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Food Habits and Nutrient Intake of Urban School Children (13-15 years)

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ABSTRACT

Diet plays an important role in health status of an individual. Socio-economic parameters have large influence on the dietary pattern. The current study is an attempt to look at the dietary pattern, socio-economic profile and to correlate them. Fifty Urban school going children (25 boys and 25 girls) in the age group of 13-15 years were selected randomly for the study. Twenty four hour dietary recall method revealed that the mean cereals and millet intake of boys was found to be 297 g, pulses 39 g, milk and milk products 242 g, roots and tubers 90 g, Green Leafy Vegetables (GLV) 39 g, other vegetables 87 g, fruits 27 g, sugar 16 g and fat 35 g. The mean food intake of girls showed that they consumed 227 g of cereals and millets, 30g of pulses, milk and milk products 222 g, roots and tubers 56 g, GLVs 35 g, other vegetables 79 g, fruits 28 g, sugar 22 g and fat 34 g. The per cent nutrient adequacy was significantly ($p<0.01$) lower when compared to RDA. Consumption of fat and sugars was comparatively more than other food groups. Age had significant negative correlation with calcium intake in both the genders. Intake of both macro and micronutrients is below the RDA. Requiring intervention to create awareness about quality and quantity of food to be consumed and its importance in leading a healthy life.

Key words: *Socio – economic profile, Food practices, Nutrient intake, School children, RDA*

INTRODUCTION

Diet is a vital determinant of health and nutritional status of population. Protective foods like fruits and vegetables that are rich in vitamins, minerals, antioxidants, phytochemicals and fiber contribute to the quality of life. Traditional food practices having all the basic five food groups in balanced proportion conferring nutritional and health benefits are being lost in the course of time. Urbanization and lack of knowledge about nutrition has led to change in dietary patterns has decreased fruit and vegetable consumption and has increased intake of energy- dense foods, high in saturated fat, sugar and salt. This 'nutrition transition' is contributing to malnutrition and impacting significantly on the health of children. Malnutrition (under nutrition or over nutrition) among the school children is the most prevalent nutritional problem in developed and developing countries.

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Children under 15 years of age are considered to be the main victims of malnutrition and is attributed to a series of diverse etiological factors. Malnutrition in early childhood has serious, long-term consequences because it impedes motor, sensory, cognitive, social and emotional development. Vitamin A deficiency, which causes blindness and increases morbidity and mortality among preschoolers, also remains a public-health problem (WHO)[17]. Despite India's 50 per cent increase in GDP since 1991, more than one-third of the world's malnourished children are in India and about one third of wealthiest children are overweight. This figure that remains obstinately high, despite the country having the second-fastest growing economy in the world, with agriculture accounting for a significant part of that growth[5]. Ignorance about proper weaning foods, unhealthy dietary habits and poor intake of fruits and vegetables are a few of the mentionable obstacles. At the other end childhood malnutrition is also emerging as a threat in a different strata of population[13]. In India 45 per cent of children are stunted, 23 per cent are wasted and 40 per cent are underweight making up almost half of world's stunted children[8]. Vitamin and mineral deficiencies also affect children's survival and development. Anaemia affects 65 per cent of children. Iodine deficiency, which reduces learning capacity by up to 13 per cent, is widespread because fewer than half of all households use iodised salt (National Family Health Survey-III). More prevailing nutritional disorders like protein energy malnutrition, underweight, vitamin A deficiency disorders, iron deficiency anaemia and iodine deficiency disorders are caused by lack of one or more nutrients in the diet. The great advantage of looking at malnutrition as a problem in human ecology is that it allows for variety of approaches towards prevention. To take preventive measures it is important to know the current situation and dietary pattern. Therefore, the present study was taken up with an objective to study the dietary pattern of urban school going children.

Objective – To study the dietary pattern of urban school children and to see the correlation between socio-economic factors and nutrient intake.

MATERIALS AND METHODS

An urban school located in south Bengaluru was selected for the study. Children in the age group of 13-15 years belonging to 8th and 9th standard were selected randomly for the study, of which 25 were boys and 25 were girls. Officially permission was obtained from the school and parents were aware of children's participation in the study. Keeping in view the objective of the study, a detailed schedule was developed. A pilot study was conducted to test the practicability of the interview schedule and the final schedule was developed after incorporating the necessary modifications.

