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### Relation of Age to Bone Mineral Density in Western Maharashtra

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#### Abstract

Osteoporosis is a systemic skeletal disease characterized by low bone mass and micro architectural deterioration of bone tissue with a consequent increase in fragility and susceptibility to fractures. To avoid disability in old age, early detection of osteoporosis and Osteopenia is important. Osteopenia means decrease in the bone mass (because of decrease in minerals mainly calcium), which is a risk factor for osteoporosis.

In this study, 300 people (114-male and 186-female) were examined. There are many methods of detecting osteoporosis and osteopenia. One of them is DXR- digital X-ray radiogrammetry, which was used here.

The radiograph of non-dominant hand was taken after taking the written consent of the patient. The radiographs were scanned using a Pronosco Xposure System, which is a computer-based diagnostic tool that calculates bone status from an X-ray image of the hand. Bone mineral density (BMD), metacarpal index (MCI), cortical thickness (CT), & porosity of 2<sup>nd</sup>, 3<sup>rd</sup>, & 4<sup>th</sup> metacarpals were automatically calculated as comparable measurement parameters.

By this study it is clear that as age advance from 30 to 80 years, percentage of normal subjects go on decreasing and percentage of Osteopenic and Osteoporotic subjects go on increasing.

**Keywords:** Bone mineral density, Radiogrammetry, Osteoporosis, Osteopenia T-score, Z score

## Introduction

Osteoporotic fractures in both the sexes constitute a major health problem with substantial morbidity & cost. A strong relation between BMD level & probability of fractures is documented. BMD in the elderly is a function of amount of bone gained during growth & the amount of bone lost during aging. According to WHO Criteria, 1 out of 8 males & 1 out of 3 females in India suffer from osteoporosis. Two hundred million people in the world are suffering from osteoporosis. Out of these, approximately 60 million people are found in India<sup>2</sup> alone. Hence this study was taken in Western Maharashtra.

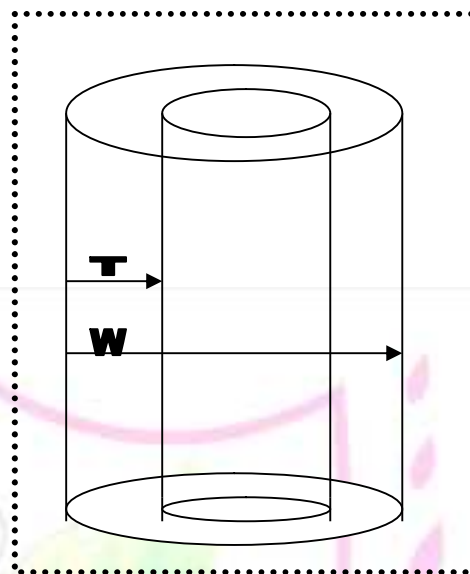
This is a cross-sectional study. 300 people coming to OPD were studied. Time period for present study was July 2007 to May 2010. They were informed about the importance & use of this investigation.

## Methodology

**Definition** – Osteoporosis is a systemic skeletal disease characterized by low bone mass and micro architectural deterioration of bone tissue with a consequent increase in fragility and susceptibility to fractures.

### Measurement of BMD:

The fundamental radiogrammetric methodology of the DXR method is an automated segmentation of a given diaphysis into cortical & medullary regions. This segmentation enables the measurement of an average cortical thickness & an average width of the bone over a given region of interest. For 1cm length 118 individual measurements are taken.



From the cortical thickness ‘T’ & outer width ‘W’ of the bone a compound measurement named bone volume per area (VPA) is derived. To achieve the benefit of improved precision, the VPA analysis is applied to 3 middle metacarpals. Region of interest are highlighted. These regions are automatically detected by software and cannot be modified by operator. Porosity of bone is also measured. By this BMD is calculated by software. Along with BMD we get the values of porosity, T-score and Z-score.

### Diagnostic criteria of osteoporosis by WHO

1. T-score between +1 and -1 is normal bone density.
2. T-score between -1 and -2.5 indicates low bone density and is osteopenia.
3. T-score of -2.5 or lower is osteoporosis

BMD is expressed as  $\text{gm}/\text{cm}^2$ .

Two other studies have been done with the same method i.e. DXR method in India. One study was by Ashwini Gandhi and Ashok Shukla in Hinduja Hospital, Mumbai<sup>2</sup>. The other one was done by K.

C. Pande<sup>4</sup> in Nagpur and New Delhi. Our study was compared with the one done by Ashwini Gandhi and Ashok Shukla in Hinduja Hospital, Mumbai.

Age-wise distribution in Western Maharashtra is shown in Table 1. Out of 300 subjects 126 are normal, 116 are Osteopenic and 58 are Osteoporotic.

As age advance from 30 to 80yrs, percentage of normal subjects goes on decreasing and percentage of Osteopenic and Osteoporotic subjects goes on increasing.

In a study done by Ashwini Gandhi and Ashok Shukla in Hinduja Hospital, Mumbai, 200 women above 40 years of age were evaluated from January 2002 to December 2003 and the result of BMD was analyzed. It shows that the incidence of osteoporosis was 8% and osteopenia 34%. Percentage of normal subjects in Mumbai study was 58%.

