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EFFECT OF DIET, OCCUPATION AND SUNLIGHT EXPOSURE ON BONE MINERAL DENSITY IN RURAL AREA

Biochemistry

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ABSTRACT

Osteoporosis is a skeletal disease characterized by reduced bone mineral density (BMD) and deterioration of bone tissue, which can lead to increased risk of fracture. BMD is a measure of bone density that reflects the strength of bones as represented by calcium content. BMD values depend on various factors such as age, sex and age at menopause. The BMD test is widely being used to detect osteopenia and osteoporosis. In this study, the effect of diet, occupation and exposure to sunlight was studied on BMD in rural area. One hundred twenty eight persons attended the screening program. BMD was evaluated by Dexa scan technique. Based on T-score, the persons were classified as normal, osteopenia and osteoporosis. In addition, the correlation of BMD with diet, occupation and sunlight exposure was performed and discussed in detail. There was a positive correlation between diet and daily exposure to sunlight. Osteoporosis can be prevented by modifying our life style and avoid fractures during old age.

KEYWORDS

Bone mineral density, Osteoporosis, Bone densitometry

INTRODUCTION

Osteoporosis is a multi-factorial skeletal disease characterized by reduced bone mineral density. It is associated with deterioration of the micro-architectural structure of bone tissue and thus increases in bone fragility and fracture risk [1, 3]. Hip fractures are more common in India with two peaks at 30 – 39 years and again at 50 – 70 years. The prevalence of osteoporosis in India is 20 % in women and 10 – 15 % in men [2].

Bone densitometry is the only technology used to measure bone mass or predicting fracture risk. Bone mineral density (BMD) is a non-invasive technique for the benefits of patients. BMD is used to assess the fracture risk and it is an intervention designed to reduce fracture risk.

Weaver et al., [3] studied the exposure of sunlight and bone density in elderly African American females of low socioeconomic status. The authors concluded that population who had low calcium and vitamin D intake from diet had reduced BMD. In 2012, Aghaei et al., [4] studied the effects of age, sex and body mass index on bone mineral density and concluded that the negative effect of age and positive effect of BMI on bone mass. In 2011, Neelam et al., [6] concluded that there is a positive correlation between BMD and low calcium diet. Patients on low calcium diet had low BMD.

MATERIAL AND METHODS

The study was carried at Meenakshi Medical College & Hospital, Kanchipuram. Totally 128 persons attended the screening program. Individuals already suffering from osteoporosis, rheumatoid arthritis were excluded in this study. BMD was measured at calcaneus bone using DEXA scan. Each individual was given a questionnaire which comprised of details of age, sex, occupation, diet and exposure of sunlight.

BONE MINERAL DENSITY

Based on WHO classification, individuals with T-score values higher than −1 were classified as normal, those with T-score between −1 and −2.5 as osteopenic and those with T-score less than −2.5 as osteoporotic [7].

Diet, occupation and exposure of sunlight Analysis

Dietary intake was assessed using a food frequency questionnaire. Intake of milk and its quantity was recorded. People were categorized as vegetarians and non vegetarians based on the diet. Occupation was categorized into indoor and outdoor activities based on their type of work. Doctors, nurses and other health professionals were considered as indoor workers and hospital care takers such as sweepers, gardeners, attenders were considered as outdoor workers. Based on the type of work, exposure to sunlight was taken into account.

The details related to dietary history, occupation and daily exposure to sunlight were collected by way of questionnaire.

Table-1 Questionnaire

S.No.	Questionnaire	Details		
1	Name			
2	Age			
3	Sex			
4	Diet			
	a) Veg	i) Yes	ii) No	
	b) Non-Veg	i) < 3 times/week	ii) > 3 times/week	
	c) Consumption of milk	i) < 100 ml	ii) > 100 ml	
5	Occupation	i) indoor	ii) Outdoor	
6	Daily exposure to sun	i) < 10 mins	ii) >10 mins	
7	Time of exposure	i) Before 10 am	ii) 10 – 3 pm	iii) After 3 pm
8	Use of sunscreen	i) Yes	ii) No	
9	Exercise per week	i) < 3 times	ii) 3 times	iii) >3 times
10	Type of dress			
	a) Women	i) Saree	ii) Salwar	
	b) Men	i) Half slack shirt	ii) Full slack shirt	
11	History of any illness			
12	Did you undergo BMD test done in our college			
	If Yes, your result	i) Normal	ii) Osteopenia	iii) Osteoporosis
13	Any treatment after that test	i) Yes	ii) No	

RESULTS

In the present study, the correlation of BMD with diet, occupation and sunlight exposure was taken up. Fig. 1 shows the number of participants with respect to T-score. Totally 128 persons participated in BMD screening and out of which 27 persons were normal, 68 were osteopenia and 33 were osteoporosis according to T score (up to -1.0 was normal, -1.1 to -2.4 was osteopenia and below -2.5 was osteoporosis).