General information - Information related to the children and their family such as age, education status of parents, monthly income of the family, type and size of the family were studied in the following way. Age was operationalized as the chronological age of the respondents in completed years at the time of investigation. The respondents were categorized into three groups (13, 14 and 15 years) based on the procedure followed by Rao *et al.,*[12]. Family type refers to a two way classification of family as nuclear and joint. The basic grouping of mates and their children is called nuclear family and the collection of more than one nuclear family on the basis of close blood ties and living in common residence is called joint family[3]. Size of the family refers to the total number of individuals living together. The children were classified in according with the socio-economic status developed by Venkataramaiah.[16]

a. Small- 1-4 members, **b.** Medium- 5-7 members, **c.** Large- >7 members

Education is operationalised as the number of years of formal education the person has undergone. Parents of respondents were grouped into illiterate who cannot read and write and literate who can read and write. Mean monthly income of the family was determined in thousands and classified as Low

Income Group (LIG), Middle Income Group (MIG) and High Income Group (HIG) using the following formula,

a. LIG - < Mean - 0.5 SD, **b.** MIG - Mean ± 0.5 SD, **c.** HIG - >Mean + 0.5 SD

Dietary practices - Baseline diet survey of the selected subjects was conducted by using 24 hours recall method for seven days. Sets of pre standardized vessels were used to obtain amount of cooked foods consumed by the subjects. With this data consumption of nutrients like protein, fat, energy, fiber, calcium, iron, β-carotene and vitamin C were calculated using food consumption table[6] and also consumption of foods (groups) like cereals, pulses, milk and milk products, fruits and vegetables, oils, fats and sugars were calculated (NIN)[11]. The adequacy of nutrient intake (% RDA) was calculated by dividing the estimated nutrient intake and foods (groups) by recommended dietary allowances (RDA) appropriate for the child's age and sex and multiplied by 100 (Thimmayyamma,)[15].

Statistical analysis - The data of repondents were consolidated, classified, tabulated and expressed in percentages. The results obtained were analysed employing different statistical methods. Frequency and percentages were computed to interpret the demographic profile of the subjects. Chi-square test used to measure the association between two groups/characteristics was carried out to know the socio-economic status, nutrient intake of the study group. The difference between food intake of boys and girls was assessed by 'F' test and interpreted accordingly. Mean and standard deviation were calculated for dietary and nutritional adequacy of the children. The student't' test signifies the variation in the mean values of sample and population. It is used in the present study to compare the children's dietary intake with RDA. Karl Pearson's correlation coefficient was used for analyzing the relationship between socio-economic parameters, anthropometric measurements and nutritional status (Snedecor and Cocheran)[14].

$$\text{Per cent nutrient adequacy} = \frac{\text{Intake of each nutrient}}{\text{Recommended dietary allowances}} \times 100$$

RESULTS AND DISCUSSION

i) Socio-economic characteristics of the school children - Table 1 shows the socio-economic characteristics of the school children. No significant difference was found between boys and girls with respect to age group. Majority of the boys (80.00 %) and girls (76.00 %) belonged to the nuclear family. There is a gradual decrease in the number of joint families prevalent in the urban areas. These results are in line with the findings of Rao *et al*.,[12] who reported that majority (92.00 %) of the children under study belonged to nuclear families. With reference to the size of the family majority of the boys (76 %) and girls (80 %) belonged to the medium size family and only 8 per cent of the boys and 6 per cent of girls belonged to large size families. And about 16 per cent of the children belonged to small size families. These results are in consonance with the findings of Akhtar *et al*.,[1] who reported that 67 per cent of the school children possess medium size families. The data revealed that majority of the parents were literates (>80.00 %). These results are on par with the findings of Errayya *et al*.,[4] who reported majority (75.00 %) of the children's parents were literates. Majority of the children belonged to the middle income group (46 %), about 20 per cent belonged to the high income group and 34 per cent of the children belonged to low income group. Significant difference was observed with respect to monthly family income among the school children. These findings are in line with the report of Hasan *et al*.,[7] that reveal 47 per cent of the children were from middle income families.

