

# Nutritional Concerns and Bone Mineral Density

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**Abstract:** *The present study comparatively assessed the bone density among women subjects on the basis of their food habits. To conduct the study, 450 women from Durg district belonging to various social class were selected as subjects. The age range of subjects was between 30 to 45 years. Bone mineral density of the subjects was tested by the calcaneal bone densitometer. A schedule to enquire about food habits including quantity and type of food and their frequency for the past one month was filled by the respondents. The obtained scores on food habits questionnaire was tabulated and median $\pm$ S.D. was used to bifurcate cases into good and poor food habits. Results indicate that the bone mineral density statuses of women with poor food habits were found to be significantly inferior as compared to women with good food habits. This interpretation is made on the basis of bone mineral density classification in which scores below -1 indicate presence of bone disease such as osteopenia. It was concluded that food habits play an important role as far as management of bone density is concerned.*

**Keywords:** Bone mass density, nutrition, osteoporosis

## 1. Introduction

Osteoporosis is characterized by low bone mass with micro architectural deterioration of bone tissue leading to enhanced bone fragility. This increases the susceptibility to fracture. Osteoporosis is a silent disease, reflected only in a low bone density, till a fracture occurs.<sup>1</sup>

Osteoporosis is a complex, multi-factorial condition characterized by reduced bone mass and impaired micro-architectural structure, leading to an increased susceptibility to fractures. Although most of the bone strength (including bone mass and quality) is genetically determined, many other factors (nutritional, environmental and life-style) also influence bone.<sup>2</sup> Bone-healthy diets should include adequate amounts of protein, plenty of vegetables and fruits, minimal amounts of sodium, and sufficient calcium and vitamin D.<sup>3</sup>

Worldwide, osteoporosis causes more than 8.9 million fractures annually, resulting in an osteoporotic fracture every 3 seconds.<sup>4</sup>

Worldwide, 1 in 3 women over age 50 will experience osteoporotic fractures, as will 1 in 5 men aged over 50.<sup>5</sup>

Studies have provided evidence that weight in infancy is a determinant of bone mass in adulthood.<sup>6</sup> Childhood and adolescence are particularly valuable times to improve bone mass through exercise.<sup>7</sup> Peak bone mass is typically achieved by late adolescence. The stronger a person's bones are at this time, the better the person is able to deal with resorption (loss) of bone that occurs with aging.<sup>8</sup> Physical inactivity and a sedentary lifestyle as well as impaired neuromuscular function (e.g., reduced muscle strength, impaired gait and balance) are risk factors for developing fragility fractures.<sup>9</sup> Low body weight and weight loss is associated with greater bone loss and increased risk of fracture.<sup>10</sup>

Good nutrition is an important part of a successful rehabilitation program in patients who have had an osteoporotic fracture. In frail, elderly, hip fracture patients this is crucially important, as poor nutritional status can slow recovery, and increase susceptibility to further

fractures.<sup>11</sup> Nutrition plays a major role in the development and maintenance of bone structures resistant to usual mechanical loadings. In addition to calcium in the presence of an adequate vitamin D supply, proteins represent a key nutrient for bone health, and thereby in the prevention of osteoporosis.<sup>12</sup> Adequate levels of calcium intake can maximize the positive effect of physical activity on bone health during the growth period of children.<sup>13</sup> Nearly all Asian countries fall far below the FAO/WHO recommendations for calcium intake of between 1000 and 1300 mg/day. The median dietary calcium intake for the adult Asian population is approximately 450 mg/day, with a potential detrimental impact on bone health in the region.<sup>14</sup> In a study in elderly men and women, higher dietary protein intake was associated with a lower rate of age-related bone loss.<sup>15</sup> Hypoenergetic diets higher in dairy foods, dietary calcium, and protein with daily exercise, favorably affected important bone health biomarkers vs. diets with less of these bone-supporting nutrients.<sup>16</sup>

## Hypothesis

Significant difference will be observed in bone mineral density of women subjects on the basis of their food habits.

