, genetic factors or family history of Osteoporosis. Important modifiable risk factors include Calcium and Vitamin-D deficiency, sedentary life style, smoking, excessive alcohol and caffeine intake, androgen/estrogen deficiency, poor health.⁽¹⁴⁾

Medical conditions like hypogonadism, thyrotoxicosis, Cushing syndrome, anorexia nervosa, malabsorption syndrome, chronic liver and renal disease, drugs like glucocorticoids and anticonvulsants, and chronic inflammatory conditions like rheumatoid arthritis may lead to secondary osteoporosis.⁽¹⁵⁾

II. Materials and Methods

This was a prospective cross-sectional study carried out in 180 apparently healthy peoples ages 18 – 77 years, attending routine health check in the OPD of Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangalore. The study was approved by the Institutional Ethics committee. The exclusion criteria were a.) Age < 18 years b.) Pregnant ladies c.) Fracture within the past 12 months d.) Prolonged immobilization in the past 12 months e.) Medical conditions like hypogonadism, thyrotoxicosis, Cushing syndrome, anorexia nervosa, malabsorption syndrome, chronic liver and renal disease, drugs like glucocorticoids and anticonvulsants, and chronic inflammatory conditions like rheumatoid arthritis that may lead to secondary osteoporosis.⁽¹⁵⁾

Dual Energy X-ray Absorptiometry (DEXA) is the Gold standard for measuring Bone Mineral Density (BMD); however, Quantitative Ultrasound (QUS) is reliable and cost-effective alternative, which was used in this study and many other similar studies.⁽¹⁶⁾⁽¹⁷⁾⁽¹⁸⁾ BMD was tested using Calcaneal Quantitative Ultrasound (BMD SONOST 3000) machine (Fig – 1). Quantitative Ultrasound of Calcaneus was used to calculate the BMD of right heel. Machine converted the BMD values into T-scores. According to the recommendations of World Health Organization (WHO), T-score < -1 was considered normal; T-score -1 to -2.5 was considered Osteopenia and T-score > -2.5 was considered Osteoporosis.

III. Observation and Result

A total of 180 participants were included in the study. The results are summarized in Tables and in Bar diagrams. Out of 180 participants 62 were males and 118 were females.

Out of 180 participants 35% of participants were having normal BMD, while 42.7% were osteopenic and 22.2% were osteoporotic. Out of 180 participants 83 (i.e., 46.6%) were of the age group of 18-27 years.

Out of 118 females, results reflected that 27.9% of study participants were having normal BMD, while 48.3% were osteopenic and 23.7% were osteoporotic. According to age group, osteopenia is predominantly seen in 18-27 years, which contributes about 50.7% of female age group under study.

Out of 62 males, 48.3% were having normal BMD, while 32.2% were osteopenic and 19.3% were osteoporotic.

