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Descriptive Study on Dietary Pattern and Health Status of Adolescents from Rural Bengaluru

D. Vijayalakshmi, D. Barbhai Mrunal, J. Deepa, Megha Katte

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ABSTRACT

Background: Changing lifestyle and food consumption patterns have greater impact on the health status of adolescents including rural, urban and peri-urban areas. Adolescents are vulnerable age group and needs special attention to meet the daily recommended nutrient intakes, especially as it lays foundation for the adult life. Thus, this study was planned to document the sociodemographic and food consumption pattern of adolescents residing in rural Bengaluru.

Methods: A semi-structured questionnaire was designed based on pilot-study to collect data on the anthropometric profile, socioeconomic status and food consumption pattern. The data was calculated for the per cent adequacy for nutrients and food intake.

Result: The data suggested that majority (80%) respondents belonged to lower middle class and only 12-16% were from upper lower class. Sixty-eight per cent respondents had normal BMI while still 29 per cent were underweight. Skipping meals was noted more in adolescent girls than boys. The per cent nutrient adequacy was more for macronutrients, while less for micronutrients; however, the calcium adequacy was higher due to regular finger millet consumption.

Key words: Adolescents, Anthropometry, Nutrient adequacy, Per cent intake adequacy.

INTRODUCTION

Food habits and consumption pattern are changing globally on account of various factors like urbanization, income levels, socioeconomic status and so on (de Lanerolle-Dias *et al*. 2015). Urbanization usually is considered as one of the major driving factors for the changes in eating and food habits amongst individuals in urban areas. However, with the recent scenario, these factors have not only influenced the food consumption pattern in urban areas, but has also modified the food choices of rural population. The diet including higher intakes of animal products, refined foods, fats and oil have been considered as urbanized diet (Pandey *et al*., 2020). These changing food consumption patterns have been associated with nutrition and health transition amongst the individuals. The modified food consumption pattern, increased intake of processed, convenience foods, coupled with sedentary life style, has ultimately increased the risk of non-communicable diseases (Abizari and Ali 2019). Along with the spiking risk of overnutrition, the burden of undernutrition and micronutrient deficiencies still prevails. Thereby making it vital to record the changing trends in adolescents' food consumption.

The changes in food consumption pattern can greatly influence the health status of the vulnerable groups, especially adolescents, children and expecting mothers. During adolescence (10-19 years) multiple factors like peer influence, social, cultural and demographic factors can affect the food choices; leading to foundation of unhealthy food habits. Thus, imparting proper nutrition knowledge and inculcating healthy eating habits during this age is essential to avoid the long-term health complications, especially for adolescent girls. Current statistics in India suggested that girls (40%) and boys (18%) fall prey to anemia (https://www.unicef.org/india/what-we-do/adolescent-nutrition#:~:text=Adolescence%20is%20a%20nutritionally%20vulnerable,cent% 20of%20boys%20are%20anaemic accessed on 23-06-2022).

Changing food habits is a global phenomenon; thus, understanding the current trends in food intakes, dietary behavior, eating habits and food choices of adolescents can prove useful in planning improved food and nutrition interventions. Further, understanding the dietary pattern of adolescents can also help in correlating it with their health status or prevalence of any life style associated disorders like obesity, cardiovascular diseases and diabetes (Abizari and Ali 2019; Venkaiah *et al*., 2002). Therefore, this study aims at documenting the socio-demographic, anthropometric profile and dietary habits of the adolescent girls and boys in rural Bengaluru.

Department of Food Science and Nutrition, University of Agricultural Sciences, Gandhi Krishi Vigyana Kendra, Bengaluru-560 065, Karnataka, India.

