

**Research Article****Fight and Prevent Osteoporosis - Bone Mineral Density: A Report in a Multicenter Hospital Survey, Need a Time for Action****Dr. K. Madhana Gopal<sup>1</sup>; Dr.N.Gowdhaman<sup>1</sup>, Dr. M. Meganathan<sup>1</sup>, Dr. K.Balamurugan<sup>2</sup>, Dr.J.Mohan<sup>3</sup>, Dr.D.Vijayalakshmi<sup>4</sup>**<sup>1</sup>Aarupadaivedu Medical College and Hospital, Puducherry; India<sup>2</sup>Department of Pharmacy, Annamalai University, Chidambaram; Tamilnadu, India<sup>3</sup>Velammal Medical College and Research Institute, Madurai; Tamilnadu, India<sup>4</sup>Aadhiparasakthi Dental College & Hospital, Melmaruvathur, Tamilnadu, India**\*Corresponding author**

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**Abstract:** As indicated by many authors Asian region there is emerging osteoporosis epidemic. T-scores in BMD are used to help diagnose normal bone mass, osteopenia and osteoporosis. A one day on BMD check was carried out in a multicenter hospital using dual energy X-ray absorptiometry (DXA). 55 subjects voluntarily entered the 'fight and prevent osteoporosis' camp. The mean BMD of 55 subjects were screened the mean was  $1.94 \pm 1.04$ , normal was in the range of  $0.65 \pm 0.22$  in 12 subjects; osteopenic range was  $1.60 \pm 0.35$  in 24 subjects and osteoporotic was  $2.54 \pm 0.34$  and above 3.1 range was  $3.51 \pm 0.28$  in 19 subjects. The above BMD results indicates that the prevalence was osteopenic > osteoporotic > normal in a single day clinic.**Keywords:** DXA, BMD, CaHA, QUS, pQCT and QCT.

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**INTRODUCTION**

Bone problems include osteopenia, osteoporosis, and osteonecrosis. The porous bone called Osteoporosis has decreased bone density and deterioration of the skeletal micro architecture, resulting in bone fragility occurs spontaneously. Osteoporosis may lead to fractures in the hip, spine (vertebrae) and the wrist and also Osteopenia (loss of bone minerals) is less severe than osteoporosis. Male and females nearing age 50, woman after menopause, Caucasian, Asian, person slender and lightweight. Osteoporosis occurs due to lack of calcium, vitamin D, smoking, use of caffeine, alcohol, lack of physical activity. As per National Osteoporosis Foundation recommendation an adult under age 50 need 1,000 mg of calcium and 400–800 IU of vitamin D every day and above the age, older need 1,200 mg of calcium and 800-1,000 IU of vitamin D every day[1].

Bone mineral density (BMD) is an accurate and reproducible, non-invasive way of measurement used to diagnose the low bone mass before the first fracture occurs and also it assists in intervention decisions, and in monitoring the progression or regression of osteoporosis. Techniques for measuring BMD are based on the differential absorption of the ionizing radiation, namely the dual energy X-ray absorptiometry (DXA). And also different techniques are available like

quantitative ultrasonometry (QUS), Quantitative Computed Tomography (QCT), Peripheral Quantitative Computed Tomography (pQCT)[2-4].

The WHO criteria are appropriate for assessment of BMD at the posterior– anterior spine, hip, and forearm of men and postmenopausal Caucasian women using the DXA techniques. DXA technology is quite safe. The T score compares to a healthy 25-year old person of the same sex. According to the World Health Organization criteria osteoporosis is defined as a bone mineral density T-score < -2.5 and osteopenia between -1 and -2.5 SD osteopenia by DXA is based on the fact that the risk of fracture doubles at each SD below normal in the healthy population. T-scores may be artificially low for adults with osteogenesis imperfecta who are shorter than average[5].

