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Relationship between Breakfast Skipping and Body Mass Index among School going Children: A Comparative Study in Bengaluru, Karnataka

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ABSTRACT

Despite the importance of breakfast consumption, breakfast skipping by children was noted consistently across all regions. The study was taken up with the objective to assess the nutritional status of the children in relation to breakfast skipping in government and private schools of Bengaluru city, Karnataka. A total of 200 school children aged 10-12 years were assessed for breakfast consumption pattern using questionnaire for the past one week. BMI for age percentiles were compared with the WHO (2007) reference standards and classified according to WHO cut-offs. The breakfast skipping was found more in the children of GHPS compared to OEHS (73% vs. 37%). In comparison with two schools, the percentage of being underweight was found to be more in GHPS children (53.0%) compared to OEHS children (26.0%) irrespective of breakfast skipping frequency. The percentage of children being obese were found more in breakfast skippers who skips 1-2 times (16.7%) and 3-4 times (23.1%) a week and were from private school. The study highlights the need of regular breakfast consumption during the transition from childhood to adolescence.

Key words: *School children, Nutritional status, Socio-economic status, Breakfast skipping, WHO standards.*

INTRODUCTION

Children are the wealth of any nation as they constitute one of the important segments of the population. 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[15]. 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[14].

School going children go through remarkable physical changes of all kinds; their food intake becomes a critical aspect for the growth and development. Health of children is of great importance as rapid growth occurs during this period. Good nutrition is a basic requirement for good health and a living organism is a product of nutrition[9].

Both nutrition and diet are vital determinants of the health and nutritional profile of children.

Studies in different countries have shown that in general, children's eating patterns have changed over the years with the trends being eating more food away from home, consuming more snacks, drinking more sugar - sweetened beverages, along with a decline in breakfast consumption and less consumption of fruits[10].

Both systematic reviews of the literature and statistical investigations on population samples support the notion that the first meal of the day is the most underestimated, and often completely neglected[12].

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[18]. In India, the proportion of children skipping breakfast regularly was even higher (over 50%) [4]. In children of all ages, the prevalence of skipping breakfast has increased as they grow older[5]. This is especially important, not only for the reasons stated above, but since consumption of breakfast has been shown to track into young adulthood.

Many studies undertaken in developed countries and some developing countries like Iran, suggests that the frequency of breakfast consumption is inversely associated with body mass index among school going children and adolescents[2].

Skipping breakfast among school children is erratic. It is essential to study the breakfast consumption pattern of children. To provide an explanatory view on the effect of breakfast skipping on the nutritional status of the children, the study was taken up with the objective to assess the nutritional status of the children in relation to breakfast skipping in government and private schools of Bengaluru city, Karnataka

MATERIAL AND METHODS

Study area and subjects

Children in the age group of 10 to 12 years were selected through random sampling method for the current investigation. A total of 200 school children (both gender) were selected from the two schools *i.e.,* Government Higher Primary School (GHPS), Bytarayanapura and Oriental English High School (OEHS), Vidyaranyapura, Bengaluru city (100 each from two schools).

The data was collected with the help of pre-designed and pre-tested 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 – 2016 academic year. The interview schedule was used to elicit the information from the participating subjects about their age, sex and socio-economic status. For the present study, updated Kuppuswamy Socio-economic status scale, 2013[19] was used. This scale takes into account education, occupation and income of the family to categorise families into upper, middle and low socioeconomic status.

Breakfast consumption pattern of children was assessed using questionnaire developed for the purpose. The questionnaire consisted of questions on frequency of consumption and skipping of breakfast. The breakfast consumption pattern of the children was assessed for the past one week. Consumption of commonly eaten items starting from the first food or beverage in the morning until the first proper solid meal was taken into consideration as breakfast. Based on the frequency of breakfast consumption, the children were classified into two groups *i.e.,* breakfast consumers and breakfast skippers.

On completion of questionnaires, anthropometric measurements such as height and weight were undertaken and recorded in their respective questionnaires using standard techniques given by WHO for anthropometric parameters[18].

Height was measured accurately to the nearest 0.10 cm using a devised vertical rod. The scale was placed on a horizontally flat surface and the respondent was standing without shoes on horizontal surface against wall with heels chin tucked in and body stretched upwards to full extent and head in the Frankfurt plane.

Weight (kg) was measured with scale with a precision of 0.1 kg. The scale was placed on a horizontally flat surface. Children were weighted barefooted and wearing a minimum of clothing and without touching any other surface or object and the reading was noted. The pointer on the balance scale was adjusted to zero before each weighing.

Data preparation and analysis

The various anthropometric measurements of height and weight were extracted from the administered questionnaires and were then compiled on age basis. These measurements were used to calculate BMI (Body Mass Index) of children. Age and gender specific BMI centiles were used to classify respondents as underweight, normal, overweight or obese using the 2007 WHO growth reference for school aged children (5-19 years old)[21]. This growth reference is well-suited to the Indian context. The WHO AnthroPlus software (WHO, Geneva, Switzerland) was used to calculate BMI z-score and percentile for each specific age and gender.

