

Nutrient Intakes of Young Girls Studying in a Government School in Jaipur City

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ABSTRACT The nutrient intakes of 146 young girls in the age group of 10-16 years studying in a government school in Jaipur city was assessed. The mean intakes of energy, protein, total fats, calcium, iron, carotenes, vitamin A, riboflavin, niacin and ascorbic acid were below the RDAs, except for thiamin and folic acid intakes. The mean intakes of pulses, green leafy vegetables, fruits, milk and milk products, fats and oils were lower than those given for the balanced diets.

INTRODUCTION

In today's urban world discrimination against girls still exists. It is prevalent in all spheres of life. It is possible that it becomes all the more apparent in girls coming from low socioeconomic families. Girls also have to share the burden of household chores, rearing of younger siblings and sometimes lending a hand in income generating activities. The nutritional status of the children, adolescents and women of such communities is poor.

The dietary and nutrient intakes of adolescent girls from rural Rajasthan were found to be low in calories, proteins, iron and vitamin A (Chaturvedi et al. 1994,1996). The energy and protein intakes of 802 school children (10-15 years) from urban schools of Secunderabad were reported to be inadequate by Chitra and Reddy (2007). On analysis of available dietary data of 12,789 adolescents collected by National Nutrition Monitoring Bureau (1998-99), it was revealed that the intakes of all the foodstuffs, especially the income elastic foods such as pulses, milk and milk products, oils and fats and sugar and jaggery were lower than the suggested levels. Moreover, the intakes of all the nutrients were below the recommended values (Rao et al. 2006). Malhotra and Passi (2007) had stated that the intakes of milk and milk products, pulses, green leafy vegetables, other vegetables and fruits were grossly inadequate in 209 rural girl beneficiaries

(11-21 years). The consumption of vegetables, milk and meat was noted to be very low by 47 adolescent girls aged 13-18 years attending a workshop on health and development in Vellore (Jude et al. 1991).

Girls have always been a marginalized group of our society. It seemed worthwhile to get an insight into the dietary and nutrient intake data of young girls coming from disadvantaged backgrounds. Such information can help programme planners to plan strategies for their overall development.

METHODOLOGY

Selection of Subjects: This paper is a part of a bigger intervention case control study where biscuits fortified with vitamin A, iron, folic acid, ascorbic acid and iodine were fed to the adolescent girls studying in a government school in Jaipur city for all working days over a period of 4 months. A government school where the number of girls enrolled was high and the school being close to the University for logistical convenience was selected for the study. Girls (n=146) in the age group of 10-16 years studying in classes VI to VIII were included in the study.

Dietary Survey: Dietary intake data were collected for 146 girls in the age group of 10-16 years. The mother of the child was the respondent. Some of the information was also supplemented by the girls. Dietary data were assessed through one day 24 hour dietary recall method. The intake was determined with the help of standardized *bhigonas*, *katoris*, glasses, ladles and spoons. The recipes were standardized in the laboratory for the calculation of the dietary intakes. Dietary

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intake data were compared with the balanced diets (Gopalan et al. 1981) and were translated into nutrient intake data with the use of Nutritive Value of Indian Foods (Gopalan et al. 1996). Commonly eaten foods like biscuits, *namkeen*, toast, *phan* (a baked product from refined wheat flour and hydrogenated fat), chips etc. were bought from the market and weighed in the laboratory. Salt packets were also checked for brand name and type of salt used. Information was also collected on the type of fats and milk used by the families. The data were collected from October 2004 to January 2005.

RESULTS AND DISCUSSION

As regards the dietary pattern, the girls consumed tea with toast, *phan*, *roti*, biscuits or bread in the morning. At mid-morning, the girls had lunch which consisted of *roti* and a *dal*/vegetable. In the late afternoons, most of the girls had a cup of tea usually without anything but occasionally with *roti*, biscuits, *namkeen*, *phan* or toast. They had an early dinner comprising *roti* and a *dal*/vegetable. Most of the women in this area worked either in the homes or outside. Hence, most of the cooking was done in the evening. The left over *dal*/vegetable was used the next morning. It was observed that the green leafy vegetables were consumed in good amounts as the data collection was conducted in winters. But as the food was cooked for the whole family to last two meals, the intake of even dark green leafy vegetables was not much. The *rotis* in many households were very thick and cooked on an earthen *tava* (griddle) on an open hearth.

The mean energy intakes of the subjects were in the range of 55%-56% of the RDAs (Table 1). The bulk of the energy intake was fulfilled by the cereal intake. The mean protein intake of the subjects was also low and was about 56%-61% of the RDAs. The pulse intake of the girls was very low and so was true for milk and milk products. The total fat intake was a little over one-third of the day's requirement.