Table 1: Socio-economic characteristics of the schoolchildren (N = 50)

Character	Boys (n = 25)		Girls (n = 25)		Combined (N = 50)		χ^2 value
	No.	%	No.	%	No.	%	
Age (years)							
13	8	32.00	10	40.00	18	36.00	0.78 ^{NS}
14	8	32.00	8	32.00	16	32.00	
15	9	36.00	7	28.00	16	32.00	
Type of family							
Nuclear	20	80.00	19	76.00	39	78.00	0.52 ^{NS}
Joint	5	20.00	6	24.00	11	22.00	
Size of the family (members)							
1 - 4	4	16.00	4	16.00	8	16.00	0.13 ^{NS}
5 - 7	19	76.00	20	80.00	39	78.00	
> 7	2	8.00	1	4.00	3	6.00	
Parents education							
Illiterate	5	20.00	4	16.00	9	18.00	0.87 ^{NS}
literate	20	80.00	21	84.00	41	82.00	
Monthly family income (Rs.)							
LIG	9	36.00	8	32.00	17	34.00	10.69**
MIG	10	40.00	13	52.00	23	46.00	
HIG	6	24.00	4	16.00	10	20.00	

** Significant at 1 % level, ^{NS} - Non-significant

ii) Food habits and dietary intake of the school children

Food habits- Food habits of an individual has considerable influence on dietary intake in terms of quality and quantity. Food habits of the selected school children are shown in the Table 2. Thirty two per cent of boys and 36 per cent of girls consumed only two meals per day and about 60 per cent of the children consumed three meals per day. Majority of the children were found to be vegetarians and the per cent of non-vegetarians is relatively high in boys (44 %) as compared to girls (28 %). Among non-vegetarians only boys consumed non-vegetarian food three times a week (9 %).

Table 2: Dietary pattern of the school children

(N = 50)

Food pattern	Category	Boys (n = 25)		Girls (n = 25)	
		No.	%	No.	%
Meals consumed per day	Once	0	0.00	0	0
	Twice	8	32.00	9	36.00
	Thrice	17	68.00	16	64.00
Food habits	Vegetarian	14	56.00	18	72.00
	Non – Vegetarian	11	44.00	7	28.00
Frequency of non-veg consumption	Weekly thrice	1	9.09	0	0.00
	Weekly twice	2	18.18	2	28.57
	Weekly once	8	72.72	5	71.42

Dietary intake - The mean food intake of the school children in comparison with the recommended dietary allowance is presented (Table 3 and Fig. 1). It was observed that the children were in a habit of skipping breakfast in the morning. The meal pattern of the

children is cereal based for breakfast. They consumed mid-day meal provided in the school for afternoon where they provided rice with dhal on most of the days. The children consumed finger millet dumplings for dinner. It was found that some children ate left overs of mid-day meal in the evening after school hours and missed their supper. The mean food intake of school children in comparison with RDA is shown in Table 3. Cereals, millets and pulses were the major food groups consumed among the school children. The consumption of protective foods like milk, milk products, GLVs, vegetables and fruits were less than 50 per cent of the RDA. The consumption of fat and sugars were upto 80 per cent of the RDA. Roots and tubers consumption was found to be 55 per cent of the RDA. The consumption of sugars was found to be significantly more in girls compared to boys at 5 per cent level. The results are in similar lines with that of Rao *et al*.,[12] who observed that the mean intake of all the food stuffs by school children were lower than the RDA except green leafy vegetables.

Table 3: Mean food intake (g/day) of the selected school children (N = 50)

Food groups	Boys (n = 25)			Girls (n = 25)			'F' test
	RDA	Actual intake	% adequacy	RDA	Actual intake	% adequacy	
Cereals and millets	420	297.02±45.75	70.72	330	226.92±49.21	68.76	0.95^{NS}
Pulses	75	39.35±12.79	52.46	60	29.92±14.69	49.87	9.40*
Milk (ml) and Milk products	500	241.71±55.13	48.34	500	221.79±52.26	44.35	1.83^{NS}
Roots and Tubers	150	89.58±19.41	59.72	100	55.99±12.13	55.99	84.64*
GLVs	100	38.67±10.07	38.67	100	34.65±13.01	34.65	2.59^{NS}
Other vegetables	200	86.78±24.92	43.39	200	79.30±22.89	39.65	1.72^{NS}
Fruits	100	26.78±7.69	26.78	100	28.10±6.41	28.10	0.72^{NS}
Sugar	20	16.43±3.38	82.18	25	21.60±5.62	86.42	18.61*
Fat/Oil (visible)	45	35.47±5.81	78.84	40	33.94±6.36	84.85	0.87^{NS}