## 2. Materials and Methods

This study was conducted from 2011 to 2013. District Durg situated in the heart of Chhattisgarh state has been earmarked for detailed study of Low Bone Mass Density. Study was carried out on age group 30 to 45 of women population from all walks of life belonging to different socioeconomic strata residing in twin city of Durg district (Durg and Bhilai) of this State. While selecting the sample for the study following criteria are emphasized:

Sample comprised different categories of normal and healthy women based on socioeconomic status, religion and communities with different food habits.

In the present study, more than 1000 candidates were tested. Out of which approximately 800 were selected for random

selection. Finally 450 candidates were analyzed critically comprising women belonging to HSES, MSES and LSES.

There have always been unexpected trends in major human concerns like Population Explosion, Insufficiency of Food Material and Nutrients, Illiteracy and Unemployment in developing countries. These factors pose direct impact on the health of its population. Low BMD or Osteoporosis is creating an emergent situation.

Bone health is the resultant of bone mass, bone architecture, and body mechanics. Nutrition supports all three components, with the principal nutrients concerned being calcium, protein, and vitamin D. Potassium, magnesium, zinc, and several vitamins are also involved to varying extents. Given modern food sources, it is difficult to devise a diet that is "bone healthy" without including three servings of dairy per day, not just because of dairy calcium, but dairy protein and potassium as well.<sup>17</sup>

The final data was collected by using pretested and predesigned schedules under a systematic plan inconstant consultation with orthopedic authorities for accuracy.

**Bone Density:** Bone Mass Density of the subjects was tested by the calcaneal bone densitometer. This apparatus helps in screening the subjects who suffer from major bone related problems silently. Osteoporosis is a frailty disease which shows no symptoms before a fracture. This apparatus is portable, cost effective and noninvasive. Hence easy to reach a large population.

A schedule to enquire about Food Habits including quantity and type of food and their frequency for the past one month was administered.

A questionnaire/ schedule was administered to all the examinees to explore their Socioeconomic Status which included type of residence, educational status, family income, possession of household articles, number of dependent family members, type of job, number of kids and their educational status etc.

Apart from these general life style schedule was also included which comprised details such as exposure to sun on per day basis, stature, consumption of alcohol, smoking, aerated drinks, consumption of cocoa etc. which show indirect impact on bone density.

BMD was measured by calculating T-score. It is the difference, in standard deviations, between BMD of the patient, from the mean BMD of a young adult reference population (healthy 30 year old adult population). A T-Score between +1 and -1 is considered normal. A T-Score less than -1.0 but higher than -2.5 indicates low bone mass density (Osteopenia), and a T-Score of -2.5 or less indicates Osteoporosis. The greater the negative number, the more severe the osteoporosis.<sup>18</sup>

### 3. Result

**Table 1:** Effect of Food Habits on Bone Density of Selected Women Subjects

Groups	n	Mean±S.D.	„t“	Level of Significance
Good Food Habits	225	-1.25±0.93	7.77	.01
Poor Food Habits	225	-1.85±0.68		

A perusal of table 1 indicate that the bone mineral density status of women with poor food habits were found to be significantly inferior (M=-1.85) as compared to women with good food habits (M=-1.25). The calculated t=7.77 also support this finding statistically. This interpretation is made on the basis of bone mineral density classification in which scores below -1 indicate presence of bone disease such as osteopenia.

### 4. Conclusion

The prevalence of low bone mass density is very high and alarming, irrespective of the socioeconomic status. The average Calcium intake of the subjects was as low as 365 mg/day (RDA 600mg/day)<sup>19</sup> whereas average protein intake was found to be 36 g/day (RDA 55g/day)<sup>19</sup>. On the basis of results it may be concluded that food habits are important markers as far as management of bone mineral density in women subjects are concerned.

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