The calcium and iron intakes were close to or exceeded a little over one half of the day's requirement. The intake of beta carotene was also about 45% to 55% of the RDAs. Most of these nutrients were obtained from whatever little milk and dark green leafy vegetables were consumed by the girls. Wheat flour used in the making of *rotis* was also a contributor to iron intake.

Table 1: Nutrient intake data of the subjects

	Energy (kcal)	Proteins (g)	Total fats (g)	Fiber (g)	Carbo- hydrates (g)	Calcium (mg)	Iron (mg)	Beta carotene (mcg)	Retinol (mcg)	Thia- min (mg)	Ribo- flavin (mg)	Niacin (mg)	Folic acid (mcg)	Vitamin C (mg)
10-12 years (n=79)	1097.9 ±297.765	34.6 ±9.580	20.7 ±9.201	5.5 ±2.108	194.5 ±56.433	339.8 ±144.609	12.4 ±4.404	872.1 ±1671.242	51.5 ±40.137	1.2 ±0.387	0.6 ±0.206	10.3 ±4.029	114.4 ±49.500	33.8 ±26.282
RDA	1970	57	55 ^a			600	19	2400	600	1.0	1.2	13	70	40
% RDA	55.7	60.7	37.7			56.6	65.2	44.9 ^b		121.7	51.5	79.4	163.4	84.4
13-15 years (n=60)	1144.1 ±296.324	36.7 ±10.297	21.1 ±9.539	5.9 ±1.981	202.7 ±54.037	357.5 ±128.362	15.4 ±12.223	1063.7 ±1692.792	45.5 ±26.418	1.3 ±0.369	0.6 ±0.189	11.1 ±3.256	115.5 ±41.831	42.7 ±41.165
RDA	2060	65	57 ^a			600	28	2400	600	1.0	1.2	14	100	40
% RDA	55.5	56.5	37.0			59.6	54.9	51.9 ^b		125.6	53.8	79.0	115.5	106.9
16-18 years (n=7)	1154.4 ±289.779	38.3 ±9.561	18.1 ±8.042	5.5 ±1.490	210.1 ±49.831	280.9 ±85.489	14.6 ±5.388	1187.5 ±1424.140	33.5 ±22.411	1.3 ±0.413	0.6 ±0.197	11.4 ±3.435	135.8 ±66.293	37.3 ±31.669
RDA	2060	63	57 ^a			500	30	2400	600	1.0	1.2	14	100	40
% RDA	56.0	60.8	31.8			56.2	48.8	55.1 ^b		134.7	50.7	81.2	135.8	93.2

^a Fats taken as 25% of the total calories.

^b Retinol converted to beta carotene for comparison with RDAs.

The intake of thiamin was more than the requirement because cereals were consumed in adequate amounts. The intake of riboflavin was not much while niacin intake met three-fourths of the day's requirement. Folic acid intake was adequate and that of vitamin C was close to the RDA. Most of the vitamin C was supplied by green leafy vegetables.

Whole wheat flour which was used in the preparation of *rotis* was the main contributor to proteins, invisible fats, fibre, carbohydrates, calcium, iron, thiamin, niacin and folic acid. Taking nutrients individually, it was seen that protein was mainly provided by cereals. Calcium intake was taken care of by milk and milk products, wheat flour and green leafy vegetables. Iron was chiefly provided by wheat flour. Beta carotene was obtained from dark green leafy vegetables and a little from wheat flour. Wheat flour provided a major portion of thiamin, riboflavin (together with milk and milk products), niacin and folic acid. The main contributors to vitamin C intake were dark green leafy vegetables like radish leaves, spinach, fenugreek leaves, cabbage and fruits like amla and zizyphus.

The intake of cereals by the girls was considered to be appropriate as about 250g-300g of cereals was consumed by them. The intake of pulses was very low (Table 2). In the winters, as vegetables were available in plenty, these were used more often than pulses. Otherwise, roots

and tubers like potatoes and onions were also used very commonly to prepare vegetables. The intake of green leafy vegetables was low, as was of roots and tubers and other vegetables for the older age group. The intake of fruits was also low. The fruits consumed were bananas, apples, sapotas, zizyphus, dates, pomegranates, amlas, guavas and oranges. There were just a handful of girls who had consumed fruits.

