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AN EXPERIMENTAL STUDY ON BONE MINERAL DENSITY AMONG SEDENTARY MEN

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of subjects in 70-80. There was significant trend of decreasing bone mineral density with increasing age. The ageing process increases the influence on the osteoporosis and osteopenia of the male. The subjects with low bone mineral density have to undergo dual energy absorptiometry (DEXA) scan in order to confirm the diagnosis.

KEYWORDS: Bone mineral density, osteopenia and osteoporosis.

ABSTRACT

Osteoporosis is one of the leading causes of fracture and disability. The data for the study was undertaken to determine osteoporosis through bone mineral density among the population in salem city, Tamil Nadu, India. For the purpose of the study a total of 254 male subjects aged (30-80) were engaged. The Bone mineral density was measured at the calcaneus by Quantitative Ultra Sound (QUS) method and T – score values were compared with world health organization (WHO) criteria and classified as normal or osteopenia / osteoporosis. The present study

reports that the bone mineral density among the sedentary men of the subjects were found to have a significant level ($P < 0.05$) of osteopenia 42.92% and 2.36% of osteoporosis. Among the study participants 54.7% were certainly neither osteoporotic nor osteopenia. A total of 115 subjects low bone mineral density screened of which 12.17% of subjects were belonging to the age group of 30-40 years and 18.26% of subjects were falling under 40-50 years. The maximum number of subjects in the study population that is 29.57 was found to be between 50- 60 years. In the age group of 60-70 years, there are 26.09% subjects and 13.91%

INTRODUCTION

In today's lifestyle, usage of advanced technology like computers, mobile, televisions and cars, most people do not have sufficient time to do physical exercise and proper diet to maintain adequate health. In reality, many people have become so inactive; that their method of lifestyle has become a serious threat to their health. Physical inactivity has become the global pandemic. About 5.3 million deaths per year worldwide; 1/3 of the world's adult people are unsuccessful

in achieving the suggested 150 min per week of physical activity (PA). In addition to the lack of prevention of non-communicable diseases leads to premature mortality which is 9% (Lee et al, 2012).

Osteoporosis is considered as serious health problem seen in the elderly especially in a rural. (Ford,Bass,Zhao, Bray, & Zhao, 2011). In elderly men, osteoporosis, and osteoporotic fractures are a significant cause of disability and mortality (Johnell&Kanis 2006). The United States Library of Medicine has confirmed it as the most familiar type of bone disease that has become a silent epidemic (Nazarko, 2011) and recognized as a major health problem throughout the world (HimaBindu& Naga Anusha, et al, 2011).

The publications on osteoporosis released on World Osteoporosis Day, October 20, 2004 by International osteoporosis foundation aims to highlight the relatively unobserved issue of osteoporosis in men, show how men bones are different from women bone, looks at challenges in awareness, diagnosis and treatment, and suggested the steps should be taken so osteoporosis can prevent fractures in men. Traditionally it has been thought of as a women's disease, in the last decade bone loss is also a predictable consequence of ageing in men has finally emerged. Even though fragility fractures are less common in men than in women, when fracture occur, it is associated with high morbidity and death than in women (Center et al., 1999). Because of the lack of awareness about osteoporosis and fractures as a disease in men is alike to the lack of awareness in women 50 years ago.

Men do not realize that the 'silent epidemic' of osteoporosis affects them and their bones are becoming thinner and more porous and frail during adult life. (Bindu et al, 2010). Bone mass achieved during growth to young adulthood is lost just under half over a man's lifetime. The loss of bone is the same as the quantity lost in women but men compensate better by placing down more new bone on the exterior surface of the bone as part of the natural process of bone remodelling (Seeman, 1995). However, this addition of new bone on the exterior surface does not completely compensate for the loss of bone in inside surface and so one in five men over 50 will have a bone fracture that decreases the quality of their lives, and lessens the length of their lives (poor,1995).

BONE FORMATION

Bone formation, also known as ossification or osteogenesis, is driven by the osteoblast cells that produce bone. Osteoblasts surrounded by the mineralized matrix become osteocytes. Thereafter osteoclasts appear and the remodelling process begins. The remodelling process converts immature woven bone into mature lamellar bone and furthermore resorbs and replaces mature lamellar bone.

BONE MODELLING AND REMODELLING

Modelling occurs when bone resorption and bone formation happen on separate surfaces (i.e. formation and resorption are not coupled). In general, during modelling the shape of the bone is altered. Bone modelling occurs during birth to adulthood and is responsible for gain in skeletal mass and changes in skeletal form (International Osteoporosis Foundation 2015). Remodelling is referred as turnover, is process of replacing existing bone matrix with new bone matrix This generally occurs in the adult skeleton to maintain bone mass (Anderson, 1991).

