



## Food Practices and their Determinants among Pre-Adolescent Age Groups: A Hospital Based Cross Sectional Study

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### Abstract

**Background:** Dietary habits are one of the most important determinants of the nutritional status of a child. The present study was conducted to understand the common dietary habits and fallacies in diet responsible for malnutrition in 5 - 10 years old children.

**Methods:** It was the cross-sectional study conducted among 5 - 10-year-old children admitted in a tertiary hospital situated in central Delhi. A total of 220 patients were enrolled. Data were collected using semi-structured pre-tested questionnaire.

**Results:** Mean age (+ SD) of children enrolled in the study was  $7.6 \pm 1.7$  years. Fruits and vegetable consumption was poor among children. The consumption of green vegetables, fruits, pulses, and milk was also poor. Sixty-seven percent children out of 220 had normal height for age and 33.2% were stunted whereas fifty-one percent children had normal weight for age, and 48% were wasted. Fifty-six per cent children had normal Body Mass Index compared 15.5% undernourished. Education of the mother influences nutritional status of the children and children taking green vegetables daily have less prevalence of stunting.

**Conclusion:** Urgent measures should be taken to promote and inculcate healthy eating habits in children. Family members should be involved in the diet planning for the children. Nutrition education should be an integral part of school curriculum.

**Keywords:** Diet; Nutritional Status; Malnutrition; Feeding Behaviour

### Introduction

Dietary habits are one of the most important determinants of nutritional status of a child [1]. The school going age group in children is the phase of building up body stores of nutrients for preparation for the rapid growth of adolescence [2] and also a base for future healthy workforce contributing to the socioeconomic growth of the country. Nutrient deficiencies at this age can lead to retarded growth, anemia, reduced immune function and impaired motor and cognitive development, all of which may adversely affect academic performance through reduced learning capacity and poor school attendance [3,4]. In this age group, nutritional requirements are high, yet vitamin and mineral intakes tend to be reduced as there is a greater consumption of 'empty calories,' frequent meal skipping and decreased vegetable and fruit intake. In spite of the fact that in many countries much is known about the nutritional situation of children and adolescents, less information is available for this age group where dietary habits sets in, and few data exist on risk factors associated with inadequate intakes in the younger cohort [5].

### Objective

The present study was conducted to understand the common dietary habits and fallacies in diet responsible for malnutrition in 5 - 10 years old children.

### Materials and Method

It was a cross-sectional study conducted in a tertiary hospital (Lok Nayak Hospital) in Delhi, India over a period of 6 months. The sample size was calculated to be 192 based on the prevalence of underweight amongst 5 - 9 years old children as 38.7% with 5% abso-

lute error [6]. From the total of 6 inpatient wards, two were selected randomly. Interviews were conducted for two days in a week in which we conducted line listing of all 5 - 10 years old admitted children with any diagnosis except congenital and hereditary diseases. First 5 children from each ward in the list per session were approached, and interviews were conducted with the mother or the guardian sitting beside the child. We enrolled a total of 220 patients in the study. Data were collected using semi-structured, pre-tested questionnaire consisted of items on socio-demographic profile of family and dietary habits of the child using food frequency method after taking informed consent from parents. Food frequency questionnaire used in the study was interviewer administered and included the list of common food items. The subject answered how often each food was eaten per day, per week and month before the onset of illness. We also collected data on immunization status, child's intake of any midday meal or mothers' visit to Anganwadi (place for food distribution under government take home ration scheme). Anthropometric examination like weight and height measurement and clinical examination for signs of micronutrient deficiencies was done. Weight was measured bare footed and light clothes using a digital weighing machine and to the nearest 0.05 Kg. Height was measured to the nearest 0.5 cm by using portable height meter after removing shoes and placing heels together. The study subjects had been explained the purpose of the study and assured confidentiality. The Institutional Ethics Committee provided ethical clearance.

