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Prevalence of low bone mineral density and nutrient adequacy of adults in Allahabad district

Akansha Sharma and Virginia Paul

Abstract

The present study was carried out to screen the bone status (Osteopenia and Osteoporosis) between the adults of age group between 35-65 years of Allahabad which is a district of Uttar Pradesh. A cross-sectional study was carried out in 304 respondents (152 males and 152 females respectively) by calculating WHO T-scores utilising P-DEXA as diagnostic tool. The results revealed that the Prevalence of osteopenia and osteoporosis was found to be 43% and 7.2% in males which in females it was found to be 58.9% and 11.2% respectively. Dietary assessment was done by 24 hour recall method Mean daily intakes of nutrients such as energy, protein, iron and calcium were found significantly lower than their respective RDAs in the diets adults. Fat in female respondents was found to be higher than RDA. The study concluded that osteopenia and osteoporosis was more prevalent in females than males although there was large percentage of males diagnosed with osteopenia which lead to osteoporosis in future due to several factors including lack of nutrition.

Keywords: prevalence, low bone mineral density, nutrient adequacy

Introduction

Indian is experiencing the epidemiological transition mainly reflecting on the growing burden of the Non-Communicable diseases due to life style changes (Quigley, 2006). Bones are a support tissue of the body that are highly specialised. Bones provide structural support, protect vital organs, provide an environment for bone marrow and act as a mineral reservoir. Osteoporosis is a disease characterized by lessening in the bone mass and disruption of bone architecture leading to impaired skeletal strength and increased susceptibility of fractures. Low bone mineral density is seen both in men and women but it is more prevalent in women. These include non modifiable factors like female sex, old age, small thin built, ethnicity and family history of fractures. Important modifiable risk factors include calcium and vitamin D deficiency, sedentary lifestyle, smoking; excessive alcohol and caffeine intake. Prevention and treatment of osteoporosis consist of non-pharmacological & pharmacological measures. The benefits of the three components of non-pharmacological therapy are well established which includes diet, regular weight bearing exercises and cessation of smoking & alcohol consumption. Measuring the bone mineral density (BMD) remains the only important tool in the early diagnosis of osteoporosis, so that effective preventive and therapeutic measures can be initiated at the earliest. There is very slight data on prevalence & incidence of osteoporosis in India. The gold standard for measuring bone density however is Dual Energy X-ray Absorptiometry (DEXA), useful tool for both axial and appendicular skeleton. It is very important to assess dietary pattern and nutrient intake of the population to know the dietary inadequacy of the several macro and micro-nutrients. There are a range of methods used in nutritional epidemiology to quantitatively assess food and nutrient intakes on the individual and population level. The most commonly used methods are the 7-day diet diary (7dDD), food frequency questionnaire (FFQ), 24-hour recall (24hR), 16-day weighed record as well as biological markers of dietary intake. 24-hour recall method was used in this study. It is difficult to completely rebuild bone that has been weakened by osteoporosis. Therefore, prevention and management of bone loss is more important than treatment which is possible by adapting changes in the lifestyle. This includes controlling body weight, quitting cigarette smoking, controlling alcohol intake, regular exercising and consuming a balanced diet with adequate amount of calcium and vitamin D. This further demonstrates the importance of nutrition education.

Methods and Materials

A cross sectional study was undertaken to study prevalence of osteopenia and osteoporosis among adults of age group between 35-65 years. The study was carried out during the free BMD check-up camp for estimation of BMD, in yashlok hospital of Allahabad district. Total of 304 participants were included in the study who attended the camp and informed consent was taken from all. The respondents having diseases such as (diabetes mellitus, renal diseases, hypertension), severely deformed patients, patients having hormonal therapy were excluded from the study. The questionnaire included information on socio-demographic variable anthropometry and dietary records. The BMD was measured by utilizing T-scores based on WHO criteria, which were obtained from the automated equipment. T score refers to the ratio between patient's BMD and that of young adult population of same sex and ethnicity. T-score of >1 was taken as normal, between 1 and 2.5 osteopenic and <2.5 as osteoporotic. Those who were

diagnosed to be suffering from osteopenia and osteoporosis based on T-scores underwent orthopedic evaluation for further management and follow up. 24-hour recall was taken for the estimation of average dietary intake and nutrient adequacy. The collected data was summarised and tabulated and for this chi-square test and t-test were applied.

Results and Discussion

Prevalence of Low BMD

Table 4.3.1 shows distribution of respondents according to Bone mineral density (BMD) and it is evident that among male respondents 49.6% were normal, 43% were osteopenic and 7.2% were osteoporotic. On the other hand 29.8% female respondents were normal followed by 58.9% were osteopenic and 11.2% were osteoporotic. The distribution shows that number of osteoporotic patients were less with highly prevalent in females while maximum males were normal and maximum females were osteopenic.

