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Assessment of nutrient intake of school going girls of Surendranagar district of Gujarat State, India

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ABSTRACT

Assessment of nutrient intake of 100 school going girls of SC and OBC community (7-11 years) in Surendranagr district was studied. Personal interviews consisting, food frequency questions and 24 hour dietary recall of school going girls were used. Amount of nutrients obtained per day from food consumed was calculated and compared with RDA for Indian children (ICMR, 2009). It is observed that consumption of energy was inadequate, protein, Calcium and Iron was far less than the daily requirement and fat was more than the daily requirement in both the community *i.e.* OBCSG and SCSG. With respect to diet quality it is concluded that the diet of SCSG girls is more adequate as compared that OBCSG girls in terms of protein. But carbohydrate, calcium and iron intake are inadequate in both the communities while fat intake is more than adequate in both the communities.

Key Words : Nutrient intake, Energy, Protein, Fat, Fe, Ca, SCSG, OBC

INTRODUCTION

Nutrition plays a vital role in growth and development of children. Inadequate nutrition may lead to malnutrition, growth retardation, reduced work capacity and poor mental and social development (Awasthi and Kumar, 1999; Manna *et al*., 2011). These conditions if encountered during childhood can lead to a life of poor productivity and endless sufferings. Among all age groups, the school age period is nutritionally significant because this is the prime time to build up body stores of nutrients in preparation for rapid growth of adolescence (Sati *et al*., 2012). There are about 55 million children in the world. By 2020, the number of children between zero and 14 years was forecasted to comprise 24.5 per cent of the total world population down from the 26.2 per cent in 2010, with an extra 59.9 million children (Jalajakumari and Sri Hari Krishanan, 2011). The population of school-going children contributes to future man-power which can improve the socio-economic condition of developing countries. Thus, their mental and physical well-being is of utmost concern which can be achieved by adequate nutrition.

Developing countries like India, account for about 40 per cent undernourished children in the World which is mainly due to the dietary inadequacy in relation to their needs (Mitra *et al*., 2007). India has diverse agro-climatic regions, ethnic multiplicities, socio-cultural practices, life styles and eating habits which vary not only between states but also within districts (Vashisth *et al*., 2005). Thus, there is a need for assessment of nutritional status in various parts of our country to obtain a clear picture of status of mal-nutrition in various regions. This will help in identifying the cause of this problem in

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each region and the solutions to combat it through locally available resources. In the present study 100 school-going children (7-11 years) from Ratanpar village of Surendranagar district of Gujarat State were selected and their nutritional status and extent of malnutrition was analyzed. The steps involved collection of general information, food and nutrient intake (24 hour dietary recall) and anthropometric assessments and finally identifying the lacunas in their diet and eating habits.

METHODOLOGY

Selection of the area:

The data utilized for this study were collected by visiting selected school of Ratanpar village of Surendranagar city. This was necessary to obtain authentic records of students as well as their management without suspicion or refusal as the teacher were very helpful including enlightening parents who may be apprehensive. Surendranagar is the district of Gujarat state and Ratanpar is its small city. The reason behind selecting this city for studying nutritional status of school going girls because in Ratanpar, the residing and studying girls are poor and come from slum areas and their family income is also low and their nutritional status is also not so good as per the RDI guidelines. Most of girls who are studying there are from Schedule Caste School going Girl (SCSG) and Other Backward Caste School going Girl (OBCSG).

Selection of the samples :

The study sample consisted of randomly selected 39 candidates from SC community and 61 candidates from OBC community, consisting of total 100 school going girls from school of Ratanpar village of Surendranagar district for the study of nutritional status and dietary quality assessment. The study (cross-sectional method) was designed in such a way that subjects from low socio-economic classes were represented. Since time and resources made it obligatory to study the subjects from educational institutions rather than from the community, it was necessary to choose particular school that consisted of subjects from low socio-economic groups as reflected in Ratanpar City of Surendranagar district to reduce bias.