### Statistical Analysis

Data were analyzed using software SPSS version 17 (Chicago II USA). Proportions, Mean  $\pm$  SD, were used for descriptive analysis.

The chi-square test and the independent sample t-test have been used to compare groups. Logistic regression models were used to assess the association between socio-demographic variables and consumption of food items.

## Results

### Socio-demographic profile

Mean age (+ SD) of children enrolled in the study was  $7.6 \pm 1.7$  years. There were 143 boys (63%) and 77 girls (35%). Mean (+ SD) family income was Rs. 7800  $\pm$  9400. There were 164 (74.5%) children belonged to the nuclear family and 56 (25.45%), joint family. Only 132 (60%) children were receiving formal education in schools whereas 30 (13.7%) were going to madrasas and other non-formal education centers. The major proportion of children (86; 39.1%) were residents of the rural area, 40 (18.2%) belonged to the urban area, and 94 (42.7%) to urban slums. Mothers of 187(85%) children were housewives, 4 (1.8%) mothers were skilled, 22 (10%) were semiskilled and 7 (3.2%) unskilled workers.

More than half of the mothers (125; 56.8%) were illiterate, 9 (4.1%) were educated up to primary level, 48 (21.8%) up to middle school, 21 (9.5%) up to secondary level, 10 (4.5%) up to senior secondary, 4 (1.8%) to graduate and 3 (1.4%) had professional qualification. Mean (+SD) numbers of children per family were  $3 \pm 1$ .

### Dietary habits of children

The food frequency questionnaire (Table 1) elicited the consumption pattern regarding the different food groups. It was seen that cereals, were consumed on an everyday basis. Protein-rich foods like pulses and lentils were consumed every day by 33.6% (74) whereas fish and meat were consumed by only 5.5% (12) of the respondents. Two-third (66.8%) of the children used to consume roots and tubers regularly (daily) while milk was regular part of the diet among 45% (99) children. One-third of the children could not make fruits a part of their diet or made it just once a week whereas one-fourth of children used to consume green leafy vegetables less than thrice a week.

S. No.	Food item	Frequency of consumption of food items*				
		Daily (Regular)	2 - 3 times per week	Once a week	Occasionally	Not at all
1.	Cereals	220 (100)	0	0	0	0
2.	Pulses (any)	74 (33.6)	97 (44.1)	34 (15.5)	12 (5.5)	3 (1.4)
3.	Milk <sup>#</sup>	99 (45.0)	19 (8.6)	14 (6.4)	13 (5.9)	74 (33.6)
4.	Tea	166 (75.5)	3 (1.4)	9 (4.1)	10 (4.5)	32 (14.5)
5.	Green vegetables	65 (29.5)	78 (35.5)	32 (14.5)	17 (7.7)	28 (2.7)
6.	Curd	45 (20.5)	6 (2.7)	22 (10.0)	20 (9.1)	127 (57.7)
7.	Cheese	23 (10.5)	9 (4.1)	19 (8.6)	18 (8.2)	151 (68.8)
8.	Roots and tubers	147 (66.8)	46 (20.9)	16 (7.3)	8 (3.6)	3 (1.4)
9.	Bread	79 (35.9)	35 (15.9)	26 (11.8)	18 (8.2)	62 (28.2)
10.	Eggs	35 (15.9)	45 (20.5)	34 (15.5)	51 (23.2)	55 (25)
11.	Meat/chicken/fish	12 (5.5)	36 (16.4)	53 (24.1)	51 (23.2)	68 (30.9)
12.	Snacks <sup>§</sup>	162 (73.6)	22 (10)	8 (3.6)	15 (6.8)	13 (6.4)
13.	Deep fried items <sup>@</sup>	26 (11.8)	21 (9.5)	47 (21.4)	54 (24.5)	72 (32.7)
14.	Fruits	50 (22.7)	41 (18.6)	47 (21.4)	44 (20)	38 (17.3)

**Table 1:** Frequency pattern of consumption of various food items.

\*: all figures expressed as N (%)

#: Milk could be of any buffalo, cow, goat.

