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Assessment of Breakfast Consumption on Nutritional Adequacy among School-going Children in India

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ABSTRACT

Background: Children of school going age constitute a highly vulnerable and important group. During their growing period, all the nutrients should be included in their diet. Breakfast provides important nutrients for growing children. Skipping breakfast among school children is erratic. Therefore, the study was undertaken to assess the role of breakfast consumption affecting nutritional adequacy among schoolchildren.

Methods: During the period 2015-2016, total of 200 school children in the age group of 10-12 years studying in government and private schools of North Bengaluru, Karnataka were selected through random sampling techniques. The breakfast consumption pattern was assessed using questionnaire. Dietary intake in terms of food and nutrients was assessed through 24 hours recall method. To measure adequacy of nutrient consumption, the obtained data was compared with recommended dietary allowance (RDA) for specific age group.

Result: Gender wise segregation revealed that 109 were boys (54.5%) and 91 were girls (45.5%). The breakfast skipping was found more in the children of government school compared to private school (73% vs. 37%). When compared with the breakfast consumers, skippers had lower mean intake of all the nutrients studied. Similar results were observed among girls as in boys**.** The study provided new information on specific meal pattern *i.e.,* breakfast that may be potential determinant of dietary adequacy and dietary quality.

Key words: Breakfast consumption, Children, Nutritional adequacy.

INTRODUCTION

Children are the wealth of any nation as they constitute one of the important segments of the population. Children in the age group of 5-14 years are often considered as school age. United Nations Educational Scientific and Cultural Organization (UNESCO) since 1972, for the purpose of statistics considered 6-11 years as primary school age and 12-17 years as secondary school age. It is recorded that in India one fifth population comprises of children between 5-14 years, the age group covering primary and secondary school age (Suvarna, 2007). In India, approximately 31 per cent of the growing population comprises children in the age group of 0-14 years of whom 26.7 per cent currently reside in urban India. A significant and increasing number of these children belong to middle and high socio-economic groups (NIPCCD: National Institute of Public Cooperation and Child Development, 2012).

Children of school going age constitute a highly vulnerable and important group. During their growing period, care should be taken to include all the nutrients in their diet. Nutrition affects the overall development of the child for which a balanced diet has to be followed. Proper nutrition can also prevent many medical problems, including becoming underweight, developing weak bones and degenerative diseases. It will also ensure that the child physically grows to his/her full potential.

An increasing scientific evidence, obtained in several Countries with different dietary habits, shows that regular breakfast consumption is associated with better health status at any age. (Marangoni *et al.,* 2009).

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Breakfast is defined literally as the meal that breaks the fast. Ideally, it is viewed as the meal that bridges an extended period of fasting, occurring as a result of the longest period of daily sleep and is consumed within 2 to 3 hours of waking; it is comprised of food or beverage from at least one food group and may be consumed at any location. As such, breakfast serves as the foundation for a pattern of eating for the day (O'Neil *et al.,* 2014).

Breakfast provides important nutrients for growing children and adolescents. Studies have shown that children who skip breakfast have a reduced intake of micronutrients compared with children who regularly consume breakfast and that these low intake levels are not compensated for at other meals (Affenito, 2005). In the Bogalusa Heart Study, a significantly higher percentage of 10-year old children who did not eat breakfast failed to meet two thirds of the nutrient

reference standards for vitamin A, vitamin B-6, vitamin D, riboflavin, folate, calcium, iron, magnesium, phosphorus, riboflavin and zinc; reported low intakes of micronutrients were similar for adolescents (Nicklas, 2004). In India, children between 10 and 15 years who consumed breakfast met about one quarter to one third of their daily energy and protein intakes from the breakfast meal (Chitra and Reddy, 2006). Importantly, the frequency of breakfast eating is associated with improved diet quality as measured by the Healthy Eating Index. Eating breakfast has been suggested to potentially prevent snacking and the consumption of energy-rich foods.

Despite the recommendations encouraging breakfast consumption, breakfast skipping by children was noted consistently across all regions. In only four countries (Netherlands, Portugal, Denmark and Sweden), 70 per cent or more children reported eating breakfast daily (Vereecken *et al.,* 2009). In India, the proportion of children skipping breakfast regularly was even higher (over 50%) (Chitra and Reddy, 2006). In children of all ages, the prevalence of skipping breakfast has increased as they grow older (Deshmukh-Taskar *et al.,* 2010). This is especially important, not only for the reasons stated above, but since consumption of breakfast has been shown to track into young adulthood.