Corresponding Author: D. Vijayalakshmi, Department of Food Science and Nutrition, University of Agricultural Sciences, Gandhi Krishi Vigyana Kendra, Bengaluru-560 065, Karnataka, India.
Email: viji.dega@gmail.com

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MATERIALS AND METHODS

Sample selection and data collection

In this study purposive random sampling was done and 100 adolescent subjects were selected (50 boys and 50 girls) falling in the age group of 13-15 years from rural North Bengaluru. A standardized questionnaire was designed based on pre-tested questionnaire and pilot-study, to draw necessary information regarding their socio-economic status and dietary habits. Detailed information regarding sociodemographic and anthropometric measurements of the subjects were collected. The height, weight, mid upper arm circumference (MUAC), skin fold thickness (SFT) was measured using standard protocols (Jelliffee, 1966). Body Mass Index (BMI) was calculated using formula: weight (in kg)/ height (in m^2); further it was categorized as underweight (<18.5 kg/m^2), normal (18.5 to 24.9 kg/m^2), pre-obesity (25 to 29.9 kg/m^2) obesity class I (30 to 34.9 kg/m^2), obesity class II (35 to 39.9 kg/m^2) and obesity class III (> 40 kg/ m^2) according to WHO (2010).

Socioeconomic status (SES)

Modified Kuppaswamy SES scale 2021 was used in this study to classify the respondents into five groups based on the total scores *viz*., upper class (I: 26-29), upper middle class (II: 16-25), lower middle class (III: 11-15), upper lower (IV: 5-10) and lower socio-economic class (V:<5). The scoring used in the scale is based on education and occupation of head of family along with total monthly income of the family (Saleem and Jan 2021).

Dietary survey and assessment

Dietary information was collected using 24-hour recall method for 3 days in a week. The consumption quantities of raw and cooked foods were recorded after showing the sets of pre-standard vessels. Dietary intake of different food groups (cereals and millets, pulses, milk and milk products, roots and tubers, green leafy vegetables, other vegetables, fruits, sugar) were quantified and based on the quantities consumed, individual nutrients were calculated using food compositional table (Longvah *et al*., 2017). Further the per cent adequacy for food intake and nutrients were calculated comparing to recommended dietary intake (RDI) and dietary allowances (RDA) (ICMR-NIN 2020). Following formula were used to calculate per cent intake and nutrient adequacy.

$$\text{Per cent nutrient/intake adequacy} = \frac{\text{Intake of each nutrient/food group}}{\text{RDA for the nutrient /RDI for food group}} \times 100$$

Research ethics

The study was approved by the institutional ethical committee for Human Research, University of Agricultural Sciences, GKVK, Bengaluru (No. DR/STA/Ethical Committee/2020-21) dated 05-04-2021. Informed consent was taken from the school management and authority, head master, parents and children before conducting the interview and asking the respondents to fill in the questionnaire. The respondents were made aware that their participation in the study is voluntary and can be withdrawn anytime.

Statistical analysis

The data was analyzed; necessary descriptive statistics was applied and the values were expressed as mean ± standard deviation (SD).

RESULTS AND DISCUSSION

Socioeconomic status (SES) and anthropometric data

The socioeconomic and anthropometric data of the respondents is provided in Table 1 and 2. It was observed that amongst adolescents (50 girls and 50 boys) 32% respondents were studying in 8^{th}, 37% in 9^{th} and 31% in 10^{th} standard. Majority of the respondents belonged to the nuclear family (68% girls and 74% boys), followed by the joint family (28% girls and 24% boys) and only 4% of girls belonged to the extended family. Amongst the total respondent (n=100), 85% adolescents responded that their father was head of family, while only 15 % reported mother as the head of the family. Considering socioeconomic status, more than 80% of the respondents belonged to the lower middle class, while 12-16% were upper lower class and only 2% were upper middle class based on the education, occupation of head of the family and the total family income.

Anthropometric data suggested that on average the height, weight, SFT, MUAC and BMI were within the normal ranges. However, when the respondents were classified into BMI categories it was noted that 32% girls and 26% boys were underweight with BMI below 18.5. However, majority of the respondents *i.e*., 64% girls and 72% boys were having normal BMI and only 4% girls and 2% boys were falling under pre-obese BMI category. The results suggested that though majority respondents were normal, still there were cases of underweight and pre-obesity. This is an indicator that the burden of under and over nutrition co-exists. The results for anthropometric data correlated with a previous study conducted by Lakshmi (2021) and the standard values given by ICMR (2010); however, Lakshmi (2021) reported the highest number of adolescents being underweight, followed by normal and at risk of obesity. This difference could be due to the sample variation in the previous and present study.