§: Snacks included namkeen, biscuits, rusk etc.

@: Deep fried items included samosa, pakodha, momos, potato fry etc.

### Physical examination

As shown in table 2, mean ( $\pm$  SD) weight, height and BMI of children were  $19.1 \pm 4.6$ ,  $116.9 \pm 12.9$  and  $13.8 \pm 2.4$  respectively. Only 37.3% of the mothers had ever visited Anganwadi during pregnancy. Midday meal provided in school was a part of the diet in only (38.6%) children. The distribution of children according to weight for age, height for age and BMI has been shown in bar diagram (Figure 1). Sixty-seven percent children out of 220 had normal height for age, and 33.2% were stunted whereas fifty-one percent children had the standard weight for age and 48% were wasted. Fifty-six percent children had normal Body Mass Index compared to 15.5% undernourished (Figure 1).

Eighty-seven percent children had no significant history of the medical disease in the past one year. Frequent episodes of diarrhea were the most common complaint mothers reported their children had suffered last year. The common medical ailments for

which children were admitted to the hospital were enteric fever (16.8%), meningitis (9.5%) and TB of any cause excluding meningitis (8.6%). Multivariate logistic regression analysis was done to find any significant association between them (Table 3). Consumption of pulses and green vegetables was regular among children belonged to rural (OR = 2.3 95%CI 1.1 - 4.6; OR = 6.4 95% CI 2.1 - 19.7) and urban areas (OR = 2.4 95%CI 1.0 - 5.6; 3.7 95% CI 1.0 - 14.2) compared to urban slums. Milk consumption was more regular among boys than girls (OR = 2.0 95%CI 1.1 - 3.8), children belonged to families with monthly income more than Rs. 10,000 (OR = 2.7 95% CI 1.1 - 6.8) than those belonged to families with < Rs.10,000 monthly income and those children whose mother visited Anganwadi (OR = 1.9 95%CI 1 - 3.8) compared to those whose mothers didn't. Children with no siblings enjoyed fruits on a regular basis (OR = 3.6 95% CI 1.0 - 12.3) as compared to children with 1 or more than one siblings.

Variables	Boys (N = 143)	Girls (N = 77)	Total (N = 220)	p value*
Height (cm) <sup>&amp;</sup>	116.8 ± 12.8	117.1 ± 13.1	116.9 ± 12.9	0.8
Weight (Kg) <sup>&amp;</sup>	19.2 ± 4.6	19.0 ± 4.6	19.1 ± 4.6	0.7
BMI (kg/m <sup>2</sup> ) <sup>&amp;</sup>	13.9 ± 2.4	13.7 ± 2.4	13.8 ± 2.4	0.5
<b>Mid-day meal<sup>#</sup></b>				
No	92 (68.1)	43 (31.9)	135 (61.4)	0.2
Yes	51 (60.0)	34 (40.0)	85 (38.6)	
<b>Visit to an Anganwadi<sup>#</sup></b>				
No	93 (67.4)	45 (32.6)	138 (62.7)	0.3
Yes	50 (61.0)	32 (39.0)	82 (37.3)	
<b>Immunization<sup>#</sup></b>				
Nil	19 (73.1)	7 (26.9)	26 (11.8)	0.5
Complete	85 (62.5)	51 (37.5)	136 (61.8)	
Partial	39 (67.2)	19 (32.8)	58 (26.4)	
<b>Bow legs<sup>#</sup></b>				
No	139 (65.0)	75 (35.0)	214 (97.3)	0.9
Yes	4 (66.7)	2 (33.3)	6 (2.7)	
<b>Angular stomatitis<sup>#</sup></b>				
No	138 (65.4)	73 (34.6)	211 (95.9)	0.5
Yes	5 (55.6)	4 (44.4)	9 (4.1)	