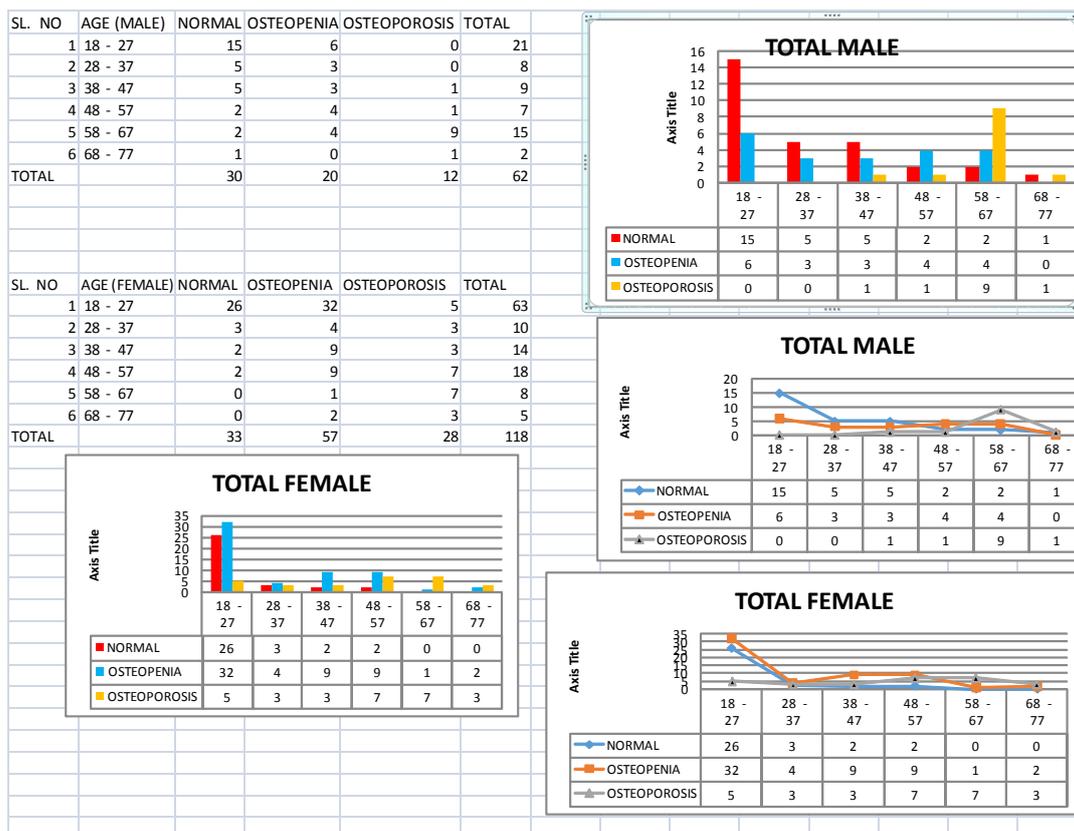


Fig - 1. Calcaneal Quantitative Ultrasound (BMDSONOST3000) machine

IV. Discussion

Osteoporosis is one of the most common causes of pathological fracture in our country. The purpose of the study was to know the age group predominantly affected by osteoporosis and osteopenia, so that the probable causes can be identified. Once the causes are known the preventive measures can be taken.

From our study it was noted that osteopenia is predominantly seen in females of 18-27 years age group, while osteoporosis is more predominantly seen in age group of beyond 48 years. But osteopenia was also noted in females of 18-27 years age group. This suggested that it is not just physical inactivity but the hormonal changes occurring in the body also contributes to osteoporosis. In males, osteopenia is predominantly seen in age group of 18-27 years while osteoporosis is predominantly seen in age group of 58-67 years, suggesting that hormonal changes with physical inactivity were the contributing factors.

The present lifestyle has less of physical activity, the games played are not physically exercising to the body, and the diet especially the non-vegetarian food contains anabolic steroids used to increase the bulk of meat by the meat industry.

Mental stress leading to release of steroids within the body, which is also the important factor contributing to osteoporosis. The increased evidence of smoking and alcohol consumption by both sexes are all be the contributing factors for osteoporosis.

Preventive measures that could be taken to avoid osteoporosis are:

1. Nutritious diet and avoiding junk foods which contains food fats (if possible cultivating vegetables and fruits at our own home or terrace farming could be a viable alternative). Avoiding farm grown chicken or meat and encouraging home grown chicken or meat could be a viable alternative.
2. Mental relaxation in the form of games which involve physical activity and are played outdoor so that there is adequate exposure to sun-light.
3. Avoiding stress at the work place and at homes by spending healthy social time with family and colleagues.
4. Physical exercises like yoga cannot only give adequate physical exercises to the body but also provide mental relaxation and thus help to reduce the mental stress and indirectly steroid release in the body.

Even though the mass screening of the population with BMD method is cost effective, people confirmed to be suffering from osteoporosis or osteopenia by this method should be subjected to DEXA scan. Thus we are minimizing mass expenditure for the detection of osteoporosis and osteopenia in the general population.

V. Conclusion

In our study the frequency of osteopenia and osteoporosis was found in young adults and elderly. It appears, that overall Indians have poor bone health and osteoporosis is common in India. Peak bone mass achieved during puberty is a strong predictor of development of osteoporosis in later years. High prevalence of vitamin-D deficiency in India is a major contributor to low bone mass. As a public health measure, it is necessary to create awareness among men and women and encourage children to drink milk and other calcium rich foods and play outdoor rather be in the physically inactive and play games with other electronic accessories. This will ensure adequate calcium intake, vitamin-D synthesis, and exercise. These three are the crucial elements in determining peak bone mass. For the young-aged, middle aged and elderly, early detection and treatment of osteoporosis with available medications can significantly reduce the risk of fractures and associated morbidity and mortality.

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