Collection of data and conduct of study:

Specially designed questionnaires were used to elicit information from the participating subjects about their age, sex, date of birth, family/personal background, medical history, socio-economic status, family size, parent's occupation and educational status, height, weight etc *i.e.* Subjective assessment and Dietary patterns of 24 hours recall method *i.e.* nutritional status. The questionnaires were kept anonymous as well as confidential in order to encourage good response. The ages of the subjects collected from the school register. It is worthy of note to here that it was only those subjects whose birth were ±3 months from the date of observation were included in this study. When any discrepancy suspected or noted from the information supplied on the questionnaire by any subject, such subject was excluded from the study. Statistical analysis will be performed using SPSS. This compute the means, standard deviations, percentile indicated that the correlation coefficients for variables

Dietary assessment :

Dietary intake of the subjects was gathered by Individual Oral Questionnaire *i.e.* one day 24 Hour recall method. For this method, the girls are asked to recall what and how much they ate and drank over the past 24 hours. Recall accuracy depends upon the girls' memory and ability to estimate portion sizes. It may also not be representative of the usual intake because this is only for a 1 day intake. When the girl's intake is affected by acute illness, a 24 hour recall of a typical day is more useful to estimate usual intake. Mean daily intake of the subjects was computed and compared with the

suggested amounts of various food groups in a balanced diet for Indian school going girls aged 7 to 11 years. The nutrient intake was calculated using the computerized programme based on food composition tables. Thereafter, mean nutrient intake was assessed and compared with the recommended dietary allowances (RDA) for the respective age groups (7-9 years and 10-12 years). In order to assess the diet quality, the adequacy of nutrient intake by each subject was computed in terms of Nutrient Adequacy Ratio (NAR) using below equation.

NAR = Subject's nutrient intake of a day / RDA of the respective nutrient

Thereafter, the subjects were categorized as those having an adequate (=1.00), fairly adequate (0.66-<1.00) or inadequate (<0.66) NAR for various nutrients. Since NAR is not a good indicator for assessing the adequacy or inadequacy of energy intake therefore, energy intake data were expressed as per cent of RDA for the particular age group. In the present study, 25% below the RDA has been employed as the cut-off for estimating energy inadequacy while 25% above the RDA has been used to identify subjects with excess energy intake.

RESULTS AND DISCUSSION

Various nutritional anthropometric indices and nutrient consumption pattern were examined to determine the nutritional status of school going girls of Ratanpar village of Surendranagar District of Gujarat State.

Calorie intake :

Average daily intake of calorie by school going girls (both SCSG and OBCSG) is presented in Table 1 and 2. The Recommended Dietary Allowance for Indian school going girls has been used as a reference.

Table 1 : Individual age wise value of mean and SD of energy consumptions (Kcal)

Age	SCSG			OBCSG		
	No.	Mean	S. D.	No.	Mean	S. D.
7	3	1024	116.69	1	853	-
8	5	1405	254.12	9	1040	388.84
9	13	1201	391.56	14	1291	623.38
10	16	1207	482.99	33	1330	406.76
11	2	1612	94.39	4	1011	276.74

Table 2 : Community and age wise value of mean of energy consumed and % deficiency of energy

Age (yrs.)	RDA	SCSG		OBCSG	
		Kcal.	Per (%) Def	Kcal.	Per (%) Def
7-9	1950	1210	62.05	1061	54.41
10-12	1970	1409	71.52	1170	59.39

The average daily intake of energy by SCSG girls was 1024 kcal/d at the age of 7 years which increases to a value of 1612 Kcal/d at the age of 11 years. The girls at all ages that are 7 years to 11 years show comparatively lower intake of calories compare to RDA. It has been found that girls of age 7-9 years and 10-11 years were 62.05% and 71.52% energy deficit, respectively. The average daily intake of energy of OBCSG girls was 853 kcal/d, at the age of 7 years which increase to a value of 1330 Kcal/d at the age of 10 years. While at the age of 11 yrs, calorie intake is slightly low *i.e.*1011 Kcal/d than that of 10 yrs. Girls belonging to OBC community also show comparatively lower intake of

calories than that of the RDA. 54.41% calorie deficit was found among 7-9 years and 59.39% calorie deficit for 10-11 years.

Protein intake :

Dietary protein requirements for Indians were computed for a predominately vegetarian diets based on cereal, legume and milk intake in the ratio of 4:1. Proteins are the major nutrient needed for the healthy growth and development of school going girls. Table 3 represents the average daily consumption of protein in the diets of the subjects. The daily intake of protein by the SCSG community is 25.34g at the age 7 years which increases to a value of 31.87g at the age of 11 years .The total protein intake has failed to meet the daily requirement of 41g and 57g per day for SCSG and OBCSG girls, respectively. The subjects at the age of 7-9 years are 68.29% deficit in protein and 10-12 years are 50.87% deficit in protein in SCSG girls. At the age of 7-9 and 10-11 years average daily intake of protein belonging to OBC community was 25 g and 24 g, respectively. Protein intake of all the subjects was below RDA. The subjects at the age of 7-9 years are 60.97% deficit in protein and 10-12 years are 42.10% deficit in protein.