**Table 2:** Distribution of anthropometric and other characteristics between boys and girls.

\*: P value < 0.05 is considered significant

&: All figures expressed as Mean ± SD

#: All figures expressed as n (%)

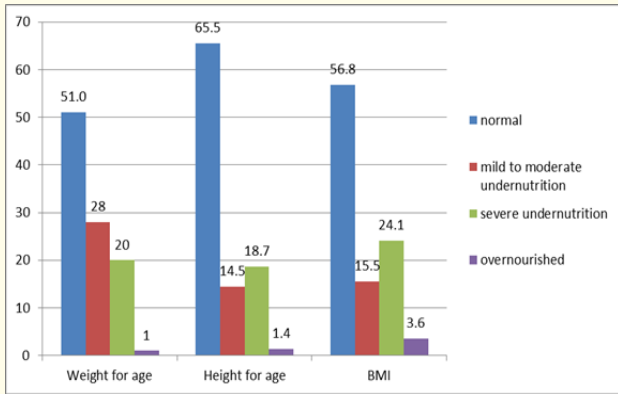
Variables	Pulse (Regular/daily) Sig Exp (B)* (95%CI)	Milk (Regular/daily) Sig Exp (B) (95%CI)	Green veg (Regular/daily) Sig Exp (B) (95%CI)	Fruits (Regular/daily) Sig Exp (B) (95%CI)	Snacks (Regular/daily) Sig Exp (B) (95%CI)
<b>Gender</b>					
Male	0.1 1.6 (0.8 - 3.1)	0.02 2.0 (1.1 - 3.8)	0.2 1.7 (0.6 - 4.3)	0.4 1.3 (0.6 - 2.7)	0.8 1.0 (0.5 - 2.0)
Female <sup>b</sup>	0.0	0.0	0.0	0.0	.00
<b>Residence</b>					
Rural	.01 2.3 (1.1 - 4.6)	0.5 1.2 (0.6 - 2.3)	0.0 6.4 (2.1 - 19.7)	0.8 0.9 (0.4 - 2.0)	0.06 0.5 (0.2 - 1.0)
Urban	.03 2.4 (1.0 - 5.6)	0.1 1.8 (0.7 - 4.1)	0.05 3.7 (1.0 - 14.2)	0.4 1.4 (0.5 - 3.4)	0.7 1.1 (0.4 - 3.1)
Urban slum <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Type of family</b>					
Nuclear	0.8 0.9 (0.4 - 1.8)	0.2 1.4 (0.7 - 2.9)	0.02 0.3 (0.1 - 0.8)	0.3 0.6 (0.3 - 1.4)	0.1 1.6 (0.7 - 3.4)
Joint <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Family income (INR)</b>					
> 10,000	0.7 0.8 (0.3 - 2.0)	0.02 2.7 (1.1 - 6.8)	0.6 1.3 (0.4 - 4.2)	0.9 0.9 (0.3 - 2.5)	0.9 0.9 (0.3 - 2.4)
< 10,000 <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Occupation of mother</b>					
Housewife	0.4 1.4 (0.5 - 3.4)	0.1 1.7 (0.7 - 4.2)	0.2 2.3 (0.4 - 11.3)	0.2 1.9 (0.6 - 6.3)	0.1 0.4 (0.1 - 1.3)
Working <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>No of children</b>					
1	0.7 0.8 (0.2 - 3.0)	0.7 1.2 (0.3 - 4.4)	0.6 1.5 (0.2 - 8.7)	0.04 3.6 (1.0 - 12.3)	0.5 1.7 (0.3 - 8.8)
>1 <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Immunization status</b>					
Complete	0.05 2.7 (0.9 - 7.6)	0.1 1.9 (0.7 - 5.2)	0.08 6.7 (0.7 - 61.8)	0.03 1.9 (0.5 - 7.5)	0.9 0.9 (0.3 - 2.8)
Partial	0.80 0.8 (0.2 - 2.7)	0.6 1.2 (0.4 - 3.6)	0.1 5.9 (0.6 - 56.8)	0.2 2.4 (0.6 - 9.5)	0.2 0.4 (0.1 - 1.4)
Nil <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Visit to Anganwadi</b>					
Yes	0.9 0.9 (0.5 - 1.8)	0.03 1.9 (1.0 - 3.8)	0.6 0.7 (0.3 - 2.0)	0.09 1.8 (0.9 - 3.8)	0.9 0.9 (0.4 - 1.9)
No <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Intake of mid - day meal</b>					
Yes	0.2 0.6 (0.3 - 1.3)	0.01 0.4 (0.2 - 0.8)	0.0 4.0 (1.5 - 10.5)	0.1 0.5 (0.2 - 1.1)	0.3 0.7 (0.3 - 1.4)
No <sup>b</sup>	0.0	0.0	0.0	0.0	0.0
<b>Mother education status</b>					
Educated	0.09 1.7 (0.9 - 3.3)	0.0 2.4 (1.2 - 4.6)	0.6 1.2 (0.4 - 3.4)	0.0 2.8 (1.3 - 5.9)	0.6 1.1 (0.5 - 2.4)
Illiterate	0.0	0.0	0.0	0.0	0.0