Milk was only used for the preparation of tea. *Chaach* (butter milk) was used for preparing kadhī (a preparation made from *besan* and *chaach*). The intake of fats and oils was also low. Sugar was mainly used in 2 cups of tea which were taken in the morning and evening.

The types of visible fats used by the families were hydrogenated fats, oils and *desi ghee*. Most of the families used oil for cooking (Table 3). This oil was bought loose from the market. *Desi ghee* (clarified butter) is still considered to be the best fat which is reserved for applying on the *chapatis*. In case the family could not afford to buy *desi ghee* they preferred to use hydrogenated fat. However, on the visits to the families it was emphasized that oil is the best medium for cooking and that a variety of oils should be used instead of using one type of oil for years together. Use of hydrogenated fats was also discouraged.

Most of the families bought milk from Saras Dairy. The three types of milk packets used were smart (Rs.12/l), *taaza* (Rs.14/l) and gold (Rs.16/l)

Table 2: Dietary intake data of the subjects

Food Groups (g)	10-12 years (n=79)	Reco- mmended	% Reco- mmended	13-18 years (n=67)	Reco- mmended	% Reco- mmended
Cereals	217.0±70.687	320	67.8	232.7±70.989	350	66.5
Pulses	11.5±13.707	70	16.4	13.4±16.243	70	19.1
Green leafy vegetables	15.0±34.051	100	15.0	19.6±39.418	150	13.1
Other vegetables	37.8±43.204	75	135.9	46.7±53.637	75	62.2
Roots and tubers	64.1±88.376			51.5±68.099	75	68.7
Fruits	9.1±29.109	50	18.2	17.3±48.084	30	57.8
Milk and milk products	97.0±69.761	250	38.8	89.8±53.002	250	35.9
Fats and oils	12.4±7.482	35	35.4	12.7±7.670	35	36.3
	(visible)	(visible)		(visible)	(visible)	
Sugar and jaggery	17.3±9.822	50	34.5	16.9±7.564	30	56.4
Nuts and oilseeds	2.4±8.226	-	-	1.2±5.814	-	-

Mean ±SD.

Table 3: Type of fat intake by the subjects

	Hydrogenated fats (g)	Oils (g)	Desi ghee (g)	Total fats (g)
10-12 years (n=79)	0.9±2.053	9.3±6.389	2.2±3.563	12.4±7.482
13-18 years (n=67)	0.8±1.391	9.3±7.083	2.5±3.309	12.7±7.670

Mean ±SD.

with the fat content of 1.5%, 3.0% and 6.0%, respectively. Ninety three of the families consumed smart milk, 28 gold milk and 12 *taaza* milk (Table 4). Some of the families owned goats and hence consumed goat's milk. In the same locality there were a few private dairies with cows and buffaloes. Some of the families bought milk from there, too. Some bought milk from the shops when need arose, and some had vendors delivering milk to their homes.

Just 25 girls had consumed fruits of which the most commonly consumed fruits were fresh dates, bananas, and apples. A few had also taken zizyphus, pomegranate, sapota, guava, orange and amla.

The salt packets were checked to confirm the brand names of salts consumed by them. In 102 households, the packets could not be seen because the salt had been transferred to plastic containers and the polythene packets were thrown away. Of the 40 salt packets seen, the brand names of the salt consumed included STC, Tata, Surya, Aapno, Bhaskar, Sona Chandi, Goyal, Sambhar, Maggie, Tajmahal, Himalaya and Healthy (Table 4). However, whenever the ladies were asked about the kind of salt consumed they would either say Surya or Tata though they might be consuming any locally prepared non-iodised salt. Some of the families used *dhehah* salt which was ground in a mill. However, such families and others who consumed locally prepared non-iodised salt were advised to switch over to branded iodised salt. They were even told of the correct usage and storage practices of iodised salt. Most of the families (87%) stored salt in closed plastic boxes, however, the rest kept it in open polythene packet or box. The most commonly used oil by the families was mustard oil (85%) which they bought loose from the market. Some of the families used groundnut oil (13%) and a few utilised soyabean oil (2%) for cooking purposes.

