

ORIGINAL RESEARCH

Cross sectional study to determine the prevalence of osteoporosis and osteopenia in disabled population of Thiruvarur District, Tamil Nadu, India by calcaneal quantitative ultra sound method

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ABSTRACT

Introduction: Osteoporosis is a skeletal disorder characterized by Low Bone Density and Micro architectural deterioration of bony tissue. This results in increased fracture risk. Most of the studies were done to identify Osteoporosis Prevalence in normal population in India and Worldwide. Our study was carried out to analyse the Prevalence of Osteoporosis and Osteopenia in disabled population. This is the first study in the World and also in India. As per the census 2011 in India out of 121 crore population, about 2.68 crore are disabled which is 2.21% of total population. Among the disabled population 56% are male and 44% are female. 69% are disabled residing in rural area. Locomotor disability percentage in India is about 20%. **Materials & Methods:** The main purpose of this clinical study was to determine the prevalence of Osteoporosis and osteopenia in disabled people attending the free BMD camp conducted in Department Of Physical Medicine and Rehabilitation, Government Thiruvarur Medical College Hospital, Thiruvarur, Tamil Nadu in association with Department of Orthopaedics in Government medical colleges and compare the BMD (Bone Mineral Density) in relation to modifiable and non-modifiable risk factors by doing calcaneal Quantitative Ultra Sound Method. **Results:** Out of 142 cases 55% were Osteoporotic and 38% were Osteopenia and 7% were normal. In disabled with hypertension 90% were Osteoporotic and 10% were Osteopenia. In disabled with diabetes 100% were Osteoporotic. In post-polio Residual paralysis 86% were Osteoporotic and 14% were Osteopenic. In myopathy 90% were Osteoporotic and 10% were Osteopenic. In amputee 83.4% were Osteoporotic and 8.3% Investigate were Osteopenia and 8.3% were normal. In stroke 93% were Osteoporotic and 7% were Osteopenia. We found that 7% of disabled people were normal and 55% were osteoporotic and 38% were osteopenic. **Conclusion:** Affected people were advised to take calcium and vitamin D3 tablets and advised to do physical exercise and to follow dietary habits.

Key words: BMD, calcaneal QUS, osteopenia, osteoporosis, disabled, tobacco, steroids

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INTRODUCTION

In Osteoporosis bone mass per unit volume is reduced that results in fractures and other complications. WHO (World Health Organization) has defined Osteoporosis as BMD > 2.5 Standard Deviations below the young normal mean. Osteopenia is defined as BMD between 1 and 2.5 Standard Deviations below the young normal mean. Normally in men and women the combination of age and reduction of

physical activity contributes to the development of Osteoporosis¹. Physical inactivity is one of the risk factor for Osteoporotic fractures. In disabled people their physical activity are less than that of normal people. So this Osteoporotic related Complications leads to loss of functional capability might result in depression and low esteem in disabled population. In India and Tamil Nadu <3% population are disabled. They have difficulties in ambulation and ADL

activities and financial burden. It is must to do regular Osteoporotic screening by calcaneal Ultra Sound Method in disabled people². We can prevent further disabilities in the disabled population by giving proper health advices, calcium and vitamin D3 supplements and life style modifications. Bone Mineral Density (BMD) is an important factor linked to bone health and fracture risk³. It is well known that BMD in the United States and European Caucasian groups is higher than that in the Asian populations. However, with the rise in Asian population, it is predicted that Asian countries will be progressively increasing in the incidence of fractures and more than half of all fractures around the world will occur in Asia by 2050. Many studies have indicated that Quantitative Ultrasound Scan (QUS) has emerged as a new and adequate tool that offers an alternative or adjunct to Dual energy X-ray Absorptiometry (DXA) for screening and assessing the peripheral skeleton status⁴. Thus, QUS accurately predicts the relative risk of all fracture risks similar to that from DXA measurements of the hip and spine. Moreover, there were many studies that had shown that the T-score resulting from the QUS method were correlated with the T-scores resulting from the DXA method. Furthermore, QUS parameters reflect BMD, as well as, other mechanical characteristics of the bone, such as elasticity, microarchitecture and strength. In addition, QUS can discriminate between individuals with a low risk and high risk of having abnormal BMD in the clinical setting⁵. According to the recommendations of the International Society for Clinical Densitometry, the calcaneus (heel) is the only ideal validated anatomic site for bone mass screening using QUS method because it is weight-bearing and trabecular rich⁶.