* Significant at 5 % level, ^{NS} - Non-significant

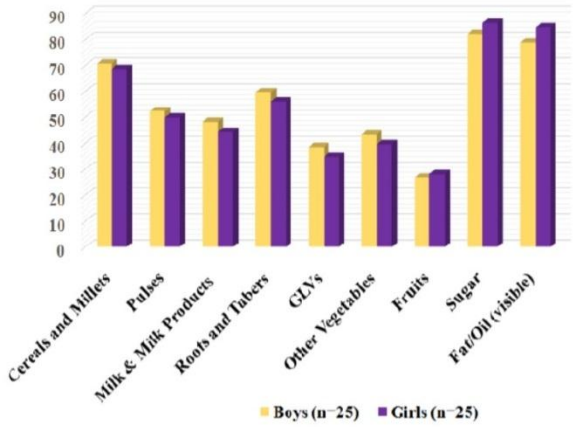

Fig. 1: Per cent adequacy of food intake among school children

Nutrient intake - The per cent adequacy of nutrients of boys and girls are shown in the Table 4 and 5. The intake of all the nutrients was lower compared to RDA in both boys and girls. Statistical analysis showed significant difference with RDA in both the groups at 1 per cent level. In the school children, the growth and development of the body muscle is

very high. The children in the age of 13-15 years are in growth spurt where the requirement of dietary protein is must for proper growth. There is rapid increase in the height, weight and also the children are in the age of attaining sexual maturity that demands more protein for maintenance of the body tissues, bones and muscles. Protein intake is observed below the RDA in both boys and girls in this study. Average intake of protein per day per person was 35.88 g in boys and 30.91 g in girls, so there was protein deficiency. Fat is concentrated source of energy, also it spares protein for the body building and repairing. It creates a sort of cushion in the form of adipose tissue to preserve body's vital organs. Average fat intake in boys and girls was 36.96 g and 35.91 g which was 18 per cent and 11 per cent less than the standard allowance. As school children are more active and play outdoor games in this age the body requires energy. Energy is also required to keep body in positive energy status. According to Table 4 and 5, average intake of calorie in boys and girls was 1959 Kcal and 1704 Kcal which was 29 per cent and 27 per cent less than the standard requirements per person per day respectively. Calcium is an important nutrient for school children, for bone structure development and maintenance, for muscle contraction, nerve signaling which are calcium dependent physiological processes. Even though the children consumed finger millet dumplings, the intake did not meet RDA. This may be due to lack of milk products in their diet and anti-nutrient factors present in ragi that hinder the absorption of calcium. Even though the Karnataka State Government is providing milk for school children under "Ksheera Bhagya" project, most of the children did not consume milk. This may be due to the lack of awareness in the children about importance of calcium in the diet. Average iron intake in boys and girls was 21.14 mg and 14.71 mg. The iron intake was comparatively low in girls. This may be due to less consumption of green leafy vegetables. Average β-carotene intake in boys and girls was 2183 µg and 2052 µg. The low intake of β-carotene was found in the school children. This may be due to the less consumption of yellow and orange fruits and vegetables (protective foods) and milk/milk products. Average vitamin C intake in boys and girls was 25 per cent and 32 per cent less than the standard requirements in the study group. This may be due to less consumption of fruits especially citrus fruits. The probable reason for this inadequate intake of quantity and quality of cereals, pulses, milk and milk products, roots and tubers, fruits and vegetables, sugar, fats and oil was lack of nutrition knowledge which can lead to unhealthy food choices. Low purchasing power also might be a contributing factor where there is tendency to consume lower amounts of nutrients particularly protective nutrients. The above results are in line with the findings of Choudhary *et al*.,[2] and Murugkar *et al*.,[10] who reported that except for fat the mean macro and micro nutrient intake was less than recommended dietary allowance.

Table 4: Mean nutrient intake of selected boys in comparison with RDA

(n = 25)

Nutrients	RDA	Mean ± SD	% adequacy	't' value
Protein (g)	54.3	35.88±8.93	66.07	10.30**
Fat (g)	45	36.96±6.53	82.14	6.14**
Energy (Kcal)	2750	1959±328.15	71.24	12.05**
Calcium (mg)	800	675±120.37	84.32	5.21**
Iron (mg)	32	21.14±2.85	66.09	19.05**
β-Carotene (µg)	4800	2183.81±370.26	45.49	35.32**
Vitamin C (mg)	40	30.39±6.06	75.99	7.91**