Studies conducted elsewhere in the country on adolescent girls and young women from rural areas and slums showed that their diets were inadequate. Chaturvedi et al. (1996) assessed the nutrient intakes of 941 adolescent girls of ages 10-18 years from 18 villages of Jaipur district. The diets were found to be deficient in calories by 26% to 36% and in proteins by 23% to 32%. In another study, Chaturvedi et al. (1994) reported that the diets of married adolescent girls from rural Rajasthan were deficient in calories by 30% to 40%, in proteins by 25% to 37%, in iron by 39%

Table 4: Types of food items consumed by the subjects

Type of milk consumed*	(n=156)	Type of fruits consumed	(n=25)	Salt packets checked for brand name	(n=146)	Type of salt consumed	(n=40)	Type of storage of salt	(n=146)	Type of oil used	(n=146)
smart (Rs 6)	93 (59.6)	dates fresh	6 (24.0)	packet not seen	102 (69.9)	Surya	22 (55.0)	closed plastic box	127 (87.0)	mustard	124 (84.9)
gold (Rs 8)	28 (17.9)	banana	6 (24.0)	packet seen	40 (27.4)	Tata	4 (10.0)	open packet/box	19 (13.0)	ground nut	19 (13.0)
taaza (Rs 7)	12 (7.7)	apple	5 (20.0)	Milled salt	4 (2.7)	Sambhar	2 (5.0)			soyabean	3 (2.1)
goat's	6 (3.8)	zizyphus	2 (8.0)			STC	2 (5.0)				
buffalo's	6 (3.8)	pomegranate	2 (8.0)			Sona chandi	2 (5.0)				
shop	5 (3.2)	sapota	1 (4.0)			Goyal	2 (5.0)				
vendor	4 (2.6)	guava	1 (4.0)			Aapno	1(2.5)				
cow's	2 (1.3)	orange	1 (4.0)			Bhaskar	1(2.5)				
		amla	1 (4.0)			Maggie	1(2.5)				
						Tajmahal	1(2.5)				
						Himalaya	1(2.5)				
						Healthy	1(2.5)				

Figures in parentheses denote percentages.

*Use of different types of milk in one day.

n>146 due to multiple responses.

to 55% and in vitamin A by 10% to 34%. In the present study, too, the energy deficit of the young girls was about 44% to 45% and the protein deficit was to the tune of 39% to 44%. The iron content of the diet was also lower by 35% to 51% and the beta carotene and vitamin A combined lesser by 45% to 55%. The studies conducted by Chaturvedi et al. (1994, 1996) were carried out in the rural areas of Rajasthan where the intakes of young girls seemed to be better than those of the adolescent girls of an urban slum of Jaipur city.

In a study on 802 school children, boys and girls, aged 10-15 years, belonging to different urban schools located in Secunderabad, it was noted that the mean nutrient intakes were inadequate compared with recommended values for energy and protein (Chitra and Reddy, 2007). In the present study too, the energy and protein intakes of adolescent girls (10-16 years) were about 56% and 60% of the RDAs, respectively. Rao et al. (2006) analysed the available dietary data of 12,789 adolescents (10-17 years) collected by National Nutrition Monitoring Bureau (1998-99). The intakes of all the nutrients were found to be below the recommended levels, while that of micronutrients such as iron, vitamin A and riboflavin were grossly inadequate in all age and sex groups. The intakes of almost all the nutrients by adolescent girls (10-16 years) in the present study were, also, below the RDAs except for thiamin and Folic acid which were found to be adequate.

Dietary intake of 52 males and 175 females from an urban slum in New Delhi was assessed by Misra et al. (2001). The diets averaged approximately 59% to 60% of energy from carbohydrates, 12% to 13% energy from protein and 24% to 27% energy from dietary total fat. It was further observed that there was lower intake of monounsaturated fatty acids (MUFA), a low ratio of n-6/n-3 fatty acids, a high ratio of polyunsaturated and saturated fatty acids, a high intake of erucic acid, and a low consumption of fibre and vitamin E intake. In the present study, the contribution by macronutrients to total calories was 70% to 73% from carbohydrates, 12% to 13% from proteins and 14% to 17% from total fats. The distribution of total calories into different macronutrients seemed to be adequate.

Malhotra and Passi (2007) assessed the diet quality of 209 girl beneficiaries (aged 11-21 years) of Adolescent Girl Scheme of six rural blocks from Delhi, Haryana, Rajasthan and Uttar Pradesh. The

mean daily intakes of milk and milk products, pulses, green leafy vegetables, other vegetables and fruits were grossly inadequate meeting only 47%, 36%, 26%, 34% and 3% of the suggested allowances; that of fats/oils and roots and tubers was somewhat adequate meeting 65% and 72% of the allowances while the intake of cereals and sugar was almost adequate revealing a deficit of only 7% and 3%. In the present study, the mean daily intake of adolescent girls (10-16 years) for all the food groups was below the recommended values, except for other vegetables and roots and tubers which was adequate for the 10-12 year old girls. Jude et al. (1991) determined the nutritional status of 47 adolescent girls aged 13-18 years attending a workshop on health and development in Vellore. The diet was predominantly based on rice. Consumption of vegetables, milk and meat was very low. In the present study, the intakes of almost all the food groups were below the recommended levels for balanced diets for young girls (10-16 years).