Table 3 : Individual age wise value of mean and SD of protein intake (g)

Age	SCSG			OBCSG		
	No.	Mean	S.D	No.	Mean	S.D
7	3	25	4.88	1	24	-
8	5	31	15.40	9	25	13.35
9	13	30	13.74	14	27	11.78
10	16	27	16.94	33	28	10.54
11	2	31	0.15	4	19	5.91

Table 4 : Community and age wise value of mean of protein consumed and % deficiency of protein

Age (yrs.)	RDA	SCSG		OBCSG	
		Grams	Per (%) Def	Grams	Per (%) Def
7-9	41	28	68.29	25	60.97
10-12	57	29	50.87	24	42.10

Fat intake :

The daily intake of fat by the subjects was presented in the Table 5. Fat is taken mainly in the form of cooking oil, fats and from milk and milk products. Table 5 represents the average daily consumption of fat in the diets of the subjects. The daily intake of fat by the SCSG community is 46g at the age 7 years which increases to a value of 68 g at the age of 11 years .The total fat intake has been more than doubled the daily requirement of 20g and 20g per day for SCSG and OBCSG girls, respectively.

Table 5: Individual age wise value of mean and SD of fat intake (g)

Age	SCSG			OBCSG		
	No.	Mean	S.D	No.	Mean	S.D
7	3	46	9.80	1	26	-
8	5	73	13.78	9	47	21.03
9	13	48	16.94	14	55	25.75
10	16	56	25.44	33	56	18.88
11	2	68	28.60	4	46	10.86

The subjects at the age of 7-9 years are 275% excess in fat and 10-12 years are 310% excess in fat in SCSG girls. At the age of 7-9 and 10-11 years average daily intake of fat belonging to OBC community were 42 gm and 51 gm, respectively. Fat intake of all the subjects was above the RDA. The subjects at the age of 7-9 years are 210% excess in fat and 10-12 years are 255% excess in fat.

Table 6 : Community and age wise value of mean of fat and % excess of fat

Age (yrs.)	RDA	SCSG		OBCSG	
		Grams	Per (%) diff	Grams	Per (%) diff
7-9	20	55	275	42	210
10-12	20	62	310	51	255

Calcium intake :

Calcium is particularly needed during school going girls. Bone growth demands calcium and for the growth of teeth also. About 150mg of calcium must be retained each day to allow for the increase in bone mass. Calcium provides rigidity to the skeleton and calcium ions plays a role in most of the metabolic processes. The daily intake of calcium by the subjects was presented in the Table 7. Calcium is taken mainly in the form of milk and milk products, cereals, pulses, roots and tubers etc. Table 7 represents the average daily consumption of calcium in the diets of the subjects. The daily intake of fat by the SCSG community is 146mg at the age 7 years which increases to a value of 232mg and 234mg at the age of 10 and 8 years, respectively. At the age of 11 yrs., it reduced to 198mg per day. The total calcium intake has failed to meet the daily requirement of 400mg and 600mg per day for 7-9 yrs and 10-12 yrs old girls, respectively. The subjects at the age of 7-9 years are 49.25% deficit in calcium and 10-12 years are 35.83% deficit in calcium in SCSG girls. At the age of 7-9 and 10-11 years average daily intake of calcium belonging to OBC community was 190mg and 196mg, respectively. Calcium intake of all the subjects has failed to meet the RDA. The subjects at the age of 7-9 years are 47.5% deficit in calcium and 10-12 years are 32.66% deficit in calcium.

Table 7 : Individual age wise value of mean and SD of calcium intake (mg)

Age	SCSG			OBCSG		
	No.	Mean	S.D	No.	Mean	S.D
7	3	146	16.96	1	170	-
8	5	234	131.56	9	155	77.08
9	13	211	88.37	14	244	146.78
10	16	232	118.15	33	213	84.08
11	2	198	124.16	4	178	39.17

Table 8 : Community and age wise value of mean of calcium consumed and % excess of calcium

Age (yrs.)	RDA	SCSG		OBCSG	
		Milligrams	Per (%) diff	Milligrams	Per (%) diff
7-9	400	197	49.25	190	47.5
10-12	600	215	35.83	196	32.66

Iron intake :

It is a well known fact that during school going yrs., the iron requirements increase due to the changes in body mass, expanded blood volume and increased respiratory enzymes *i.e.* for overall growth. But in the absence of adequate dietary intake of iron, the girls become highly prone to anemia.