AGE RELATED BONE LOSS

After attaining the peak bone mass there is a progressive loss of bone (Hui,Slemenda and Johnston 1990;Kelly et al, 1995;Heaney et al,2000). The age related bone loss can be attributed to a number of age related factors including malnutrition, reduced levels of sex hormones, heritability, inactivity, medications, and diseases causing secondary osteoporosis (Rosen, 2005). When the loss of bone starts in men, they lose approximately 1% of their bone mineral density per year as they age (Hannan, 2000).

OSTEOPOROSIS

According to the National Osteoporosis Foundation, "osteoporosis, or porous bone, is a disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased susceptibility to fractures, especially of the hip, spine and wrist, although any bone can be affected." A hip fracture can impair a person's ability to walk unassisted and may cause prolonged or permanent disability or even death".

The condition, osteoporosis is identified in which bone mass decreases gradually and painlessly, resulting in weak, fragile, brittle bones which are prone to fractures (Germano, 2000).

Bone mineral density peaks before the age of 30 after which it slowly decreases (National Osteoporosis Foundation 2005). Osteoporosis is diagnosed by a DXA (Dual-energy X-ray absorptiometry) scan which measures bone mineral density (National Osteoporosis Foundation, 2002). This provides a T Score, which is the measurement used to assist in determining whether or not an individual has osteopenia or osteoporosis.

Normal	T Score Higher than -1
Osteopenia	-1 to -2.5
Osteoporosis	-2.5 or lower

It is worth noting that a T score of less than -1 does not necessarily mean that an individual's bone density is decreasing. An individual may naturally have decreased bone density and may have had so for their entire life. Further testing should be conducted to and compared to the original T score for further clarification (Schousboe et al, 2007).

SELECTION OF AREA AND SUBJECT

For the purpose of the study a total of 254 male subjects aged 30-80 years were randomly selected from Salem and surrounding communities to participate in this cross-sectional investigation of bone health and nutrition. The screening of bone mineral density was carried out at Mahatma Gandhi stadium.

ASSESSMENT OF BONE MINERAL DENSITY

As Quantitative Ultrasound CM 400 is apt for measurements at the field level, this was used for measurement of the bone mass for the selected subjects with the help of well-trained specialists under the supervision of ortho surgeons. The results attained were compared with the standards given by IOF (2012) for classification as either normal or osteopenic or/osteoporotic.

RESULT AND DISCUSSION

Table - I: Distribution of age among the selected subjects

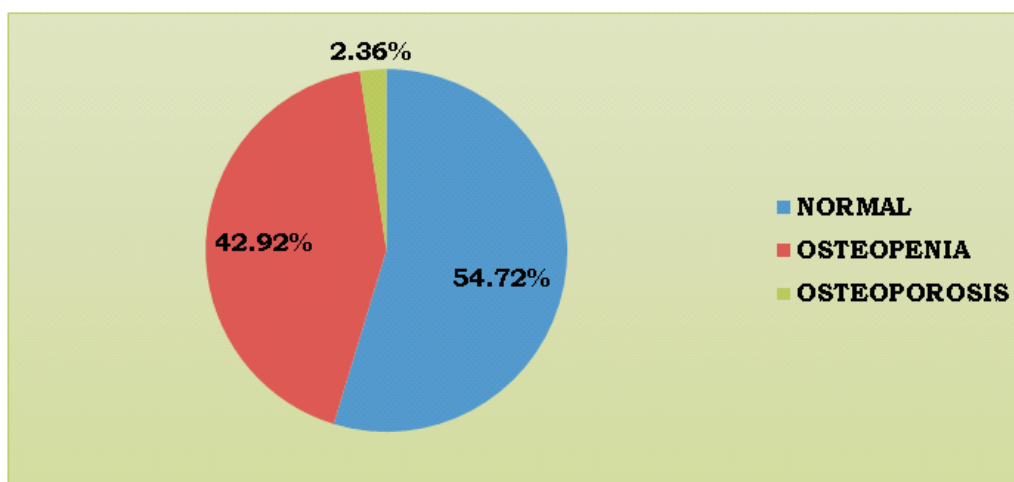
Age Group	Frequency	Percentage
30-40	28	11.02
40-50	66	25.98
50-60	88	34.65
60-70	48	18.9
70-80	24	9.45
TOTAL	254	100

From the above table it is evident that 11.02% of subjects were belonging to the age group of 30-40 years and 25.98% of subjects were falling under 40-50 years. The maximum number of subjects in the study population that is 34.65% was found to be between 50-60 years. In the age group of 60-70 years, there are 18.9% subjects and 9.45% of subjects in 70-80 years.

Table: II Distribution of BMD scores indicating the levels of bone porosity.