MATERIALS AND METHODS

After the institutional ethical committee clearance this study was carried out. In this clinical study the disabled people of Thiruvavur District were subjected to do BMD (Bone Mineral Density) measurement by Quantitative ultra Sound method. Bone mineral density assessment was done on right Calcaneus using the quantitative ultrasound machine by a trained technician. This technique uses the ultrasound waves

and measures the broadband ultrasound attenuation (BUA) (dB/MHz) and the speed of sound (SOS) m/sec in the centre of the bone. The device then combines the values of BUA and SOS to yield a parameter known as 'quantitative ultrasound index (QUI), which is expressed as T score.

INCLUSION CRITERIA

1. Male and female between 10 years to 70 years.
2. Diabetic patients.
3. Hypertensive patients.
4. Stroke patients.
5. Post-polio residual paralysis patients.
6. Myopathy patients.

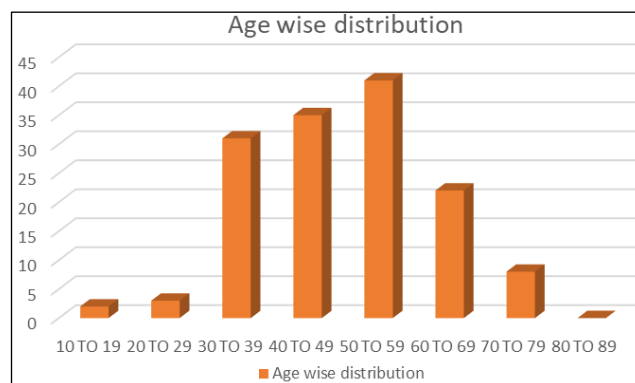
EXCLUSION CRITERIA

1. Bed ridden patients.
2. Patients with GCS < 8
3. Age < 10 years.
4. Amputation patients.
5. Right above knee/below knee amputee.

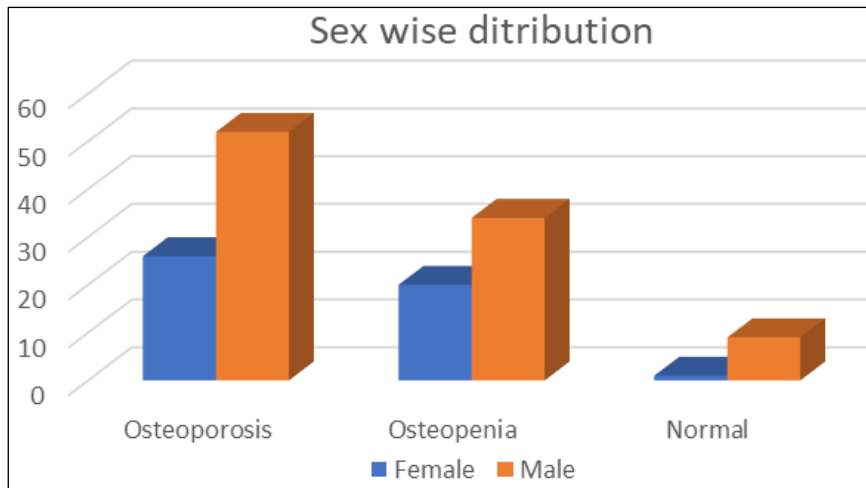
Calcaneal Quantitative ultra Sound is more reliable, most cost effective which was being used in this study. This equipment itself converts the BMD value into T SCORE. All good clinical practice guidelines (GCP) were followed. Clinical details about diabetes, hypertension, muscular disorder, amputation, stroke, post-polio were recorded. These results were tabulated and analysed statistically. Test of significance (CHI-SQUARE TEST and Z TEST) were applied whenever necessary. Osteoporosis and Osteopenia distribution in disability.