Skipping breakfast among school children is erratic. It is essential to study the breakfast consumption pattern of children. With the increased interest in the breakfast consumption habits, such research clearly will be of significance. Hence, in the light of the above and its potential role in the growth and development, the study was undertaken to assess the role of breakfast consumption on nutritional adequacy among school going children in India.

MATERIALS AND METHODS

The present investigation was undertaken to study the Breakfast consumption pattern and its association with nutritional adequacy among school going children in Bengaluru, Karnataka.

In the current investigation, two schools were randomly selected from North Bengaluru city. They are,

1. Government Higher Primary School (GHPS), Bytarayanapura, Bengaluru
2. Oriental English High School (OEHS), Vidyaranyapura, Bengaluru.

Selection of subjects

Children in the age group of 10 to 12 years (5^{th} - 7^{th} standard) were selected through random sampling method for the current investigation. A total of 200 school children (both gender) were selected (100 each from two schools). All the children were assessed for the parameters such as dietary and nutrient intake; a well-structured interview schedule was prepared in accordance with the methodological procedure and in consultation with nutrition experts, statistician and available literature and extension personnel. The interview schedule was pre-tested initially, based on the responses obtained and difficulties realized, suitable amendments were made to make it more functional.

Data collection

The data was collected with the help of interview schedule by paying repeated visits to the study area and the responses were obtained on various parameters to meet the requirements of the study. The data was collected during the period of 2015-16.

Kuppuswamy's socio-economic status scale is an important tool to measure socioeconomic status of families in urban areas. This scale takes into account education, occupation and income of the family to categorise families into upper, middle and low socioeconomic status. The updated Kuppuswamy scale of 2013 remodified by Vijaya and Ravikiran, (2013) was used for the study purpose.

Breakfast consumption pattern of 200 children was assessed using questionnaire developed for the purpose. The questionnaire consisted of questions on socio-economic status, consumption and skipping of breakfast, regularity, frequency, place and time taken for consumption of breakfast and types of accompaniments. The breakfast consumption pattern of the children was assessed for the past one week.

Based on the frequency of breakfast consumption, the children were classified into two groups *i.e.*, breakfast consumers and breakfast skippers.

Definition of breakfast

For the study purpose, Breakfast has been defined as any eating occasion between 5.00 am to 9.00 am during school days. During holidays, it extends up to 11.00 am.

Dietary and nutrient intake assessment

Dietary intake in terms of food and nutrients was assessed for all the children through 24 hour recall method.

Baseline diet survey of the respondents was conducted by using 24 hour recall method for seven consecutive days in a month using Standardized cups, vessels, paper discs and rubber balls. Respondents were asked to recall the type of preparation made for breakfast, lunch, evening tea and dinner *etc.* for the previous day (other than feasting and fasting day). Information on account of raw ingredients used for each preparation and also on the total cooked amount of each preparation was recorded in terms of standardization tools (standardization as per the procedure indicated by Bamji *et al.* (2009). The average raw ingredients in all the meals consumed by each respondent per day were calculated.

The schedules were properly sorted out after verification and serially numbered. Data on intake of foods- cereals, pulses, vegetables *etc*. evaluated. Using the quantity of foods consumed per day, nutrient intake was calculated using tables of Nutritive Value of Indian Foods (Longvah *et al.,* 2017). These figures were compared against the RDA for the school children of different age group as per the revised requirements suggested by ICMR to provide a measure of

Table 1: Age and gender wise distribution of the children. (N=200)

Gender	GHPS age (in Years)				OEHS age (in Years)				Total age (in Years)			Grand total
	10	11	12	Total	10	11	12	Total	10	11	12	No.(%)
Boys	24	20	13	57	17	25	10	52	41	45	23	109 (54.5)
Girls	16	14	13	43	18	18	12	48	34	32	25	91 (45.5)
Total	40	34	26	100	35	43	22	100	75 (37.5)	77 (38.5)	48 (24.0)	200 (100.0)

Figures in parenthesis includes percentages.

GHPS - Government Higher Primary School, Byatarayanapura, Bengaluru.

OEHS - Oriental English High School, Vidyaranyapura, Bengaluru.

adequacy or inadequacy of food and nutrient consumption (ICMR, 2010).

$$\% \text{ Adequacy} = \frac{\text{Intake of each nutrient}}{\text{Recommended allowances}} \times 100$$

Dietary habits and meal pattern were also recorded.

In the present study, the t-test was used to compare the children's dietary intake with RDA. The chi-square test was used to evaluate differences between experimental or observed data and expected or hypothetical data. Data collected was consolidated and analyzed. The data were analyzed through IBM SPSS (Statistical Package for the Social Sciences) software 21.