Dietary pattern assessment

Food habits and meal consumption pattern

The food habits indicated that 56% of adolescents were non-vegetarian and 44% were vegetarian. Majority of the respondents (86%) consumed three meals a day, whereas 14% respondents were consuming only two meals a day. However, amongst the total sample, 8 girls and 5 boys reported about skipping meals. Detailed investigation suggested that from the 8 adolescent girls the breakfast and lunch was skipped once a week by half (4 girls) while dinner was skipped by 62.5%. Among the five boys, 60% skipped breakfast once a week, while 20% skipped twice and thrice a week. When compared, more girls skipped

meals than boys. The reasons provided by girls and boys (n=13) for skipping meals included time shortage (37.5%, 40%), disliking a particular food (37.5%, 40%) and only a few reported that they skipped meals when they were not hungry (25%, 20%) respectively (Table 3). Results are concurrent with the study conducted by Durgannavar and Vijayalakshmi (2018) for school going adolescent girls and boys.

Food and nutrient intake adequacy

The food intake adequacy compared to recommended dietary intake (RDI) is denoted in Fig 1. It was observed that the food intake adequacy for cereal and pulses were above 70% for both boys and girls. In terms of GLVs, intake adequacy was above 70% for girls but only 62% for boys. For both boys and girls 50 % adequacy is met for milk, milk products and roots and tubers. The lowest adequacy was

Table 1: Socio-economic profile of the respondents.

Variables	Gender		Total
	Girls (n=50)	Boys (n=50)	(n=100)
Ordinal Position of the respondents			
First child	30 (60)	25 (50)	55 (55)
Second child	16 (32)	25 (50)	41 (41)
Third child	4 (8)	0 (0)	4 (4)
Education of the respondents			
8th STD	6 (12)	26 (52)	32 (32)
9th STD	20 (40)	17 (34)	37 (37)
10th STD	24 (48)	7 (14)	31 (31)
Family type			
Extended	2 (4)	0 (0)	2 (2)
Joint	14 (28)	12 (24)	26 (26)
Nuclear	34 (68)	38 (76)	72 (72)
Head of Family			
Father	44 (88)	41 (82)	85 (85)
Mother	6 (12)	9 (18)	15 (15)
Socioeconomic status according to modified Kuppaswamy scale 2021			
Upper (I)	0 (0)	0 (0)	0 (0)
Upper middle (II)	1 (2)	1 (2)	2 (2)
Lower middle (III)	41 (82)	43 (86)	84 (84)
Upper lower (IV)	8 (16)	6 (12)	14 (14)
Lower (V)	0 (0)	0 (0)	0 (0)

Note: Figures in parenthesis includes percentages (%).

Table 2: Mean anthropometric measurements.

Anthropometric measurements	Gender	
	Girls (mean±SD)	Boys (mean±SD)
Height (cm)	150.28±5.00	154.46±9.78
Weight (Kg)	45.63±7.86	47.03±7.21
MUAC (cm)	20.68±3.87	21.40±2.97
SFT (mm)	13.69±0.78	10.83±0.28
Average BMI (kg/m^2)	20.17±2.53	20.10±2.53
Distribution of the respondents according to BMI (%)		
Underweight (<18.5 kg/m^2)	32	26
Normal (18.5 to 24.9 kg/m^2)	64	72
Pre-obesity (25 to 29.9 kg/m^2)	4	2
Obesity class I (30 to 34.9 kg/m^2)	0	0
Obesity class II (35 to 39.9 kg/m^2)	0	0
Obesity class III (> 40 kg/ m^2)	0	0

Note: MUAC: Mid upper arm circumference; SFT: skin fold thickness, BMI: Body Mass Index; n= 50 for both girls and boys. Data is expressed as mean±SD for anthropometric measurements and as percentages for distribution of respondents according to BMI.

noted in terms of fruits as 46% (boys) while 36.3 (girls) in the study group. Moore *et al*., (2012) also indicted that majority adolescent girls have inadequate food intake for fruits. It is reported by previous study (Rodrigues *et al*., 2017) that skipping meals results in poor quality diets with reduced intake of fruits and vegetables. This was also observed in present study where the intake of fruits and vegetables were less than the RDI. The present results are also in line with those from Venkaiah *et al*., (2002) indicating that the food intake of 13-15 years children was less than the RDI.