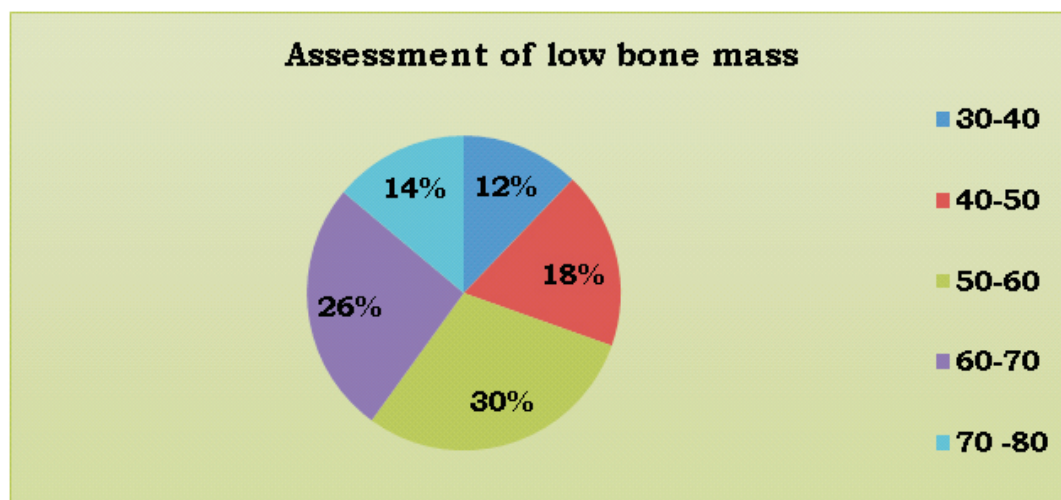
S. No	BMD Category	Number of Subjects	Mean	SD	Percentage
1	Normal	139	-0.071	±0.65	54.72%
2	Osteopenia	109	-1.482	±0.32	42.92%
3	Osteoporosis	6	-3.045	±0.41	2.36%

The present study reports that the bone mineral density among the sedentary male were found to have a significant level ($P < 0.05$) of osteopenia 42.92% and 2.36% of osteoporosis. Among the study participants 54.7% were certainly neither osteoporotic nor osteopenic.

Figure -1**Table: III Assessment of Low Bone Mass**

Age	Low BMD	Percentage
30-40	14	12.17
40-50	21	18.26
50-60	34	29.57
60-70	30	26.09
70 -80	16	13.91
Total	115	100

From the above table III, it is sensibly understood that (n= 115) of the subjects were found with low bone mineral density. It shows that 12.17% of subjects were belonging to the age group of 30-40 years and 18.26% of subjects were falling under 40-50 years. The maximum number of subjects in the study population that is 29.57 was found to be between 50-60 years. In the age group of 60-70 years, there are 26.09 subjects and 13.91% of subjects in 70 -80 years.



The study report shows that Osteopenia is the early stages of Osteoporosis and this can develop into Osteoporosis unless prevention methods are put in place. Osteoporosis can affect the whole skeleton, but the most common areas to break are the wrist, spine and hip. The disease affects all age groups and both sexes.

There was significant trend of decreasing bone mineral density with increasing age. The age processes increases the influence on the osteoporosis and osteopenia. The subjects with low bone mineral density have to undergo dual energy absorptiometry (DEXA) scan in order to confirm the diagnosis.

CONCLUSION

Reasons ascribed for lower BMD in Indians include possible genetic differences, nutritional deficiency and smaller skeletal size (Shivane et al, 2012). Bone that lasts throughout a lifetime is built during childhood and teenage. After thirty years of age, the cells that build bone are not efficient and bone progressively will be lost. Bones begin to breakdown faster than the formation of new bone (Evelien et al 2011). Exercise habits, osteoporosis knowledge, and health beliefs perceived susceptibility and seriousness, exercise barriers and benefits, and health motivation (Taggart and Connor, 1995) are lacking in the adulthood.

In the 2009, IOF Asian Audit, expert groups predicted that the number of osteoporosis patients in India was approximately 26 million in 2003, would rise to 36 million patients by 2013 (Malhotra & Mittal, 2008) but in 2013, 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).

With estimates showing that approximately 80% of the urban Indian population is vitamin D deficient (Beloyartseva et al, 2012) and hip fractures occur about a decade earlier than in western nations (Malhotra & Mittal, 2008). Indians have lower BMD than their North American counterparts (ICMR 2010). A study involving more than 3,500 subjects carried out at tertiary care center in South India to study the influence of the newly generated ICMR database (ICMRD) on the study of osteoporosis reported that a greater percentage were diagnosed as having osteoporosis as compared to the ICMR database. Osteoporosis at the spine and hip was present in 42.7% and 11.4% subjects using the database and in 27.7% and 8.3% subjects using the ICMR database (Paul et al, 2012).

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