**MATERIALS AND METHODS****Inclusion Criteria:**

All 55 subjects voluntarily entered the 'fight and prevent osteoporosis' study a bone mineral camp conducted in a multicenter hospital, Cuddalore Dist. Tamilnadu, in collaboration with Pharmed Ltd, Chennai, Tamilnadu in the month of October 2014 and informed consent form was obtained from each subject. These patients were from rural population. Both males and females in the age group in between 30-75 were

included since it is a free camp age restriction was not done. BMD suggestive of osteoporosis and osteopenia, subjects who were able to walk with or without walking aid, women having regular menstrual cycles with at least ten cycles per year, on the birth control pill (BCP) were included into the study.

#### **Exclusion criteria:**

A history of radiation therapy or chemotherapy, traumatic fractures, intake of medications that affect bone metabolism, breastfeeding within the last year, pregnancy, major chronic diseases (Heart, intestinal, kidney, liver), bed-rest for 1 month (Chikungunya or swine flu) within 6 months prior to the study, previous surgery on the spine, hip, or forearm, undergone an imaging contrast procedure within 4 days. And also hemiplegia, Parkinson's diseases, polyneuropathy, Grade 4 osteo-arthritis, people suffering from acute illness and non-ambulatory subject were excluded in the study[6-7].

#### **Bone mineral density testing:**

The all the volunteers were then made to undergo, bone mineral density test. Bone mineral density was measured by using Dual Energy X-ray Absorptiometry (DXA). BMD densitometer measures both reflection and transmission densities. Density and opacity measured with readings that run on a scale from 0 to 4.0. Basically the instrument is a Peripheral DEXA bone densitometers (Osteotech Solutions, Mumbai, Maharashtra, India.) measured BMD in calcaneus (heel) bone, the instrument has an advantage of scanner cone beam PDEXA, the X-Ray source is stationary anode, X-Ray tube and X-Ray detector are CCD detector. The bone mineral density was measured in the form of T- score the subjects are normal if T-scores were  $\geq -1$ , osteopenic if the lowest T-score was between  $-1$  and  $-2.5$  and osteoporotic if either T-score was  $\leq -2.5$ [8].

#### **Statistics**

Analysis was carried out using the statistical package in easy calculation software. Data for participated subjects were presented as mean  $\pm$  standard deviation for variables and 'P' values were also calculated.

### **RESULTS AND DISCUSSION**

A cross-sectional study were performed in a bone mineral camp conducted in a multicenter hospital, Cuddalore Dist. Tamilnadu, in collaboration with Pharmed Ltd, Chennai, Tamilnadu, in accordance with ethical considerations. The subjects were voluntarily entered in the 'fight and prevent osteoporosis' one day camp in the month of October 2014. A total of 55 subjects in the age group of 30-75 years participated in the study. Males (22) and females (33) ratio was 40: 60, both the sex less than 25 years and more than 75 years were excluded.

The prevalence of osteoporosis varies according to sex, race and region. The Asian region is emerging osteoporosis epidemic and 50% of the world's osteoporotic hip fractures in Asian women by 2050 [9]. Men have greater bone mineral content and bone area, taller and heavier than women. Gender differences in BMD, skeletal size and geometry in middle aged men and women, which together with the subsequent rate of bone loss, may influence fracture risk in later life[10].

Men with elevated Para thyroid hormone decrease Calcium levels in the blood, low testosterone and less estrogen may have increased bone turnover and decreased bone mass. In males testosterone is essential for development of peak bone mass with age-related bone loss however it is reported to be low in 20-40% of men over age 70 and causes femur and vertebral fractures older [11]. Therefore measuring bone mineral density in males and females are essential and also in most of the study proved that higher prevalence of osteoporosis in women than in men was seen[12] and our study also coincided with the above facts.

Bone mineral density (BMD) is defined as the volumetric density of calcium hydroxyapatite (CaHA) in a biological tissue in terms of  $\text{g.cm}^{-3}$ . It is calibrated by means of phantoms with known density of CaHA. BMD is the combined density of both bone and soft tissues. Bone mineral density can refer to two different measurements tissue mineral density (TMD) and bone mineral density (BMD)[13].

