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Dietary calcium consumption of women (15-30years) Residing in the city of Mumbai

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Abstract : *Maintenance of optimum calcium status is necessary for the development of dense bone mass and to avoid lifetime risk of fractures and osteoporosis. Forty five percent of peak bone mass is attained during adolescence which necessitates adequate calcium intake from early stages of life. The present study has been undertaken to assess the calcium status of adolescent and adult women in the age group of 15-30 years (n=62) using a standardized questionnaire. Information on the anthropometrical measurements and clinical symptoms related to calcium deficiency of the subjects. Dietary calcium consumption was recorded using 24 hours dietary recall method. There was significantly low intake of energy (P=0.009) and protein (P=0.002) in the age group of 15-20 years compared to others. Dietary calcium intake in these subjects (15-20 years) was also significantly (P=0.014) lower than the RDA suggested by ICMR as well as USDA (1997-2001). Carbohydrate, protein, fat and energy consumption significantly (P<0.001) and positively correlated with calcium intake. There was no significant correlation between the calcium intake and BMI of the subjects. It may thus be concluded that women in the age group of 15-30 years (n=62) need to be educated on the role of nutritious diet in health especially on the importance of calcium for bone health.*

Keywords: *Assessment, Calcium, Osteoporosis, Peak bone mass.*

Introduction

Calcium needs during adolescence are greater that in childhood or adulthood because of increased demands for skeletal growth. 45% of peak bone mass is attained during adolescence and so adequate calcium intake is important for the development of dense bone mass. Additionally, Calcium requirement for adults is defined as the amount of dietary calcium required to yield equilibrium between intake and excretion that protects bones from osteoporosis (Hegsted, 2001).The prevalence of osteoporosis was 48% at the lumbar spine, 16.7% at the femoral neck, and 50% at any site in healthy ambulatory postmenopausal Indian women as measured by dual-energy x-ray absorptiometry (Paul et al, 2008). About 31% of the Indian population had normal vitamin D levels, 54% had vitamin D insufficiency and 15% vitamin D deficiency about two-third of the population had low levels of vitamin D according to study conducted by Harinarayan et al (2004). Dietary calcium intake was inadequate in both rural and urban societies of south Indian subjects compared to the recommended daily allowances (RDA).

Methodology

Sixty two female subjects in the age group of 15-30 years were selected using purposive sampling technique and were divided into three different age groups i.e. 15-20 years (adolescents), 20-25 years (immediately post adolescence) and 25-30 years (adulthood). A questionnaire cum interview schedule was prepared and standardized to obtain information regarding dietary calcium consumption . Information was collected on the anthropometric measurements (height, weight and Body Mass Index (BMI) using standard protocol. Height of the subjects was measured using measuring tape. It is used for assessing the effects of calcium intake on bone accretion during a period of rapid growth (Fiorito, 2006). Height is an indicator of the pubertal growth spurt and reflects growth in stature; it serves as an indicator of pubertal growth (Tanner J, 1962). Body weight is used as an indicator of an individual's overall health .The weight of the subjects was recorded using a bathroom weighing scale. BMI is calculated by dividing weight in kgs by height in meters squared. BMI is an estimate of body composition that correlates an individual's height and weight to lean body mass . Dietary practices and dietary nutrient intake of the subjects were measured using a Food Frequency Questionnaire [FFQ] and repeated 24 hours Dietary Recall methods.The data obtained was analysed using SPSS version 16.0.

Results and Discussion

The importance of female nutrition precedes and extends beyond the reproductive years to optimize completion of adolescent growth and establish body nutrient reserves before pregnancy and to maintain adequate nutritional status, particularly skeletal health, through the postmenopausal years (Bartley et al, 2005).

Table-1: Age and BMI of the subjects

Variable/ Age Group	15 to 20 years (n=27)	20 to 25 years (n=25)	25 to 30 years (n=15)	F test
BMI	22.25 ± 4.28	23.57 ± 3.94	25.27 ± 4.06	F=3.3, S, P=0.027

A significant (P=0.027) difference was noticed in the BMI of the subjects of different age groups. Subjects in the age group of 25-30 years were found to be over weight where as the other two groups had normal BMI. This shows that women tend to put on weight as they grow beyond their adolescent age which might be due to a change in their food habits and in their life style. The difference in the food habits also reflected in their energy, macronutrients and fiber intake presented in the following table.

Table-2: Mean energy, macronutrient and fiber intake of subjects.