The daily intake of iron by the subjects was presented in the Table 9. Iron is taken mainly in the

form whole cereals and pulses. Table 9 represents the average daily consumption of iron in the diets of the subjects. The daily intake of iron by the SCSG community is 7mg at the age 7 years which increases to a value of 11mg at the age of 11 years. The total calcium intake has failed to meet the daily requirement of 26mg and 29mg per day for 7-9 yrs and 10-12 yrs old girls, respectively. The subjects at the age of 7-9 years are 34.61% deficit in iron and 10-12 years are 32.75% deficit in iron in SCSG girls. At the age of 7-9 and 10-11 years average daily intake of iron belonging to OBC community was 8.33mg and 8.5mg, respectively. Iron intake of all the subjects has failed to meet the RDA. The subjects at the age of 7-9 years are 32.03% deficit in iron and 10-12 years are 29.31% deficit in iron.

Table 9 : Individual age wise value of mean and SD of iron intake (mg)

Age	SCSG			OBCSG		
	No.	Mean	S.D	No.	Mean	S.D
7	3	7	2.07	1	9	-
8	5	9	3.48	9	8	4.80
9	13	10	4.79	14	8	2.74
10	16	8	4.05	33	10	4.90
11	2	11	8.43	4	7	2.74

Table 10 : Community and age wise value of mean of iron consumed and % deficiency of iron

Age (yrs.)	RDA	SCSG		OBCSG	
		Milligrams	Per (%) diff	Milligrams	Per (%) diff
7-9	26	9	34.61	8.33	32.03
10-12	29	9.5	32.75	8.5	29.31

Diet quality :

In order to assess the diet quality of both the communities, the adequacy of nutrient intake by each subject was computed in terms of Nutrient Adequacy Ratio (NAR). Thereafter, the subjects were categorized as those having an adequate (=1.00), fairly adequate (0.66-<1.00) or inadequate (<0.66) NAR for various nutrients.

Carbohydrate, calcium and iron intake of SCSG girls are inadequate while Fat intake is adequate at all age groups of SCSG girls. Whereas protein intake of 18 girls (46%) out of 39 is fairly adequate while 21 girls (54%) out of 39 is inadequate.

Carbohydrate, Calcium and Iron intake of OBCSG girls are inadequate while Fat intake is adequate at all age groups of OBCSG girls. Whereas Protein intake of 14 girls (23%) out of 61 is fairly adequate while 47 girls (77%) out of 61 is inadequate.

A country's development is reflected by the health condition of its population. The status of health in a group is influenced by factors such as education, poverty, nutritional intake and proper utilization of available resources. Of these, nutrition is of paramount importance, improper nutrition can give rise to the phantom of mal-nutrition which can cripple any society. Malnutrition in children is the consequence of a range of factors that are often related to poor food quality, insufficient food intake and severe and repeated infectious diseases, or frequently some combinations of the three. These conditions, in turn, are closely linked to the overall standard of living and whether a population can meet its basic needs, such as access to food, housing and health care (WHO, 1997). Dietary surveys and anthropometric measurements are therefore one of the essential components of nutritional assessment (Kulsum *et al.*, 2008)

The present study was undertaken to evaluate the nutrient intake of school going girls of Ratanpar village of Surendranagar district. From the results obtained it was observed that the nutrient

intake of school going girls was inadequate with compare reference standards. Carbohydrates are the main source of energy, since the amount of carbohydrates consumed couldn't match the RDA of Indian children of same age; the energy fulfillment was automatically lowered. Protein deficiency in children was not as severe as energy or carbohydrate deficiency but still prevailed to a considerable extent. Protein is an important nutrient required during the growth years of life. Its deficiency can have severe health effects on the physical and mental growth of children. The high amount of fat observed in the diet of children is mainly attributed to the cooking traditions followed in Surendranagar district whereby the amount of fat used in cooking is higher than required. Moreover it is also due to easily available ready to eat packed foods like Farasans, wafers which is very high in fat contents. Iron deficiency can lead to cognitive deficits and reduced intellectual performance among school children (Sachdev, 1997; Rammohan *et al.*, 2012). The kind of diet being consumed has a lot of influence on iron absorption. Cereal based diets permit low absorption of iron as compared to diets rich in meat and fish (Gopal *et al*., 1999). Since the diet consumed by children in Bhopal district are low in meat and fish could have resulted in iron deficiency.

Conclusion:

It is concluded that consumption of energy was inadequate, protein, Calcium and Iron was far less than the daily requirement and fat was more than the daily requirement in both the community *i.e.* OBCSG and SCSG. With respect to diet quality it is observed that the diet of SCSG girls is more adequate as compared that OBCSG girls in terms of protein. But carbohydrate, calcium and iron intake are inadequate in both the communities while fat intake is more than adequate in both the communities.

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