The mean BMD of 55 subjects were screened the mean was  $1.94 \pm 1.04$ , normal was in the range of  $0.65 \pm 0.22$  in 12 subjects; osteopenic range was  $1.60 \pm 0.35$  in 24 subjects and osteoporotic was  $2.54 \pm 0.34$  and above 3.1 range was  $3.51 \pm 0.28$  in 19 subjects. The above BMD results indicates that the prevalence was osteopenic > osteoporotic > normal in a single day clinic. Osteoporosis is currently estimated to be a major health threat. An inadequate nutrition (especially intake of macronutrients, trace elements and vitamins), can be associated with an increase in bone remodeling leading to significant loss of bone and an increase fracture risk[14].

BMD and body mass index (BMI) are still among the commonly used quantitative traits for osteoporosis and obesity, respectively. BMI ( $\text{kg/m}^2$ ) was calculated as per the World Health Organization, normal score is 26.0 in our study out of 55 subjects the mean was  $24.44 \pm 4.68$ , in 35 subjects were normal, above score is 26.0 was 20 of participants equates to a classification of "overweight", according to the World Health Organization classification[15].

**Table: 1 Results of BMD measurements**

| Variable                 | Overall      |           | Groups       | Mean ± SD   | 'P' value |
|--------------------------|--------------|-----------|--------------|-------------|-----------|
| Total subjects           | 55           |           |              |             |           |
| Women                    | 33           |           |              |             |           |
| Men                      | 22           |           |              |             |           |
| Age (years)              | Mean ± SD    | 'P' value | ≤30          | 30±0        | 0         |
|                          | 48.47±13.42  | 13.3      | 31-40        | 35.76±2.3   | 2.2       |
|                          |              |           | 41-50        | 44.5±2.67   | 2.5       |
|                          |              |           | 51-60        | 54.64±2.95  | 8.0       |
|                          |              |           | 60 >         | 68±7.8      | 56.7      |
| Weight (kg)              | 65.85±12. 65 | 12.54     | 40<          | 36.4±4.6    | 10.89     |
|                          |              |           | 41-50        | 45.96±1.0   | 0.66      |
|                          |              |           | 51-60        | 55.47±3.05  | 2.88      |
|                          |              |           | 61-70        | 64.92±3.0   | 2.9       |
|                          |              |           | 71>          | 78.58±8.32  | 65.88     |
| Height (cm)              | 164.2±10. 28 | 10.18     | 165.3 <      | 157.06±5.85 | 5.76      |
|                          |              |           | 165.3 >      | 174.14±5.86 | 5.73      |
| BMI (kg/m <sup>2</sup> ) | 24.44 ±4.68  | 4.64      | 15-20        | 16.93±1.90  | 3.17      |
|                          |              |           | 21-25        | 23.76±1.62  | 2.53      |
|                          |              |           | 26-30        | 28.74±1.46  | 1.98      |
|                          |              |           | 31-35        | 32.8±2.61   | 5.1       |
| BMD                      | 1.94 ±1.04   | 1.02      | 0 to -1      | 0.65±0.22   | 0.04      |
|                          |              |           | -1.1 to -2.0 | 1.60±0.35   | 0.11      |
|                          |              |           | -2.1 to -3.0 | 2.54±0.34   | 0.10      |
|                          |              |           | 3.1 >        | 3.51±0.28   | 0.07      |

BMI= body mass index; BMD= Bone mineral density

**CONCLUSION**

The dual energy X-ray absorptiometry (DXA) is a validated technique, and can be used for fracture prediction. The predictive value of BMD can be used for biochemical indices of bone resorption, clinical risk factors in a independent manner viz. age, previous fragility fracture, premature menopause, a family history of hip fracture, and the use of oral corticosteroids[16]. The osteopenic and osteoporotic patients were given Supracal K2, Supracal ISO, Supracal OS, Supracal – A and Supracal- pro as the dosage regimen is needed to them and gifted samples by the Pharmed Ltd, Chennai. Patients were advised to take calcium & vitamin D rich foods, quit smoking & caffeine and alcohol; further advised for to increase the physical exercise. As indicated by many authors and our one day camp BMD results coincide that the Asian region there is emerging osteoporosis epidemic and also a through BMD check is advised for women aged 65 or older, men aged 70 or older, women who has a quick menopause, hereditary osteoporosis and adults who has frequent break of bones or low bone mass or bone loss.

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