Variable/ Age Group		15 to 20 yrs (n=27)	20 to 25 yrs (n=20)	25 to 30 yrs (n=15)	F test
Energy (Kcal)	Intake	937.40 ± 238.80	1148.85 ± 414.85	1303.97 ± 413.16	F=4.2, P=0.009*
	RDA	2060	1984	2056	
Protein (g)	Intake	35.63 ± 11.22	44.74 ± 21.03	57.97 ± 16.42	F=5.6, P=0.002*
	RDA	60	50	50	
Fat (g)	Intake	18.87 ± 8.42	27.15 ± 13.58	28.87 ± 13.43	F=3.6, P=0.019*
	RDA	22	20	20	
Carbohydrate (g)	Intake	152.00 ± 54.76	180.14 ± 68.69	192.84 ± 78.26	F=3.2, P=0.03*
	RDA	309	297	308	
Fiber (g)	Intake	2.42 ± 1.74	6.04 ± 13.61	4.14 ± 3.05	F=0.9, P=0.45
	RDA	20-35	20-35	20-35	

*significant, F=analysis of variance (ANOVA); *Recommended Dietary Allowance for Indians ICMR (1989)

The mean energy intake of the subjects in the present study was lower than their respective RDAs (Table No.2). Especially, adolescent subjects were found to have the lowest (P=0.009) intake compared to that of the other groups probably due to their low food intake. In fact this age group requires high energy for their growth and development and low intake might impair their linear growth and delay sexual maturation.

The protein and fat consumption of the younger subjects was found to be lower than RDA with that of the adolescents being the lowest (P=0.002). The protein requirement for adolescents is the highest due the rapid growth and development that occurs during this age. Where as the intake of protein was higher than the recommendation among the subjects in the age group of 25-30 years. The proteins were mainly derived from milk and non vegetarian products like fish and meat, This suggests that the quality of protein consumed by the subjects was good but the quantity was poor. The data indicated an age associated higher protein and fat intake among the subjectsof the present study. Consumption of a high-fat diet promotes increased energy intake and the development of obesity (Little et al, 2007).

Mean micronutrient intake of subjects:

Sufficient calcium intake is essential for obtaining optimal peak bone mass in youth for minimizing bone loss later in

life (Barrette-Conner, 1995). Mean peak values for calcium retention were found in adolescents to be 282mg/d in boys and 212mg/d in girls in studies of longitudinal DEXA measurement (Matkovic, 1992). In a study by Abrams et al (1994) at the calcium intake of about 930 mg/day, the intestinal absorption fraction transiently increased from 27.7% to 34.4% in early puberty (10.9 years) and decreases to 25% in the late puberty (15.2 years).

Table-3: Comparison of mean micronutrient intake of subjects

Variable/ Age Group		15 to 20 yrs	20 to 25 yrs	25 to 30 yrs	F test
Calcium (mg)	Intake	387.41 ± 184.32	626.69 ± 332.84	650.54 ± 327.39	F = 3.8, P = 0.014*
	RDA	500# 1300**	400# 1000**	400# 1000**	
Phosphorus (mg)	Intake	797.02 ± 270.43	974.71 ± 442.18	1102.90 ± 249.51	F = 2.8, P = 0.045*
	RDA	500# 1250**	400# 700**	400# 700**	
Ca : P		1.0 : 2.0	1.0 :1.5	1.0 :1.7	
Vitamin C (mg)	Intake	39.36 ± 46.14	35.86 ± 32.83	41.64 ± 50.89	F = 0.1, NS, P = 0.9
	RDA	40#	40#	40#	

*significant, NS = not significant, F = analysis of variance (ANOVA)

#Recommended Dietary Allowance for Indians ICMR (1989)

** Recommended Dietary Allowance and Adequate Intake according to Dietary Reference Series (1997-2001).

In the present study the mean calcium intake was significantly different (P = 0.014) among subjects of different age groups and was also significantly lower than RDA in the age group 15-20 years, whereas the mean intake of calcium has increased with age among the other two groups of subjects (20-25 years and 25-30 years) which might be due to higher intake of food. But the calcium intake of all the groups was very low (below 50%) as compared to United States Dietary Association's (1997-2001) recommendation. All the subjects had significantly (P = 0.045) higher mean intake of phosphorus. The ideal Ca: P ratio should be 1:1,5 but in the present study it was found to be different among the three groups. i.e.1:2, (in 15-20 years), 1:1.5 (in the age group of 20-25 years), and 1:1.7 (in 25-30 years). This might have influenced the absorption of calcium in these age groups. Vitamin C facilitates absorption of calcium in the body. However, In the present study the all the

subjects had lower vitamin C intake than the RDA.

Data on dietary practices with regard to calcium rich food intake indicated that the frequency of consumption of calcium rich nuts & oil seeds was found to be low but similar across the age groups. The intake of calcium rich milk, cheese and paneer was similar in subjects of all age groups with the consumption of milk being higher followed by curd, cheese and paneer. However, the intake of curd was significantly less frequent (P=0.01) in the younger subjects (15 to 20 years) than the other age groups. Thus, the calcium intake through dairy products was lower among the adolescent subjects of the present study. The intake of dry fruits like dates and raisins was also found to be poor among the subjects. The overall intake of non vegetarian foods like fish, egg and mutton, though slightly higher among the older age group, was found to be very low among subjects with the intake of fish and egg more frequent than mutton. The awareness about importance of calcium and requirement of calcium was more in subjects of 15-20 year old and 20-25 years, whose intake of calcium was significantly low.

Conclusion: From the above results it was concluded that there is a strong need to create awareness of nutritional adequacy among adolescent as well as adult women especially about the importance of optimum calcium intake through valuable food sources in order to facilitate bone growth.

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