BMI classification according to WHO

BMI category	WHO cut offs
Underweight	<5th Percentile
Normal	5th – 85th Percentile
Overweight	85th – 95th percentile
Obese	>95th percentile

Data collected was consolidated and analyzed. Descriptive statistics were performed and expressed as means and standard deviation for continuous variables (BMI) or as number of subjects and percentages for nominal variables (socio-demographic and BMI classification). Independent t-test and Chi-squared test (χ^2) were used to evaluate the difference between continuous and categorical variables. All the statistical calculations were carried out through IBM SPSS (Statistical Package for the Social Sciences) for Windows, Version 21.0. *P* values less than 0.05 were considered as significant.

RESULTS AND DISCUSSION

Socio-demographic profile of the respondents

The investigation was carried out on a total of 200 children representing 10, 11 and 12 year age group (5th, 6th and 7th 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 included were 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 (49.0 %) 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 whereas age and gender showed non-significant difference (Table 1).

Breakfast skipping pattern among the school children

Breakfast behaviour includes consumption and skipping. Distribution of children according to breakfast skipping pattern is presented in Table 2. 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 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: $\chi^2 = 15.98$ & Girls: $\chi^2 = 13.19$).

The above results were in consistent with the study conducted by Chitra and Reddy[4] 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*[7]., and John and Narasihman[11]). In contrast to the above results, Arora *et al*.[2] 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.

Body Mass Index of the children in relation to breakfast skipping

The BMI is a measure of overall adiposity. The WHO[20] recommends it as a fatness measure in children for public health screening. Comparison of BMI with WHO standards showed that boys found to meet the standard BMI at 95.2, 84.5 and 89.4 per cent whereas girls met at 87.0, 89.1 and 94.4 per

cent of BMI for 10, 11 and 12 year age group respectively among GHPS. However, mean BMI of the children of GHPS (government school) was found to be significantly lower compared to the WHO standards (*p*<0.05, *p*< 0.01) (Table 3).

Among OEHS children, higher percentage of standards was met by all the children. Boys and girls in the age group of 10 and 12 years achieved cent per cent standards as compared with WHO standards (100.1% and 102.1% respectively). Significant results were found among 10 year (girls), 11 year (boys and girls) and 12 year (boys) children in GHPS whereas non-significant results found among OEHS children

The above findings were in line with the study conducted by Murugkar *et al.*[13] who reported that the BMI of the study population was found to be significantly lower (*P*<0.05) than the reference BMI values (ICMR reference values). In the present study, private school children had higher BMI values compared to government school children. This could be attributed to their socio-economic condition which in turn had effect on the availability of nutritious food to the children.

In comparison with two schools, the percentage of being underweight was found to be more in GHPS children (53.0%) compared to OEHS children (26.0%) irrespective of breakfast skipping frequency. In spite of having daily breakfast among GHPS children, more than 50 per cent of the children found to be underweight and it is slightly higher in the children who skip breakfast 3-4 times in a week (55.9%). Among OEHS children, more than 60 per cent of children who consume breakfast regularly were found to be normal (63.5%). Equal percentage of children (50.0%) who had breakfast 5-4 times per week was found to be underweight and normal in OEHS. The percentage of children being obese were found more in breakfast skippers who skips 1-2 times (16.7%) and 3-4 times (23.1%) a week and were from private school (Table 4).

As with the above results, Berkey *et al.*[3] reported that overweight breakfast skippers had lower BMIs over time when

compared with overweight breakfast eaters (P < .01), whereas normal-weight breakfast skippers had higher BMIs over time when compared with normal-weight breakfast eaters. Interestingly, when these same data were analyzed cross-sectionally, results indicated that, overall, breakfast skippers were heavier.

The results were in concurrent with the findings of Deshmukh-Taskar et al.[5] who indicated that the prevalence of obesity (BMI ≥95th percentile) was higher in breakfast skippers (22.1%) than in RTE cereal consumers (15.2%), especially in boys (24.1% *vs.* 14.3%). Breakfast skippers had a higher BMI percentile for age than RTE cereal consumers.

Garg et al.[8] also revealed that more numbers of breakfast non-skippers (69.1%) were found to have BMI in normal range than breakfast skippers (52.2%) whereas more number of breakfast skippers (21.73%) were found to be overweight than breakfast non-skippers (4.7%). Similar results were observed in the studies conducted by Fayet-Moore et al.[6] and Al-Oboudi[1] who reported lower prevalence of overweight among breakfast consumers compared to skippers.

The age and socio-economic class exerted a positive relationship with the BMI whereas frequency of breakfast skipping showed to be inversely correlated with the BMI (Table 5).

