Original article

Fixed Day Approach in Detection of Osteoporosis and Osteopenia in a Medical College using Bone Mineral Density T-score

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Abstract

Background: Osteoporosis is a major public health problem, associated with substantial morbidity and socio-economic burden. An early detection can help in reducing the fracture rates and overall socio-economic burden in such patients. **Aim:** To study the outcome of fixed day approach of detection in osteoporosis cases in the Dept. of orthopaedics. **Materials and methods:** A total number of 359 subjects were screened under clinical and portable heel ultrasound bone densitometer examination (calcaneal QUS) in dept. of orthopaedics of Sri Siddhartha Medical College, Tumakuru on world osteoporosis day October 20th 2016. Then the subjects were categorised into osteopenic, osteoporotic and severely osteoporotic using Bone Mineral Density (BMD) T Score. The diagnosed severely osteoporotic subjects were admitted and treated symptomatically. **Results:** The result suggested that a substantial female population had osteopenia and osteoporosis after the age of 45 years. **Conclusion:** A substantial population was screened for osteoporosis and osteopenia using calcaneal QUS method utilizing same World Health Organisation (WHO) T-score criteria that otherwise shall remain undiagnosed and face the complications.

Key words: BMD-T score, osteopenia, osteoporosis, calcaneal QUS.

Introduction

Osteoporosis is a disease characterized by reduction in the bone mass and disruption of bone architecture leading to impaired skeletal strength and an increased susceptibility of fractures.[1]

It is a major public health problem associated with substantial morbidity and socio-economic burden worldwide.[2] Moreover, the proportion of elderly population is rapidly increasing in the developed as well as the developing world, which increases concern among aging population and public health workers regarding disability, dependence, associated economic and social problems that are caused by osteoporosis. Osteoporosis does not have a dramatic clinical presentation except when fractures result. As age advances, the incidence of osteopenia and osteoporosis increases.[3]

Measuring the bone density remains the only important tool in the early diagnosis of osteoporosis, so that effective preventive and therapeutic measures can be initiated at the earliest. The gold standard for measuring bone density however is the Dual energy X ray absorptiometry (DEXA), useful tool for both the axial and appendicular skeleton, as the detection rate of osteopenia and osteoporosis is higher with it in comparison to calcaneal quantitative ultrasound (QUS) method.[4]

But the commonest used modality of measuring bone density still remains to be calcaneal QUS.[5] It has gained the importance in the situation where tool like DEXA are not available, since, calcaneal QUS is cost effective.[6]

Although, similar studies evaluating bone status in women from outside and within India are present in the literature, data is scanty from this region.[7-13]

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Materials and methods

The present prospective, cross sectional hospital based study included healthy population of men and women. A total number of 359 subjects were screened under clinical and portable heel ultrasound bone densitometer examination (calcaneal QUS) in Dept. of orthopaedics of Sri Siddhartha Medical College Tumakuru on world osteoporosis day October 20th 2016 (Figure 1). Then the subjects were categorised into osteopenic, osteoporotic and severely osteoporotic using BMD T Score (Figure 2). Severely osteoporotic cases were admitted. A total of 359 subjects including men and women were enrolled and distributed in the following age groups: less than 30 years, 31-44 years & more than 45 years. An informed written consent was taken from all the subjects who participated in the present study.

Systemic diseases like renal and hepatic disorders rheumatoid arthritis, endocrine disorders like thyrotoxicosis, hyperparathyrodism, Addison's disease, Cushing syndrome and prolonged immobilization and women with oophorectomy were excluded from the study. Women on long term medication affecting the bone turnover (steroids, heparin, warfarin, thyroxine, hydrocortisone, phenytoin sodium, hormonal replacement therapy) were also strictly excluded. The exclusion was based on the clinical examination and if required specific investigations were carried out. The questionnaire included information on socio-demographic, personal habits, obstetrics, menstrual and medical history. The bone mineral density was measured at the calcaneus by QUS and T-scores were calculated based on WHO criteria (Table 1).[14]