Per cent nutrient adequacy for the adolescent girls and boys as presented in Fig 2, indicates that energy requirements were fulfilled up to 84.55% for boys and 81.98% for girls. Similarly, Venkaiah *et al*., (2002) also indicated that energy requirement of majority of 13-15-year children was fulfilled above 70% of RDA. The actual mean intake for protein was 35.33 g/day and 32.61 g/day for boys and girls, which was lower than the RDA of 45 g/day and 43 g/day, meeting the adequacy of 78.51% and 75.84% respectively. For dietary fiber, the daily recommended allowance is 40 g/2000 Kcal (ICMR-NIN 2020) and for the selected sample the data revealed that the actual intake of the adolescents was able to meet 72.23% (boys) and 70.97% (girls) adequacy. The requirements for calcium were satisfied to 85.53% (boys) and 81.58% (girls), this could be attributed to daily and regular consumption of finger millet (ragi) as staple cereal along with some quantities of milk and milk products. The actual iron consumption was recorded lower (boys: 14.15 mg/day; girls:17.66 mg/day) than the RDA (boys: 22 mg/day; girls: 30 mg/day) in both boys and girls thus, the per cent adequacy was 64.33% and 58.80% respectively. The requirements for vitamin B complex (thiamine, riboflavin, niacin and folate) ranged from 50.47% to 63.78% for boys and 52.21% to 61.19% for girls indicating that the actual nutrient intake was just enough to fulfill half of the RDA (ICMR-NIN 2020). Vitamin C adequacy was surprisingly meeting 80% in both boys and girls, because of daily intake of citrus fruits (*e.g*., lime); as they were informed about the health benefits of vitamin C (immunity boosting nutrient) and its regular consumption during

Table 3: Meal consumption pattern and food habits of the adolescent respondents.

Variables	Gender		Total
	Girls	Boys	
Food habit (n=50 for both boys and girls)			
Non-vegetarian	22 (44%)	34 (68%)	56 (56%)
Vegetarian	28 (56%)	16 (32%)	44 (44%)
Meals consumed per day (n=50 for both boys and girls)			
Twice	4 (8%)	10 (20%)	14 (14%)
Thrice	46 (92%)	40 (80%)	86 (86%)
Skipping meals (n=50 for both boys and girls)			
No	42 (84%)	45 (90%)	87 (87%)
Yes	8 (16%)	5 (10%)	13 (13%)
Skipping breakfast (n=8 for girls and n=5 for boys)			
Daily	0 (0%)	0 (0%)	0 (0%)
Once a week	4 (50%)	3 (60%)	7 (53.84%)
Twice a week	2 (25%)	1 (20%)	3 (23.08%)
Thrice a week	2 (25%)	1 (20%)	3 (23.08%)
Skipping lunch (n=8 for girls and n=5 for boys)			
Daily	0 (0%)	0 (0%)	0 (0%)
Once a week	4 (50%)	2 (40%)	6 (46.16%)
Twice a week	3 (37.5%)	2 (40%)	5 (38.46%)
Thrice a week	1 (12.5%)	1 (20%)	2 (15.38%)
Skipping dinner (n=8 for girls and n=5 for boys)			
Daily	0 (0%)	0 (0%)	0 (0%)
Once a week	5 (62.5%)	3 (60%)	8 (61.53%)
Twice a week	2 (25.0%)	1 (20%)	3 (23.08%)
Thrice a week	1 (12.5%)	1 (20%)	2 (15.39%)
Reasons for skipping meals (n=8 for girls and n=5 for boys)			
Do not have time	3(37.5%)	2 (40%)	5 (38.46%)
Do not like particular food	3(37.5%)	2 (40%)	5 (38.46%)
Not hungry	2(25%)	1 (20%)	3 (23.08%)

Note: n= 50 for both girls and boys. In skipping meal, the sample size changes based on the responses of the adolescents. Figures in parenthesis includes percentages.