The theoretical framework proposed by Zhai et al.[22] acknowledges that economic status may affect the children's access to resources by lifestyle choices and behaviors, area of residence and food affordability which results in higher BMI among children.

As reported by Timlin et al.,[16] the frequency of eating breakfast was inversely associated with weight gain and BMI in a dose-response manner (P <.01) which is in agreement with the current study findings.

A study conducted by Van Lippevelde et al.,[17] on 10-12 year old children in eight European countries (Belgium, Greece, Hungary, the Netherlands, Norway, Slovenia, Spain, and Switzerland) found that the children's breakfast consumption was negatively related to children's BMI-z-score (all p<0.001) which supports the current study findings.

Table 1: Socio demographic profile of the respondents

Variables	GHPS (n=100)	OEHS (n=100)	Total (N=200)	χ^2
Age (years)				
10	40	35	75 (37.5)	
11	34	43	77 (38.5)	1.72[NS]
12	26	22	48 (24.0)	
Gender				
Male	57	52	109 (54.5)	0.50[NS]
Female	43	48	91 (45.5)	
Socio-economic class				
Upper (I)	00	21	21 (10.5)	
Upper middle (II)	22	65	87 (43.5)	90.70[*]
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   NS – Non significant
Figures in parenthesis includes percentages

Table 2: Distribution of the children according to breakfast skipping pattern

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

GHPS – Government Higher Primary School, Byatarayanapura, Bengaluru

OEHS – Oriental English High School, Vidyaranyapura, Bengaluru

Figures in parenthesis includes percentages   NS – Non significant

Table 3: Mean BMI of the respondents as compared with WHO standards   (N=200)

Age (Years)	Sex	WHO standards	BMI Mean±SD		% standard		t-value	
			GHPS	OEHS	GHPS	OEHS	GHPS	OEHS
10	M	16.4	15.6±3.7	15.0±2.9	95.2	91.40	-1.040^{NS}	-2.028^{NS}
	F	16.6	14.4±1.8	17.0±3.4	87.0	102.17	-1.706^{**}	0.444^{NS}
11	M	16.9	14.3±1.5	16.6±3.4	84.5	97.99	-8.046^{**}	-0.497^{NS}
	F	17.2	15.3±2.5	17.1±4.4	89.1	99.65	-2.767^{*}	-1.165^{NS}
12	M	17.5	15.6±3.1	17.5±4.4	89.4	100.17	-2.185^{*}	-0.265^{NS}
	F	18	17.0±3.5	17.5±1.9	94.4	97.39	-1.044^{NS}	-0.853^{NS}

GHPS – Government Higher Primary School, Byatarayanapura, Bengaluru

OEHS – Oriental English High School, Vidyaranyapura, Bengaluru
**Significant at 1 per cent level   *Significant at 5 per cent level   NS – Non significant

Table 4: BMI of the children in relation to the frequency of breakfast skipping   (N=200)

Frequency of breakfast skipping (per week)	GHPS n	OEHS n	Underweight		Normal		Overweight		Obese	
			GHPS No. (%)	OEHS No. (%)	GHPS No. (%)	OEHS No. (%)	GHPS No. (%)	OEHS No. (%)	GHPS No. (%)	OEHS No. (%)
1-2 times	27	18	13 (48.1)	2 (11.1)	14 (51.9)	12 (66.7)	0 (0.0)	1 (5.6)	0 (0.0)	3 (16.7)
3-4 times	34	13	19 (55.9)	2 (15.4)	13 (38.2)	8 (61.5)	2 (5.9)	0 (0.0)	0 (0.0)	3 (23.1)
5-6 times	11	06	05 (45.5)	3 (50.0)	6 (54.5)	3 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Daily	01	00	01 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Never	27	63	15 (55.6)	19 (30.2)	8 (29.6)	40 (63.5)	2 (7.4)	1 (1.6)	2 (7.4)	3 (4.8)

GHPS – Government Higher Primary School, Byatarayanapura, Bengaluru

OEHS – Oriental English High School, Vidyaranyapura, Bengaluru

Figures in parenthesis includes percentages

Table 5: Relationship between age, socio-economic class and breakfast skipping with body mass index

Variables	BMI	
	Correlation Coefficients (r)	*P*-value
Age	0.124	0.080
Socio-economic class	0.105	0.137
Frequency of breakfast skipping	-0.101	0.155

CONCLUSION

The study concluded that the breakfast skipping coupled with lower socio-economic status resulted in higher incidences of underweight among GHPS whereas unhealthy eating behaviours of children gave rise to overweight incidences among OEHS. The study highlights the need of regular breakfast consumption during the transition from childhood to adolescence. Breakfast provision in schools may offer a way to overcome social inequalities in daily breakfast consumption and could serve to yield health benefits associated with breakfast consumption. More research is needed to examine the influence of type of breakfast consumption on the nutritional status over time in larger sample of children.

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