Figure 1: Detection of BMD by calcaneal QUS method

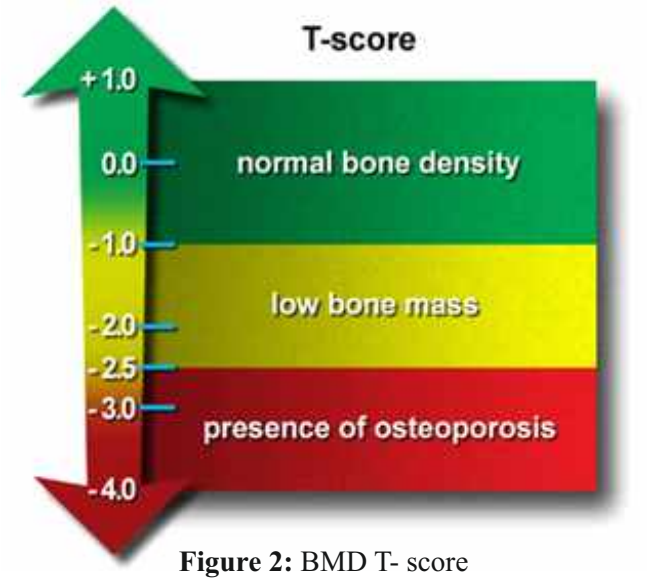

Figure 2: BMD T- score

Although, the use of the WHO T-score thresholds of -2.5 for osteoporosis and -1.0 for osteopenia may be

Table 1: World Health Organization definitions based on bone density levels

World Health Organization Definitions Based on Bone Density Levels	
Level	**Definition**
Normal	Bone density is within 1 SD (+1 or −1) of the young adult mean.
Low bone mass	Bone density is between 1 and 2.5 SD below the young adult mean (−1 to −2.5 SD).
Osteoporosis	Bone density is 2.5 SD or more below the young adult mean (−2.5 SD or lower).
Severe (established) osteoporosis	Bone density is more than 2.5 SD below the young adult mean, and there have been one or more osteoporotic fractures.

inappropriate at skeletal sites other than the spine, hip and forearm or when other modalities, such as quantitative ultrasound (QUS) are used.[15,16] QUS yields a lower incidence or prevalence of osteoporosis if this WHO T score is applied. Although studies are present suggesting alternate equivalent T score with calcaneal QUS method, but there is lack of any clear strategies or appropriate equivalent T score thresholds, hence QUS screening using same diagnostic criteria can at least confirm or rule out osteoporosis.[15,16]

Statistical analysis was performed with the help of computer software Epi-Info. The statistical significance among category variables was assessed by the use of chi square test for trend. P value of <0.05 was considered statistically significant.

Table 2: Distribution of BMD-T score among study population

T score interpretation	Men	Women	Total (%)
Normal	67	98	165 (45.96)
Osteopenia	20	102	122 (33.98)
Osteoporotic	07	60	67 (18.66)
Severe osteoporotic	00	05	05 (1.39)
Total population	94 (26.18%)	265 (73.81%)	359(100)

RESULTS

A total of 359 subjects belong to different age groups and both sexes were enrolled in the present study. The most common age group was less than 30 years (171) followed by 31-44 years (110) and ≥ 45 years (78). 73.8% were females and 26.2% were males.

Out of 359 subjects, 165 had normal T-score. Remaining were grouped as osteopenic (122), osteoporotic (67) and severely osteoporotic (5). (Table 5)

Discussion

The incidence of osteoporoticin the present study was (18.66%) and severe osteoporotic (1.39%) with maximum number of osteopenia was (33.98%).

Although the results of present study in comparison to the various studiesclearly reflect the under diagnosis of osteoporosis by QUS in comparison to DEXA, but QUS still remain the commonest modality of measuring bone density of cancellous bone (peripheral bone measurement) in the heel, with advantage of low cost, lack of radiation and portability.[8-12]

The incidence indicated in the present study may not be the true incidence of the population as QUS yield a lower incidence or prevalence of osteoporosis if the same WHO T score is applied.[15,16]

However, QUS screening conclusively confirms or rules out osteoporosis or osteopenia in any population.

The present study has some limitations less number of patients were screened over a single day. QUS method may be used for osteoporosis screening but confirmation of osteoporosis may be done on the basis of DEXA or bone resorption markers, which were not carried out in the present study.

Conclusion

The present study suggests that calcaneal QUS method utilizing same WHO T score criteria is an alternative screening tool because of the low cost, feasibility and help in identifying osteopenia and osteoporosis in a substantial population who otherwise shall remain undiagnosed and face the complications.

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Conflicts of interest: Nil

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