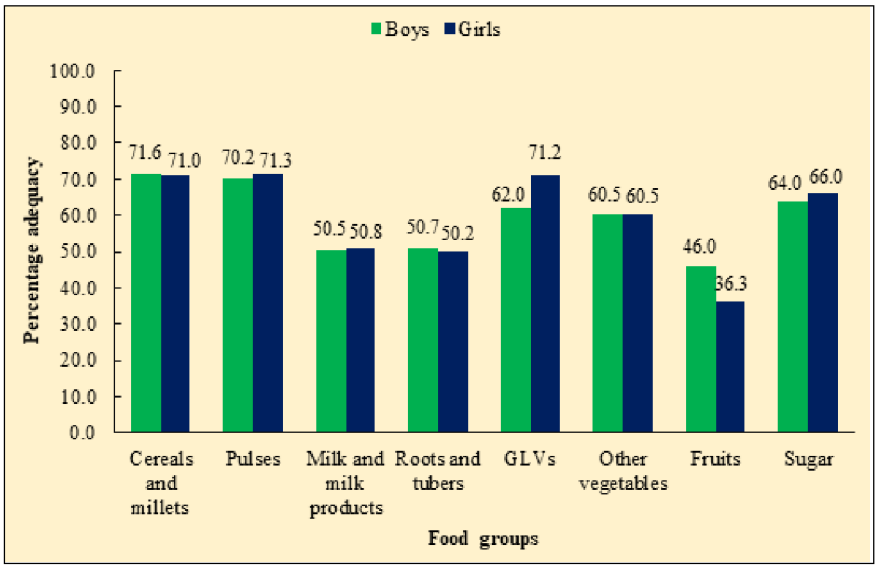

Fig 1: Per cent food intake adequacy of the rural adolescent children.
Note: GLVs: Green leafy vegetables.

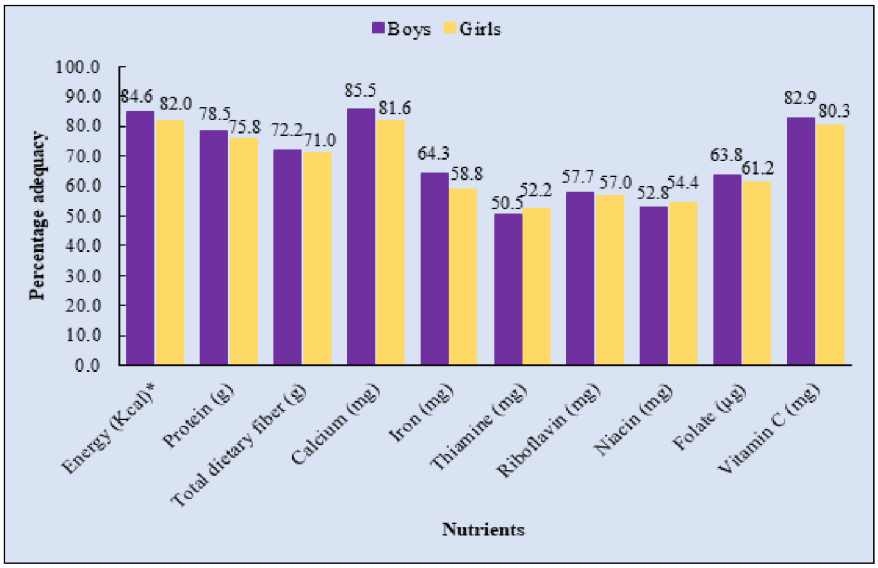

Fig 2: Per cent nutrient adequacy of the rural adolescent children.
Note: *Energy is represented as EER (Estimated Energy Requirement) as there is no RDA for energy.

pandemic period by anganwadi teachers. Overall, results indicated that nutrient intake of both girls and boys was lower than the RDA for their respective age group and these results were concurrent with the reports of Shafiee *et al*. (2015).

CONCLUSION

This study delineated information about the socioeconomic profile, dietary pattern and body composition of rural adolescents. It was concluded that in rural Bengaluru, majority of adolescents had micronutrient inadequacy, even though they belonged to normal BMI category. This may be due to their economic status and low intake of fruits and vegetables. This descriptive study could also provide basis to document, associate and plan nutritional interventions for understanding the relation between socioeconomic and nutritional status amongst adolescents residing in different areas *viz*. rural, urban and peri-urban.

Conflict of interest: None.

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