Pathak et al. (2004) collected data on dietary and nutrient intake of young married women from a rural community from Haryana. It was found that the mean dietary intake of iron, folic acid and calories was 14.8 ± 7.7 mg, 49.2 ± 20.1 mcg and 1564 ± 411 kcal, respectively. There was an inadequate intake of food as revealed by their calorie intake that was 83.4% of the RDAs. Only 6.9% and 7.8% of the women were consuming iron and folic acid more than 75% of the RDAs. The energy intake was much lower for the young girls of the present study being 55% to 56% of the RDAs, iron intake was 49% to 65% of the RDAs although folic acid intake was adequate.

Data obtained from the National Pilot Program on Control of Micronutrient Malnutrition from Assam, Bihar (Jharkhand), Orissa, West Bengal, and Tripura have been reported by Chakravarty and Sinha (2002). It was observed that except for cereals, the diet was deficient in all other food groups. Nutrient intake (i.e., energy, protein, vitamins and minerals) was also deficient in almost the entire study area. An almost similar pattern was observed for young girls of the present study.

CONCLUSION

The dietary and nutrient intakes of the young girls studying in a government school were much below the RDAs. The energy and protein intakes

were 55%-56%, and 56% to 61% of the RDAs, respectively. The intakes of calcium, iron, beta carotene and vitamin A and riboflavin were 35% to 65% of the RDAs. Niacin and vitamin C intakes were much closer to the RDAs. The diets had adequate amounts of thiamin and folic acid. The intakes of pulses, green leafy vegetables, fruits, milk and milk products and fats and oils as per the balanced diets were very low. The data suggested that attempts should be made in educating the girls to improve their dietary intakes. As the girls are regimented in a school system such an approach can prove to be successful.

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REFERENCES

- Chakravarty I, Sinha RK 2002. Prevalence of micronutrient deficiency based on results obtained from the national pilot program on control of micronutrient malnutrition. *Nutr Rev*, 60 (5 Pt 2): S53-8.
- Chaturvedi S, Kapil U, Bhanthi T, Gnanasekaran N, Pandey RM 1994. Nutritional status of married adolescent girls in rural Rajasthan. *Indian J Pediatr*, 61(6): 695-701.
- Chaturvedi S, Kapil U, Gnanasekaran N, Sachdev HP, Pandey RM, Bhanthi T 1996. Nutrient intake amongst adolescent girls belonging to poor socioeconomic group of rural area of Rajasthan. *Indian Pediatr*, 33(3): 197-201.
- Chitra U, Reddy CR 2007. The role of breakfast in nutrient intake of urban school children. *Public Health Nutr*, 10(1): 55-8.
- Gopalan C, Rama Sastri BV, Balasubramanian SC 1981. *Nutritive Value of Indian Foods*. Hyderabad : National Institute of Nutrition, Indian Council of Medical Research, pp. 29-32.
- Gopalan C, Rama Sastri BV, Balasubramanian SC 1996. *Nutritive Value of Indian Foods*. Hyderabad : National Institute of Nutrition, Indian Council of Medical Research, pp. 47-77.
- Jude PM, Chandrakala S, Jayalakshmi S, Vijayakumar, Parvathy D, Sampathkumar V, Abel R 1991. Status of adolescent girls in a rural south Indian population. *Indian J Matern Child Health*, 2(2): 60-3.
- Malhotra A, Passi SJ 2007. Diet quality and nutritional status of rural adolescent girl beneficiaries of ICDS in north India. *Asia Pac J Clin Nutr*, 16 Suppl 1:8-16.
- Misra A, Sharma R, Pandey RM, Khanna N 2001. Adverse profile of dietary nutrients, anthropometry and lipids in urban slum dwellers of northern India. *Eur J Clin Nutr*, 55(9), 727-34.
- Pathak P, Kapil U, Kapoor S, Saxena R, Kumar A, Gupta N, Dwivedi S, Singh R, Singh P 2004. Prevalence of multiple micronutrient deficiencies amongst pregnant women in a rural area of Haryana. *Indian J Pediatr*, 71: 1007-1014.
- Rao KM, Laxmaiah A, Venkaiah K, Brahmam GN 2006. Diet and nutritional status of adolescent tribal population in nine states of India. *Asia Pac J Clin Nutr*, 15(1): 64-71.