RESULTS AND DISCUSSION

The investigation was carried out on a total of 200 children representing 10, 11 and 12 year age group (5^{th}, 6^{th} and 7^{th} class) belonging to two different schools *viz.*, GHPS (Government Higher Primary School) and OEHS (Oriental English High School) represented the sample size of 100 each, respectively. The samples drawn were cross sectional and included both boys and girls. Age wise classification showed that 75 (37.5), 77 (38.5%) and 48 (24%) children belonged to 10, 11 and 12 years respectively; whereas gender wise segregation revealed that 109 were boys (54.5%) and 91 were girls (45.5%). Boys outnumbered the girls in the present study (Table 1).

As per the socio-economic classification, nearly half of the families (49%) from GHPS School belonged to lower middle class whereas 65 per cent of the families of OEHS School belonged to upper middle class. The percentage of families being in upper class was found to be nil in GHPS School and 21 per cent in the OEHS School. There was significant difference found between the families of two schools with respect to socio-economic class (Table 2).

The results were in line with the findings of Ashok *et al.* (2014) who reported that, 69 per cent of government school children belonged to Classes IV and V and 78 per cent of private school children belonged to Classes I and II socioeconomic group.

Breakfast behaviour includes consumption and skipping. Distribution of children according to breakfast skipping pattern is presented in Table 3. The breakfast skipping was found more in the children of GHPS compared to OEHS (73% vs. 37%). Of all the children studied, 22.5 per cent skipped 1-2 times a week, 23.5 per cent skipped 3-4 times in a week and 8.5 per cent skipped breakfast 5-6 times in a week period. Only one child in the GHPS School

Table 2: Socio-economic profile of the parents. (N=200)

Socio-economic class	GHPS	OEHS	n (%)	χ^2
Upper (I)	00	21	21 (10.5)	90.70*
Upper middle (II)	22	65	87 (43.5)	
Lower middle (III)	49	14	63 (31.5)	
Upper lower (IV)	29	00	29 (14.5)	

GHPS- Government Higher Primary School, Byatarayanapura, Bengaluru.

OEHS- Oriental English High School, Vidyaranyapura, Bengaluru.

*Significant at 5 per cent level.

Figures in parenthesis includes percentages.

Table 3: Distribution of the children according to breakfast skipping pattern. (N=200)

Breakfast skipping pattern	Boys (n=109)			χ^2	Girls (n=91)			χ^2	Grand total
	GHPS (n=57)	OEHS (n=52)	Total (%)		GHPS (n=43)	OEHS (n=48)	Total (%)		(%)
1-2 times/week	15	07	22 (20.2)		12	11	23 (25.3)		45 (22.5)
3-4 times/week	19	07	26 (23.9)		15	06	21 (23.1)		47 (23.5)
5-6 times/week	05	03	08 (7.3)	15.98^{NS}	06	03	09 (9.9)	13.19^{NS}	17 (8.5)
Daily	01	00	01 (0.9)		00	00	00 (0.0)		1 (0.5)
Never	17	35	52 (47.7)		10	28	38 (41.8)		90 (45.0)

GHPS - Government Higher Primary School, Byatarayanapura, Bengaluru.

OEHS - Oriental English High School, Vidyaranyapura, Bengaluru.

Figures in parenthesis includes percentages.

NS - Non significant.

Table 4: Dietary pattern followed by the children.

Dietary pattern	GHPS (n=100)	OEHS (n=100)	Total (N=200)
Type of meal			
Vegetarian	17	11	26 (14.0)
Non-vegetarian	83	89	172 (86.0)
Meals per day			
Twice a day	46	19	65 (32.5)
Thrice a day	54	81	135 (67.5)

Figures in parenthesis includes percentages.

GHPS-Government Higher Primary School, Byatarayanapura, Bengaluru.

OEHS-Oriental English High School, Vidyaranyapura, Bengaluru.

skipped breakfast regularly during a week period. When data was analyzed for chi-square test, there was no significant difference found between boys and girls of two schools (Boys:$\chi^2 = 15.98^{NS}$ and Girls: $\chi^2 = 13.19^{NS}$).