Table 1: Distribution of respondents according to BMD

BMD classification and values	Male (N=152)	Female (N=152)	Total (N=304)
	%	%	(%)
Normal (> -1)	49.6	29.8	39.7
Osteopenia (-1 TO -2.5)	43	58.9	50.9
Osteoporosis (-2.5 or lower)	7.2	11.2	9.2

The chi-square statistic is 12.526. The p-value is .001906. The result is significant at $p <$

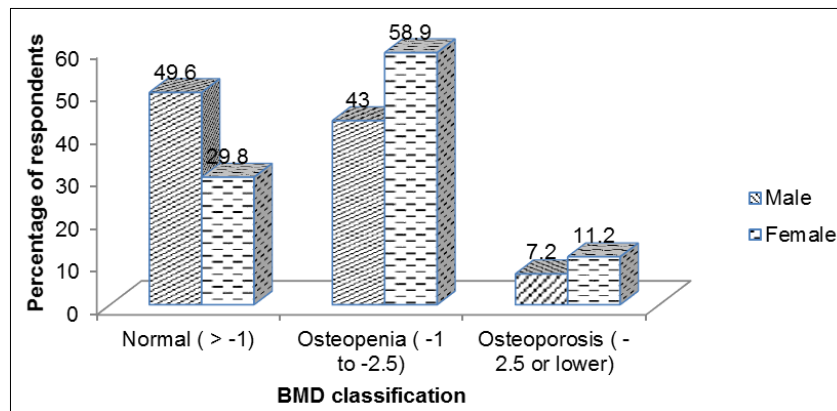


Fig 1: Distribution of the respondents according to their bone mineral density

Average daily nutrient intake of Respondents

Table 2: Average daily nutrient intake of respondents.

Particular	Males (N=151)	RDA/Diff	Female (N=151)	RDA/Diff	t-value (cal)	P-value	t-table	Result
Calorie (Kcal/day)	1546±161.1	2320/-774	1338.1±123	1900/-561.9	11.129	2.191	1.97	S
Protein (g/day)	29.6±5.2	60/-30.4	33.1±4.5	55/21.9	6.1832	5.596	1.97	S
Fat (g/day)	20.8±3	25/-4.2	27±4.3	25/+2	15.203	3.506	1.97	S
Iron (mg/day)	11.6±4	17/-5.4	9.2±2.7	21/-11.8	6.0572	1.055	1.97	S
Calcium (mg/day)	276.8±70.4	600/-323.2	297.4±55.8	600/-302.6	2.8019	0.0057	1.97	S

(N=302) S = Significant (At 5% level of significance)

Table No.2 shows the average nutrient intake of all the nutrient with reference to energy, protein, fat, iron, calcium compared to the recommended dietary allowances (RDA) given by ICMR (Srilakshmi, 2014). The result found was not at a desired level. It was found from the result that the average intake of major nutrient group i.e., energy, protein, fat, iron, calcium were mostly very less than the recommended dietary allowances given by ICMR. Regarding male respondents average nutrient intake of calorie was (1546 kcal/day), protein (29.6 g/day), fat (20.8 g/day), iron (11.6 mg/day) and calcium

(296.8 mg/day). Whereas in female respondents the average nutrient intake of calorie was (1338.1 Kcal/day), protein was (33.1 g/day), fat was (27 g/day) which was greater than RDA, iron (9.2 mg/day) which was very less as compared to RDA and calcium was (297.4 mg/day). On applying t- test significant results were found for calories, proteins, fat, carbohydrate, iron and calcium the calculated t value was (11.129 for calorie), (6.18 for protein), (15.20 for fat), (6.05 for iron), (2.80 for calcium) was greater than the table value of t (1.97).

Nutrient adequacy ratio

Table 3: Distribution of the respondents according to their nutrient adequacy ratio

S. No	Nutrient Intake		Male	Female
1.	Energy (Kcal)	Average intake	1546±161.1	1338.1±123
		Adequacy Ratio (%)	66.6%	70%
2.	Protein (g)	Average intake	29.6±5.2	33.1±4.5
		Adequacy Ratio (%)	49.3%	60.1%
3.	Fat (g)	Average intake	20.8±3.1	27±4.2
		Adequacy Ratio (%)	83.2%	108%
4.	Iron (mg)	Average intake	11.6±4	9.2±2.7
		Adequacy Ratio (%)	68%	43.8%
5.	Calcium (mg)	Average intake	276.8±70.4	297.4±55.8
		Adequacy Ratio (%)	46%	49.5%

Table No.3 shows the distribution of the average daily nutrient intake and nutrient adequacy ratio(%). It is evident from the table 4.4.6 that regarding energy the nutrient adequacy ratio of male respondents was 66.6% (which was lesser than RDA) and female respondents was 70%. Nutrient adequacy ratio for protein of male respondents 49.3% and female respondents 60.1%, regarding fat, nutrient adequacy ratio of male respondents was 83.2% and female respondents was 108% (greater than RDA). Nutrient adequacy ratio for iron in male was 68% and female was 43.8% whereas for calcium in male it was 46% and in female respondents it was 49.5% (which was very less as compared to RDA).

Conclusion

The study revealed a disquieting situation in frame of reference to bone health as a large number of the respondents had osteopenia which may lead to osteoporosis due to several reasons such as menopause (drastic decrease in estrogen levels) in women and smoking, high alcohol consumption, high beverage consumption and lack of physical activity in men or both sexes. The findings from the data suggests that the average intake of all the nutrients except fat in females was found to be less when it is compared with RDA given by ICMR. The poor consumption of vitamin-D and Calcium rich foods are considered as risk factors as they are associated with low bone mineral density.

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