**Table 3:** Multiple logistic regression models of associations between intake of various food items and socio demographic variables.

b. Reference category .This parameter is set to zero because it is redundant.

Exp (B) are Odds ratio with 95% CI.

\*P value < 0.05 is considered significant.



**Figure 1:** Distribution of grades of weight, height and BMI among children.

\*BMI: Body Mass Index; the reference was taken as WHO BMI growth charts 2006 for 5 - 19 yrs old children.

Children lived in the joint family ( $p < 0.05$ ) and not taking mid-day meal ( $p < 0.01$ ) had less prevalence of underweight compared to their counterparts (Table 4). Children of educated mothers also had less prevalence of underweight ( $p < 0.01$ ). The prevalence of stunting was less frequent among children consuming green vegetables regularly ( $p < 0.05$ ) compared to those consuming them infrequently (Table 4).

**Discussion**

The consumption of cereals was reported regular (daily or 7 days in a week) in the current study. Among cereals, wheat and rice consumption pattern followed the regional preference for cereal. Wheat is staple cereal while rice is next in northern India and it followed the same in dietary pattern. Only one-fourth of the children had milk and other dairy products, as a regular part of the diet. Another significant finding was the very high prevalence

Variable	Weight for age		P value	Height for age		P value
	Normal	Under-weight <sup>a</sup>		Normal	Stunting <sup>b</sup>	
<b>Type of family</b>						
Nuclear	78 (69.0)	86 (80.4)	0.05	105 (72.9)	59 (77.6)	0.4
Joint	35 (31.0)	21 (19.6)		39 (27.1)	17 (22.4)	
<b>Mid-day meal intake</b>						
Yes	35 (31)	50 (46.7)	0.01	57 (39.6)	28 (36.8)	0.6
No	78 (69)	57 (53.3)		87 (60.4)	48 (63.2)	
<b>Education status of mother</b>						
Educated	54 (47.8)	32 (29.9)	0.007	57 (39.6)	29 (38.2)	0.8
Illiterate	59 (52.2)	75 (70.1)		87 (60.4)	47 (61.8)	
<b>Intake of green vegetables</b>						
Regularly <sup>c</sup>	16 (14.2)	15 (14.0)	0.9	26 (18.1)	118 (81.9)	0.02
Infrequent	97 (85.8)	92 (66.0)		5 (6.6)	71 (93.4)	

**Table 4:** Effect of different variables on weight and height for age.

a: Weight for age < - 2SD; b: Height for age < - 2 SD; c: Regularly means 7 days in a week