The above results were in consistent with the study conducted by Chitra and Reddy (2006) who reported that 42.8 per cent did not skip breakfast at all, 11.6 per cent skipped breakfast once in two days, 8.0 per cent skipped breakfast once in three days, 25.1 per cent skipped breakfast once a week, 10.8 per cent skipped breakfast once in two weeks and 1.7 per cent skipped breakfast every day. Similar findings were reported in the various studies (Gajre *et al.,* 2008, John and Narasihman, 2008). In contrast to the above results, Arora *et al.* (2012) in the study reported that significantly more government school (lower SES) students consumed breakfast daily as compared to private school (higher SES) students (73.8% vs. 66.3%, p<0.001).

Government schools generally cater to the lower income and lower-middle income class in Indian context. Students belonging to lower income group are more likely to experience scarcity of good quality food amounting to a lack of wholesome breakfast as well as other meals of the day. Disparities in breakfast consumption across regions may be explained by differences in cultural practices, socio-economic factors and availability of school-meal programs. The dietary pattern followed by the children revealed that Non-vegetarians were predominated over vegetarians (86.0% *vs*. 14.0%) irrespective of school type. Nearly 68 per cent of the school children were consuming three meals a day (67.5%) in both the schools (Table 4).

The intake of the selected nutrients was calculated for the children from the food intake records obtained by 24 hour intake recall method for past one week. The formulated per cent adequacy is a measure of association between Recommended Dietary Allowance (RDA) and the actual mean intake of nutrients by the subjects. The mean nutrient intake and percentage deficit/ excess of the school children are summarized in Table 5.

It can be visualized from the table that the mean intake of all the nutrients among all the children studied was less than RDA. When compared with the breakfast consumers, skippers had lower mean intake of all the nutrients studied. Among breakfast consumers, the mean intake and per cent

Table 5: Average daily nutrient intake between breakfast consumers and skippers among boys (10-12 years). (N=200)

Nutrients	RDA#	Breakfast consumers				Breakfast skippers			
		Mean ± SD		Per cent adequacy		Mean ± SD		Per cent adequacy	
		GHPS	OEHS	GHPS	OEHS	GHPS	OEHS	GHPS	OEHS
Protein (g)	39.9	27.52±0.79	32.50± 5.15	69.0	81.0	20.30±1.91	24.94±4.32	51.0	62.0
t-test		70.443**	6.428**			46.001**	15.509**		
Fat (g)	35	24.03±1.00	28.19± 4.41	69.0	80.0	26.42±6.61	31.53±11.49	75.0	90.0
t-test		48.957**	6.915**			5.804**	1.349**		
Energy (Kcal)	2190	1764 ±134.46	1932±473.08	81.0	88.0	1551.76±69.32	1681.87±416.60	71.0	77.0
t-test		14.142**	2.433**			41.175**	5.455**		
Calcium (mg)	800	788.91±28.81	844.17±206.37	99.0	105.0	555.15±62.91	601.18 ±137.86	69.0	75.0
t-test		1.721^{NS}	2.429*			17.407**	6.450**		
Iron (mg)	21	13.05±1.26	15.97±3.08	62.0	76.0	11.02±0.56	12.37±2.30	52.0	59.0
t-test		28.145**	7.303**			79.851**	16.793**		
β-carotene (µg)	4800	1640.95±64.79	2220.10±942.76	34.0	46.0	1394.16±114.24	1855.84±417.93	29.0	39.0
t-test		218.041**	12.238**			133.323**	31.505**		
Vitamin C (mg)	40	17.86±1.97	21.71±7.34	45.0	54.0	12.98±1.86	16.68±6.82	32.0	42.0
t-test		50.215**	11.139**			64.818**	15.289**		

**Significant at 1 per cent level; *Significant at 5 per cent level; NS - Non significant; #RDA - Recommended dietary allowances, ICMR, (2010); GHPS - Government Higher Primary School, Byatarayanapura, Bengaluru; OEHS - Oriental English High School, Vidyaranyapura, Bengaluru.

adequacy for the nutrients *viz.*, protein (Mean - 32.50g, % adequacy - 81.0), fat (Mean - 28.19g, % adequacy - 80.0), energy (Mean - 1932 Kcal, % adequacy 88.0), iron (Mean - 15.97 mg, % adequacy - 76.0), calcium (Mean - 844.17 mg, % adequacy - 105.0), β-carotene (Mean - 2220.10 µg, % adequacy - 46.0) and vitamin C (Mean - 21.71 mg, % adequacy - 54.0) were found highest in OEHS as compared to GHPS. Similar trend was observed among breakfast skippers compared between the schools. Even though, the mean intake of all the nutrients were found higher among children in OEHS, still the per cent adequacy was not met for the nutrients except for calcium (105.5%). It was noticeable in the table that, the mean fat intake was found to be higher in the breakfast skippers compared to breakfast consumers (GHPS: 24.03g vs. 26.42; OEHS: 28.19 g vs. 31.53 g). Overall, the mean nutrients intake of government school children was found to be lower compared to private school children irrespective of breakfast consumption. The analyzed t value for these nutrients was found significant at one per cent level in children of all the groups except for calcium in GHPS group which showed non-significant among breakfast consumers.