** Significant at 1 % level.

Table 5: Mean nutrient intake of selected girls in comparison with RDA

(n = 25)

Nutrients	RDA	Mean ± SD	% adequacy	't' value
Protein (g)	51.9	30.91±9.51	59.57	11.02**
Fat (g)	40	35.91±4.34	89.77	4.70**
Energy (Kcal)	2330	1704±216.43	73.16	14.44**
Calcium (mg)	800	691±124.03	86.37	4.39**
Iron (mg)	27	14.71±3.78	54.48	16.25**
β-Carotene (µg)	4800	2052.72±347.23	42.76	39.55**
Vitamin C (mg)	40	27.24±4.21	68.10	15.15**

** Significant at 1 % level.

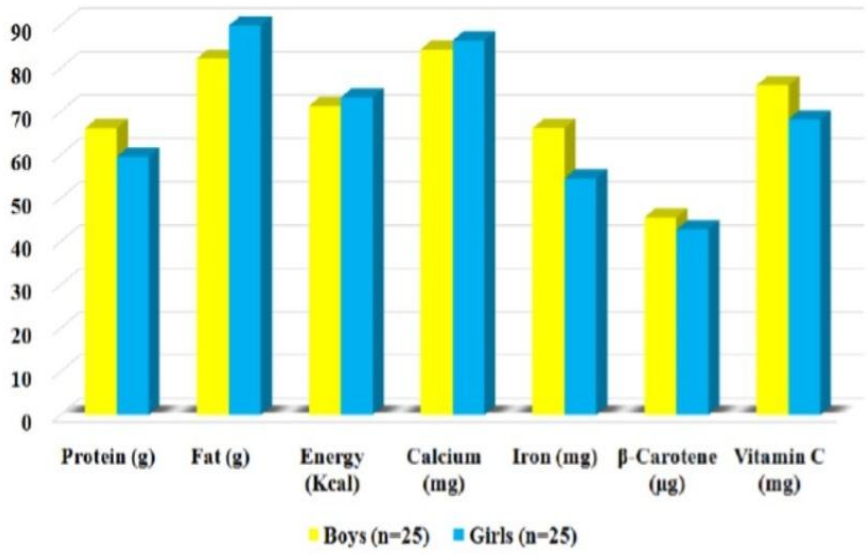

Fig. 2: Per cent adequacy of nutrient intake among school children

iii) Correlation co-efficient of socio-economic factors on nutrient intake – Children's dietary status is determined by variety of complex factors namely socio-economic characteristics. The correlation between these parameters are shown in Table 6. Age had a significant positive correlation with fat intake (r = 0.418*) among boys and negative correlation with the calcium intake in both boys (r = -0.634**) and girls (r = -0.465*). This may be due to lack of knowledge. Family type had negative correlation with calcium intake (r = -0.296) and iron intake (r = -0.022) in boys. This may be due to the decreased access to food stuffs with increase in number of family members. Family income had a positive correlation with the intake of calcium in both boys (r = 0.531**) and girls (r = 0.466*). This can be attributed to their increased purchasing power that might have led to increased consumption of calcium rich foods. These results are in line with the findings of Murugkar *et al*.,[10] who reported that the poverty has resulted in the nutritional inadequacy of the children.

Table 6: Correlation coefficient of independent variables on nutrient intake of school children

(n = 50)

Independent variables	Correlation co-efficient (r)									
	Boys (n = 25)					Girls (n = 25)				
	Protein (g)	Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Protein (g)	Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)
Age	0.156	0.418*	0.067	- 0.634**	0.079	0.161	0.208	- 0.395	- 0.465*	0.361
Family type	0.095	0.265	0.197	- 0.296	-0.022	0.214	- 0.219	- 0.081	0.110	0.190
Family size	0.117	0.110	0.051	0.304	0.145	- 0.108	0.188	- 0.039	0.266	- 0.310
Parents education	0.040	0.074	- 0.049	- 0.086	- 0.023	0.011	- 0.074	0.052	- 0.256	0.043
Family income	0.162	- 0.304	- 0.160	0.531**	- 0.041	0.345	- 0.227	0.176	0.466*	- 0.174

*Significant at 5 % level, ** Significant at 1 % level.