\*p value < 0.05 is considered significant

of daily intake of tea (75.5%) and deep fried items (11%), low intake of recommended servings of green leafy vegetables (30%) and fruits (22%). The minimum consumption of 5 servings of fruits and vegetables was met by only 10% of the children. The results are comparable to the study conducted in Bhopal in 2012 [7] which reported that protein-rich foods like pulses and lentils were consumed every day by 22% of the respondents whereas fish and meat were consumed by only 8% of the interviewees. The study also concluded that milk in the form of tea, sugar, and fat was consumed on the everyday basis and fried snacks consumption was regular among 27% children. A study among urban and rural children from Bareilly, Uttar Pradesh in 2011 [8] reported much better results than the current study. The consumption of green vegetables, roots and tubers, milk, and dairy products, pulses, meat and fish all were higher among rural and urban children compared to children in the present study though tea consumption was regular among them as

well. A study from Kerala [9] conducted among 3 - 6 years old children in 2013-14 concluded that diet of children was imbalanced based on cereals, their intake of pulses, green vegetables, roots and tubers, sugar and fats were very small as compared to Indian Council of Medical Research (ICMR) standards.

High protein sources like egg, meat, chicken were not eaten at all among 25% and 31% of children respectively in the present study. Whereas 75% children ate snacks like biscuits, namkeen, and others things made from highly refined flour and 22% used to eat deep fried items at least thrice in a week. Mothers' efforts to feed their children in limited resources were constrained by dislikes for home prepared food by them. In the current study, primary sources of vitamin A, C micronutrients and high fiber like fruits, vegetables were missing. Sources of iron, calcium, like vegetables, milk products were also limited. A case-control study among 902

school children in Delhi by Bhadoria, *et al.* [10] reported regular consumption of fried foods among 43 - 49.2% children whereas the regular consumption of green vegetables was only among 41 - 61%. Milk and fruits were regularly consumed by 88 - 91% and 58.3 - 86.5% respectively. In the report by National Nutrition Monitoring Bureau (NNMB) in 2012 [11], it was reported that average daily consumption of milk among 5 - 9 years old children was 64 - 67 grams and more than 80% children consumed less than 50% of the daily requirement. Tea is a favourite beverage among children which could either be a compulsion due to poor socio-economic status or illiteracy or unawareness among families and needs an exploration since consumption of tea is not good for the health of children due to its contents like caffeine and theobromine etc.

### Malnutrition

The prevalence of undernutrition was 49%, and stunting was 33%. Anthropometric data from NNMB 2012 survey revealed that the prevalence of undernutrition among 5 - 9 years old boys and girls was 36.5% and 30.9% respectively. The pooled data from 10 states of India under NNMB [11] survey also quoted that the average intake of milk and milk products and vegetables have increased whilst the consumption of micronutrients, fruits and cereals has decreased over the years in this age population. Though most of the study subjects (70%) used to go government school yet, mid-day meal was a part of the diet in 38.6% only. The wholesome purpose of mid-day meal scheme is to fill in the gap the deficit for energy and proteins by supplementing food in school.

### Conclusion

The consumption of green vegetables, fruits, pulses, and milk was inadequate in children. Education of the mother influences nutritional status of the children and children taking green vegetables daily have less prevalence of stunting. Family members should be involved in the diet planning for the children.

### Limitations of the Study

Though we tried to eliminate bias due to confounders like current illness by excluding congenital or genetic disorders, yet it could add to unknown bias. The anthropometric measurements could not be compared with results of other studies due to the hospitalized population in the sample and not from the general population. Food frequency questionnaire was used to assess overview of food consumption pattern among 5 - 10 years old children. Exact calories and micronutrient uptake could not be calculated, and hence no comparison with RDA was a limitation in the current study.

### Conflict of Interest

No Conflict of interest.

### Funding

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