RESULT

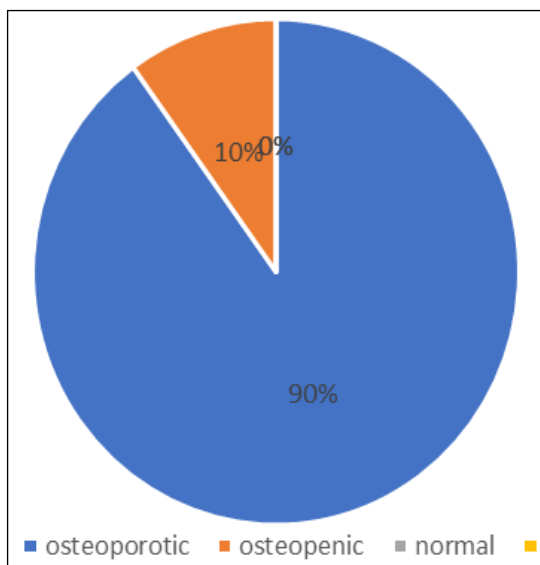
Out of 142 cases 55% were Osteoporotic and 38% were Osteopenia and 7% were normal. In disabled with hypertension 90% were Osteoporotic and 10% were Osteopenia. In disabled with diabetes 100% were Osteoporotic. In post-polio Residual paralysis 86% were Osteoporotic and 14% were Osteopenic. In myopathy 90% were Osteoporotic and 10% were Osteopenic. In amputee 83.4% were Osteoporotic and 8.3% Investigate were Osteopenia and 8.3% were normal. In stroke 93% were Osteoporotic and 7% were Osteopenia.