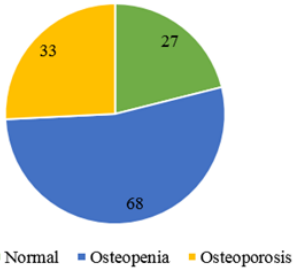

Figure-1: Participants with respect to T-score

People on non-vegetarian diet were 85.93% and 14.06% were vegetarian. Fig. 2 shows the correlation between non-vegetarian diet, milk consumption and BMD. Among the non-vegetarians, 15.45% take non-vegetarian diet more than three times and their T score were -1.0 which is normal, whereas 84.54% participants take less than three times and the T score ranged between -1.1 to -2.4 which is osteopenia. The effect of consumption of milk regularly by 35.15% showed T score with -1.0 and in 64.84% who did not consume milk the T score was -1.1 to -2.4. This suggests that diet plays a vital role in BMD showing

positive correlation with p value < 0.01.

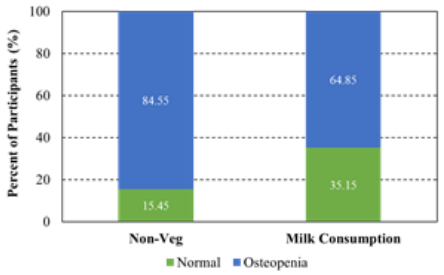

Figure-2: Correlation between diet and BMD

Fig. 3 shows the correlation between indoor and outdoor activities. Based on the occupation history, 45.31% of participants belong to indoor occupation and 54.68% were outdoor workers with maximum sun exposure between 10 am and 3 pm. Most of the indoor occupants were osteopenia with T score between -1.1 to -2.4 and outdoor occupants with T score -1.0.

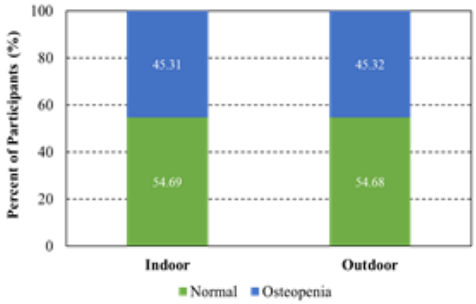

Figure-3 Correlation between occupation and BMD

DISCUSSION

From this study, it was evident that diet plays a major role in maintaining the bone mineral density. Diet including intake of non vegetarian and consuming milk regularly will prevent the prevalence of osteoporosis among individuals. Vicky Tai et al. proved that increasing the intake of calcium rich dietary food increased the BMD over a period of one to two years [8]. Similar results were found in the study conducted by Weaver et al. Persons who work outdoor during daytime are getting enough exposure to sunlight, which helps in synthesis of vitamin D in the body. This in turn prevents the incidence of osteoporosis among those individuals, whereas people working indoors were not exposed to sunlight due to their nature of work. Also it was observed from the questionnaire that persons who were exposed to sunlight between 10 am to 3 pm due to their work pattern had normal BMD. Hence it is evident that exposure to sunlight plays a vital role in maintaining the bone mineral density. Hence daily exposure to sunlight may reduce the risk of osteoporosis which prevents fracture in old age.

CONCLUSIONS

In this study, the effect of diet, occupation and exposure to sunlight was studied on BMD in rural area. There was positive correlation between diet and daily exposure to sunlight. Osteoporosis can be prevented by changing our life style and avoid fractures during old age. High risk persons can be identified by BMD screening and interventions like calcium and vitamin D supplementation can be started to prevent fractures secondary to osteoporosis. Further studies are required to look for improvement of T score in the persons with osteopenia after suggestion of exercise, diet and sunlight exposure.

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