Florentino *et al.* (2002) addressed the influence of diet on the children's nutritional status from all public and private schools in the city of Manila and found that the children from private schools, who are generally of higher socioeconomic status than those from public schools, tended to have higher intakes of calories, protein, iron and vitamin A than public school children which were in concurrent with the present study findings.

Rani (2012) in the study revealed that as compared to government school children, matriculation school children seemed to have a better intake of nutrients *viz.* calories, protein and fat which supports results of the present study where government school children had lower nutrient intake compared to private school children.

Kral *et al.* (2011) found a significant relationship between breakfast consumption and total daily energy intake.

Table 6 depicts the similar results among girls as observed in boys. The mean energy intake was found to be 1569 kcal to 1639 Kcal, which meets 78 and 81.2 per cent of adequacy among government and private school children respectively. The per cent adequacy of β-carotene and vitamin C was found to be low in both the school children (β-carotene: 33.95 and 41.61; Vitamin C: 39.53 and 37.47 in GHPS and OEHS respectively). Among all the nutrients, energy and calcium had higher per cent adequacy compared to other nutrients. Calculated t value for all these nutrients found significant at one per cent in children of both the groups (breakfast consumers and skippers).

The results were in agreement with the findings of Sunita and Jain (2005) who reported that the diets of both boys and girls (6-12 years) were deficient in most of the nutrients (energy, protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin and ascorbic acid) except fat and folic acid. Among girls, vitamin A was less than 35 per cent and riboflavin was less than 42 per cent of RDA.

Table 6: Average daily nutrient intake between breakfast consumers and skippers among girls (10-12 years). (N=200)

Nutrients	RDA#	Breakfast consumers				Breakfast skippers			
		Mean ± SD		Per cent adequacy		Mean ± SD		Per cent adequacy	
		GHPS	OEHS	GHPS	OEHS	GHPS	OEHS	GHPS	OEHS
Protein (g)	40.4	27.85±2.98	30.88±4.92	68.94	76.44	18.64±1.45	21.44±5.55	46.15	53.07
t-test		18.831**	8.657**			67.317**	15.280**		
Fat (g)	35	24.95±1.27	27.50±5.05	71.28	78.57	28.71±1.14	29.74±10.77	82.04	84.96
t-test		35.287**	6.643**			24.760**	2.186**		
Energy (Kcal)	2010	1569±174.72	1639±28.54	78.05	81.57	1169±43.94	1273±522.70	58.19	63.33
t-test		11.293**	5.762**			85.539**	6.303**		
Calcium (mg)	800	537.67±43.84	641.87±138.2	67.21	80.23	472.04±37.68	533.89±53.45	59.00	66.74
t-test		26.762**	5.117**			38.920**	22.265**		
Iron (mg)	27	16.47±2.29	18.31±6.31	60.99	67.82	10.60±0.76	13.25±2.11	39.26	49.06
t-test		20.548**	6.154**			96.212**	29.150**		
β-Carotene (µg)	4800	1629.51±432.92	1997.35±792.49	33.95	41.61	1433.25±102.29	1695.63±298.73	29.86	35.33
t-test		32.752**	15.816**			147.190**	46.474**		
Vitamin C (mg)	40	15.81±0.65	14.99±1.13	39.53	37.47	12.07±1.95	11.72±2.65	30.17	29.31
t-test		166.244**	98.824**			63.943**	47.641**		

#RDA - Recommended dietary allowances. GHPS - Government Higher Primary School, Byatarayanapura, Bengaluru.
OEHS - Oriental English High School, Vidyaranyapura, Bengaluru. **Significant at 1 per cent level.

CONCLUSION

The findings of the study provide new information on specific meal pattern *i.e.,* breakfast that may be potential determinant of dietary adequacy and dietary quality. Eating breakfast regularly is associated with better overall health including healthier body weight, better diet quality and cognitive benefits. The identification of changes in breakfast habits in children should be seen as potential starting point of intervention programmes. In addition, families should be targeted, since during childhood, family mealtimes are important for healthy dietary habits. The current results play an important role for developing targeted preventive measures for skipping breakfast in school children.

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