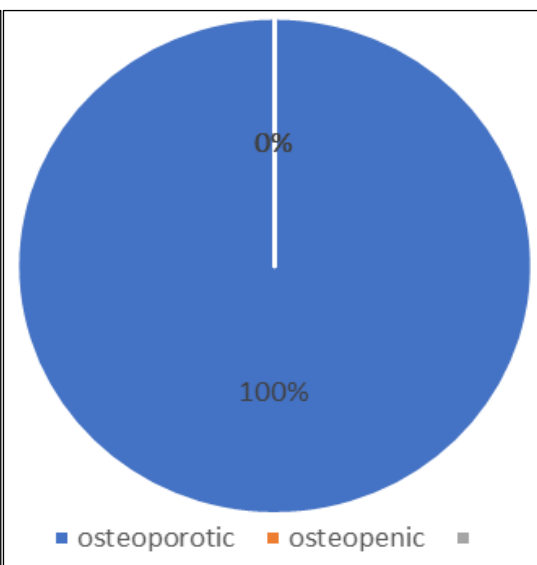
Graph1: Age wise distribution



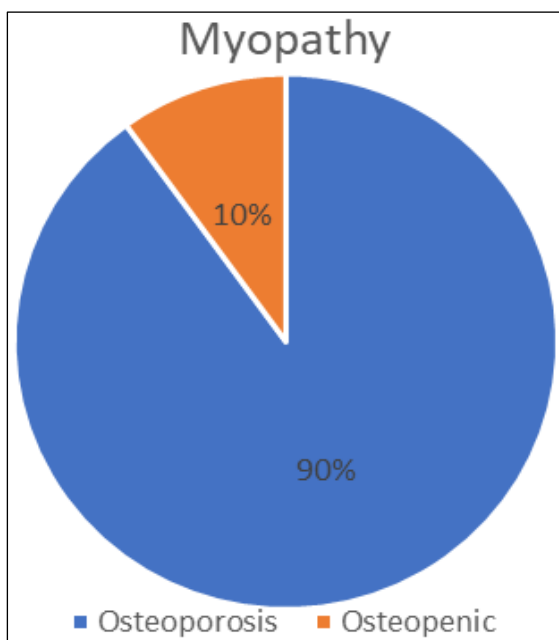
Graph2: Sex wise distribution



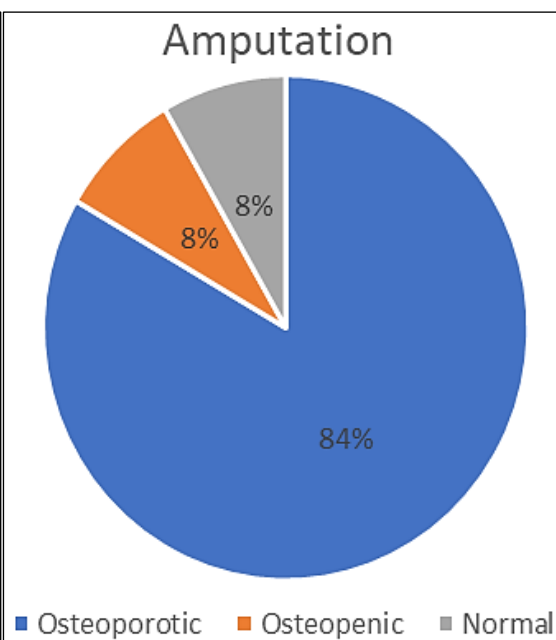
Graph3: Disabled with hypertension



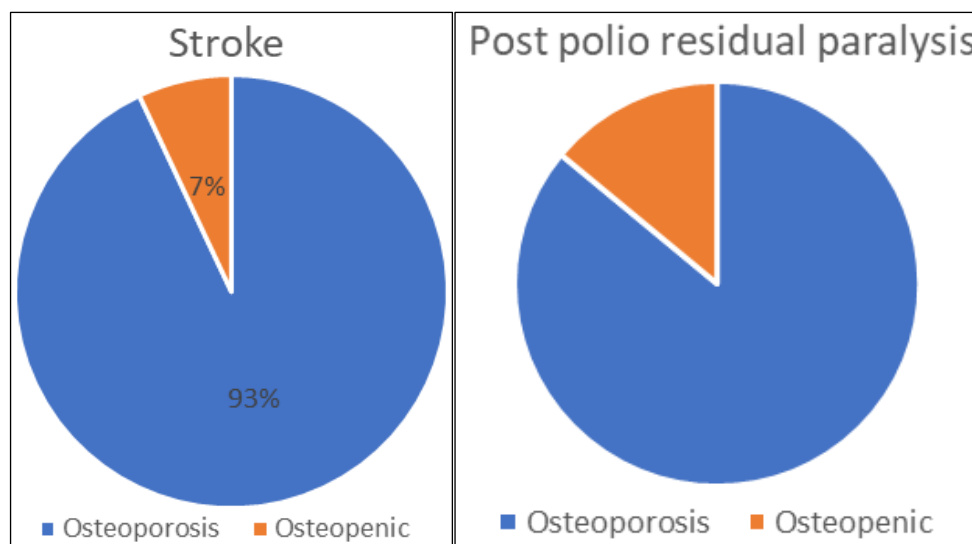
Graph4: Disabled with diabetic



Graph5: Myopathy



Graph 6: Amputation



Graph 7: Stroke

Graph 8: Post-Polio Residual Paralysis

DISCUSSION

The prevalence of osteoporosis is high in our part of the world, among our study participants 32.6% female and 24% male were osteoporotic, other studies conducted in this area showed similar results. A preliminary survey done in India our neighboring country, reported that the prevalence of osteoporosis and osteopenia among Indian women at the age of 45 is 20.3% and 36.8% respectively and this prevalence increases to 100% after 65⁷. In world Wide Osteoporosis causes more than 8.6 million fractures annually in normal population. Osteoporosis Prevalence is more in developing countries. In normal population Osteopenia Prevalence is more than Osteoporotic Prevalence. In our study Osteoporotic prevalence is more than osteopenia Prevalence in disabled population. Osteoporosis affects all age groups in both sexes. So far no cross sectional study done to determine the prevalence of Osteoporosis in disabled population. It is easy to measure BMD by Quantitative ultrasound method in disabled population also⁸. We found that from our study Osteoporosis are more prevalent than osteopenia in the disabled population of Thiruvarur District. This is the ideal time to treat the high risk cases and to prevent major disability in the disabled. Smoking is one of the most important modifiable risk factor for human health⁹. One of the meta analysis on smoking and human health concluded that current smokers at the age of 50 will have decreased bone mass and increased risk of fracture, ex-smokers have the intermediate risk between non-smokers and current smokers, even the intrauterine exposure of tobacco smoke is associated with retarded skeletal growth leading to increased risk of fracture in future. Calcium and vitamin D are important factors for strong bones¹⁰. Lack of adequate Calcium intake is an established risk factor for osteoporosis; our study participants were not taking sufficient amount of dietary calcium or calcium supplements. Regular intake of calcium supplements for one year by Indian