Age wise distribution of cases in Mumbai study is shown in Table 2. In comparison to the study by Ashwini Gandhi, percentage of normal population is less, and the percentage of osteoporosis and osteopenia is more. This study was done in the rural population with low economic status where health awareness is also less in comparison to urban area.

#### **Experimental results:**

Study of 300 cases proves following points-

1. Bone mineral mass decreases as age advances.
2. Porosity increases as age advances.
3. Above 60 years age. There is 99 % incidence of osteoporosis or osteopenia.

#### **Conclusion:**

As age advances BMD goes on decreasing. Hence by evaluating BMD at correct age one can improve bone mineral content by taking supplementary calcium as well as by exercise. Evaluation of BMD will definitely help to reduce old age complications such as fractures, disability due to fractures and dependent life.

#### **References**

1. American Journal of Epidemiology 2006,163(5):441-449  
doi:10:1093/aje/kwjo55
2. Journal of Obstetrics and Gynecology, India Vol-55, No-03: May/June 2005  
Page-265 to 267
3. Pronosco Product monograph.
4. Journal of Bone and Mineral Research 2001, 16 (suppl.1): M087 (ASBMR2001)

**Table 1: Age-wise distribution of cases in Western Maharashtra (N=300)**

<i>Age in Years</i>	<i>Normal</i>	<i>Osteopenia</i>	<i>Osteoporosis</i>	<i>Total</i>
30-40	30	15	1	46
41-50	41	25	5	71
51-60	37	38	20	95
61-70	12	25	15	52
71-80	6	13	17	36
<b>Total</b>	<b>126</b>	<b>116</b>	<b>58</b>	<b>300</b>

**Table 2: Age wise distribution of cases in Mumbai study (N=200)**

<i>Age yrs.</i>	<i>Normal</i>	<i>Osteopenia</i>	<i>Osteoporosis</i>	<i>Total</i>
41-45	42	16	00	58
46-50	34	25	05	64
51-55	28	10	04	42
56-60	12	07	03	22
61-65	00	04	02	06
Above 65	00	06	02	02
<b>Total</b>	<b>116 (58%)</b>	<b>68(34%)</b>	<b>16(8%)</b>	<b>200</b>

**TABLE No. 3A – Distribution of patients (n = 300).**

<i>Age group in yrs.</i>	<i>Normal %</i>	<i>Osteopenic %</i>	<i>Osteoporotic %</i>
30-40	65.2	32.6	2.2
41-50	57.7	35.2	7
51-60	38.9	40	21.1
61-70	23.1	48.1	28.8
71-80	16.7	36.1	47.2

$$\chi^2 = 51.808, p < 0.001$$

Conclusion: Association between age (in years) of the patients and diagnosis was compared and was found to be statistically significant.

**TABLE No. 3B – Distribution of patients (n = 174).**

<i>Age group in yrs.</i>	<i>Osteopenic %</i>	<i>Osteoporotic %</i>	<i>Total %</i>
30-40	15	1	16
41-50	25	5	30
51-60	38	20	58
61-70	25	15	40
71-80	13	17	30

$$\chi^2 = 16.728, df = 4, p\text{-value} = 0.002183$$

Conclusion: Association between diagnosed patients and age group was compared and found to have statistically significant association between them. (P-value = 0.002183)

**TABLE No. 2 – BMD among males**

<i>Diagnosis</i>	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>
<b>Normal</b>	62	0.453	0.964	0.59494
<b>Osteopenia</b>	41	0.358	0.565	0.49324
<b>Osteoporosis</b>	11	0.306	0.520	0.44018
<b>Total</b>	114	0.358	0.964	0.54343

ANOVA F = 40.928, P < 0.001

**TABLE No. 3 – BMD among females**

<i>Diagnosis</i>	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>
<b>Normal</b>	64	0.468	0.669	0.56177
<b>Osteopenia</b>	75	0.387	0.880	0.48677
<b>Osteoporosis</b>	47	0.283	0.493	0.38913
<b>Total</b>	186	0.283	0.880	0.48790

ANOVA F = 140.373, P < 0.001

**Conclusion-** BMD means of Normal, Osteopenia and Osteoporosis patients was calculated. It was found to be 0.59, 0.49, 0.44 respectively in male patients and the difference between the means was statistically significant (p<0.001).

In female patients it was 0.56, 0.48 and 0.38 respectively and the difference between means was statistically significant (p<0.001).

**TABLE No. 4 – Distribution of women based on average menopausal age**

<b>Age Group by menopause</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>
Age < 50 Years	79	0.376	0.688	0.53301
Age > 50 Years	107	0.283	0.880	0.45460
<b>Total</b>	<b>186</b>	<b>0.283</b>	<b>0.880</b>	<b>0.48790</b>

t = 6.981, p < 0.001

**Conclusion-** Mean difference of menopausal age between women with age less than 50 with age more than 50 years was compared and found significant mean difference between these two groups (p<0.001)