CONCLUSION

It is evident from the present study that dietary pattern of the study group is below the RDA. The diet of the school children was lacking variety and they were not concerned about the quality of the food they consumed. This can lead to malnutrition in the long run. Malnutrition in early childhood has serious, long-term consequences because it impedes motor, sensory, cognitive, social and emotional development. So, it is important to encourage children to consume more fruits and vegetables as they are rich source of vitamins, minerals, dietary fiber and antioxidants that are required for the normal growth, development and maintenance of health. In a country marked by malnutrition fruits and vegetables have an important role as "protective foods". Research supports the role of fruits and vegetables consumption in prevention of non-communicable diseases also[9]. Studies have shown that eating patterns are developed at an early age and can be traced into and through adulthood. Convincing the children to opt for fruits and vegetables over junk foods can only be achieved by interventions that focus on promoting the healthy food practices. Considering the above there is need to educate children about nutrition, healthy eating habits and its importance to reduce the incidence of malnutrition. Nutrition intervention combined with nutrition garden can be more beneficial in this regard specially for school going children. Considering the parents and the teachers in the dietary intervention programmes is equally important as they need their continuous support and are influenced more by them.

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REFERENCES

1. Akhtar, M. S., Bhatty, N., Sattar, M., & Javed, M. T., Comparison of nutritional status in children of different socio-economic statuses. *Medical Journal of Islamic Academy of Sciences*, **14(3):** 97-102 (2001).
2. Choudhary, S., Mishra, C. P., & Shukla, K. P., Dietary pattern and nutrition related knowledge of rural adolescent girls. *Indian J Prev Soc Med*, ***41***(3), 207-215 (2010).
3. Dahama, O. P., & Bhatnagar, O. P., Education and communication for development. Oxford and IBH publishing Home. Bombay (1980).

4. Errayya, D, Kumari, R. P., Sunita, S., Lakshmi, V. G. & Naidu, A. S., A study on nutritional status and micronutrient deficiencies among primary school children. *IOSR Journal of Dental and Medical Sciences (IOSRJDMS),* **13(12):** 20-23 (2014).
5. Gillespie, S., Harris, J., & Kadiyala, S., The Agriculture-Nutrition Disconnect in India: What Do We Know?. *IFPRI Discussion Paper*, **01187*:*** 1-56 (2012).
6. Gopalan, C., Rama Shastri, B.V., Balasubramanian, S. C., Rao, B. S. N., Deoshale, Y. G., & Pant, K. C., Nutritive value of Indian foods. NIN, Hyderabad. 47-58 (2012).
7. Hasan, I., Zulkifle, M., & Ansari, A. H., An assessment of nutritional status of the children of government Urdu higher primary schools of Azad Nagar and its surrounding areas of Bangalore. *Arch Appl Sci Res*, **3(3):** 167-176 (2011).
8. Jain, M., India's Struggle Against Malnutrition—Is the ICDS Program the Answer?. *World Development*, **67:** 72-89 (2015).
9. McAleese, J. D., & Rankin, L. L., Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *Journal of the American Dietetic Association*, **107(4):** 662-665 (2007).
10. Murugkar, D. A., Gulati, P., & Gupta, C., Nutritional status of school going children (6-9 years) in rural area of Bhopal district (Madhya Pradesh), India. *International Journal of Food and Nutritional Sciences*, **2(4):** 61-67 (2012).
11. NIN, Dietary guidelines for Indians – A manual, ICMR (2010).
12. Rao, K. M., Balakrishna, N., Laxmaiah, A., Venkaiah, K., & Brahmam, G. N. V., Diet and nutritional status of adolescent tribal population in nine states of India. *Asia Pacific journal of clinical nutrition*, **15(1):** 64 (2006).
13. Riaz, R., Sultana, A., Hameed, S., Tehseen, I., & Sabir, S. A., Nutritional Status of School Going Children. *Journal of Rawalpindi Medical College (JRMC)*, **14(1):** 51-54 (2010).
14. Snedecor, G. W., & Cochran, W. G., Statistical methods. 6th edition. Published by Oxford and IBH publishing co., 1, Calcutta (1967).
15. Thimmayamma, B. V. S., A handbook of schedules and guidelines in socio-economic and diet surveys. *National Institute of Nutrition, Indian Council of Medical Research, Hyderabad*, **33*:*** (1987).
16. Venkatataramaiah, Development of socio-economic status scale for urban areas. Ph.D. Thesis, Univ. Agric, Sci, Bengaluru (1990).
17. WHO, Global Database on Vitamin A Deficiency. *The Lancet.* 137-159 (2009).