women is a protective factor for osteoporosis a study says. Females in our study were mostly taking oral form of tobacco and male were involved in both smoking and oral tobacco¹¹. Serum cotinine, a tobacco exposure marker is a risk factor for decreased bone mineral density. A study conducted on multi ethnic groups of women above 60 showed that smokeless tobacco is associated with low bone mineral density. Steroids induced osteoporosis is well known and number of studies has confirmed this relationship. In our study 10% of the participants were currently taking or has taken steroids (both oral and inhaled) for more than 3 months in their past¹². The dose for oral steroids was defined to be more than 30 mg as defined by international Osteoporosis foundation but the dose for inhaled steroids was not specified. This intake was significantly associated with low bone mineral density. Prescription of these drugs must be justified, and whenever prescription is indicated for a longer duration, risk factor assessment for osteoporosis should be done¹³. Osteoporosis is a silent disease and mostly fracture is the first symptom to mark the disease. In our study past history of low trauma fracture among our participants as the first symptom of decrease was significantly associated with osteoporosis. History of fracture in one or both of the parents was positive in 20.8% and was significantly associated with osteoporosis. Family history of osteoporosis is an independent risk factor for osteoporosis and this risk increases if two or more first degree relatives gave a positive history. More studies are necessary to evaluate family history as a suitable and economical tool for identifying women at risk of osteoporosis and for promoting the adoption of preventive behaviours^{14, 15}.

CONCLUSION

The growing knowledge on the physical mechanisms related to the ultrasound characterization of bone tissue and the clinical application of QUS methods have shown that these techniques are a useful tool to

assess integral bone mineral status and fracture risk in children. Our study is unique in the way that it did not exclude patients who were taking medication known to influence bone metabolism, i.e. AEDs, and who were of limited mobility. Consequently, it is difficult to compare study results to other studies. Some factors specific for our study population may have affected test results. In order to offer a familiar surrounding and to reduce the need for travelling (for some patients a very stressful event), measurements were done at the residential facility. Moreover, anatomical defects made interpretation of scans difficult in some cases. On the other hand, medication compliance (to bisphosphonates) is considered high in this population, since the caregivers administer all medication. We found that 7% of disabled people were normal and 55% were osteoporotic and 38% were osteopenic. Affected peoples were advised to take calcium and vitamin D3 tablets and advised to do physical exercise and to follow dietary habits.

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