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**Malay Kumar Patsa**

1. Research Scholar, Seacom  
Skills University,  
Kendradangal, Bolpur,  
Birbhum, West Bengal, India  
2. Contractual Whole Time  
Teacher, Bankura Sammilani  
College, Kenduadihi, Bankura,  
West Bengal, India

**Pamela Banerjee**

Assistant Professor, Seacom  
Skills University, Kendradangal,  
Bolpur, Birbhum, West Bengal,  
India

## Food consumption pattern and nutrient intake of rural primary school children

**Malay Kumar Patsa and Pamela Banerjee**

### Abstract

To know food consumption pattern and nutrient intake of rural primary school children, a cross sectional study was carried out on 238 children (7-9 years) of Bankura district, West Bengal. Using a pre-tested schedule, dietary data was collected by 24-hours diet recall method and food consumption frequency was recorded in terms of frequency of meals, timing of meals and food groups. The mean nutrient intake was then calculated and compared with recommended dietary allowances (RDA) for children by t-test. The p value of  $\leq 0.05$  was considered statistically significant. From this study it was found that most of the children (63.71% boys and 63.16% girls) consumed meals thrice a day. After comparing intake with requirement, it was found that the intake of energy and all nutrients (except carbohydrate) by the children (both boys and girls) are significantly lower than the requirement. There was no significant difference between intake and requirement of carbohydrate of the children. From this study it can be concluded that the primary school children of the study area consumed inadequate energy and most of the macro and micro nutrients which in turn affect the nutritional status of the children.

**Keywords:** Food consumption, nutrient intake, school children, Nutritional status

### 1. Introduction

Primary school age is the dynamic period of physical growth and mental development. Nutrition during this period is of paramount importance because it is the period of foundation for their life time health, strength and intellectual vitality [1]. The health of children is mainly depends on food intake which provides sufficient energy and nutrients to promote physical, social, cognitive growth and development [2]. Primary school children i.e. the children of the age group 5-12 year are vulnerable because of their rapid rate of growth. Physical growth, development and well-being of the children are directly related to their nutritional status [3]. Nutritional imbalance during school age period can cause serious health implications throughout their life [2]. Inadequacy of nutrient during childhood causes undernutrition which results growth failure, developmental delays, decreased cognitive function and low immunity and reduced adult size, leading to decreased economic productivity [4].

Childhood malnutrition is associated with a number of socioeconomic and environmental characteristics such as poverty, parents' education/occupation, and access to health care services [5]. Poverty, low literacy rate, large families, food insecurity, food safety, women's education appears to be the important underlying factors responsible for poor health status of children from low socioeconomic class [6]. In developing countries, diets fed to children usually lack in variety and are monotonous staples and cereals with little intake of animal source foods. This becomes an exacerbating factor to malnutrition because children are at their critical point of growth where they require adequate nutrients to meet the growth demands [7]. Food consumption and nutrient intake are important issues of food security [8]. Food consumption pattern is the personal behaviors that is developed over the years and influenced by food availability, people's knowledge, attitudes and perceptions, tradition, culture and other social factors [8, 9]. The type and the amount of food an individual chooses to consume affect his or her well-being and have implications for the society as a whole [10].

**Corresponding Author:**

**Pamela Banerjee**

Assistant Professor, Seacom  
Skills University, Kendradangal,  
Bolpur, Birbhum, West Bengal,  
India

The information regarding food consumption pattern and nutrient intake rural primary school children in different parts of India was reported in different studies. But there is a lack of such information of rural school children in Bankura District, West Bengal (India). With this background the present study was conducted to know food consumption pattern and nutrient intake of rural primary school children in Bankura district.

## 2. Methods

### 2.1 Study design

A cross sectional study design was used to carry out the survey on rural primary school children of Bankura district.

### 2.2 Participant of the study

238 children aged 7-9 years of both sexes (boys 124 and girls 114) studying in Government aided primary schools located at rural areas of Bankura district were the participant of the study.

### 2.3 Sample selection

Children were selected from 8 Government aided rural primary schools of 4 community development blocks by multistage random sampling. Primary school children between the age of 7 and 9 years attending Government aided primary school of rural area of Bankura district were included in the study. Children who were absent from the school on the day of survey and children who were sick or differentially abled are excluded from the study.

### 2.4 Data collection

Data was collected after receiving permission from District Primary School Authority and taking written consent from the parents/guardian of the children. A pre-designed and pre-tested schedule was used for data collection. Data regarding food consumption and dietary intake was collected by interviewing the caregiver of the children. Dietary data was collected by 24-hours diet recall method and food consumption frequency was recorded in terms of frequency of meals, timing of meals and food groups. For the estimation of the food consumed household utensils like glasses, plates, spoons cups etc. were used. The average daily nutrient intake was calculated with the help of food composition table <sup>[11]</sup>. The calculated daily nutrient intake was then compared against recommended dietary allowances (RDA) for children <sup>[12]</sup>.

### 2.5 Statistical analysis

Statistical analysis was carried in MS Excel spread sheet after entering the collected data. Data of nutrient intake was expressed as means and standard deviations and compared with RDA by t-test. The p value of  $\leq 0.05$  was considered statistically significant.

## 3. Results

### 3.1 Age and gender wise distribution of the children

From 8 Government aided primary schools located at rural areas of Bankura district, 238 children aged 7-9 years were selected as participants of study. The age and gender wise distribution of the children is presented in table 1.

**Table 1:** Age and gender wise distribution of the children

Age	Boys (n =124)		Girls (n =114)	
	Number	Percentage	Number	Percentage
7 years	37	29.84	33	28.95
8 years	42	33.87	41	35.96
9 years	45	36.29	40	35.09

### 3.2 Food consumption pattern of the children

Food consumption pattern of the children was recorded in terms of frequency of meals, timing of meals and frequency of food groups. Most of the children (63.71% boys and 63.16% girls) consumed meals thrice a day. A small section of the children (10.48% boys and 10.53% girls) consumed meals five times a day. 25% boys and 24.56% girls consumed meals four times a day. Only 0.81% boys and 1.75% girls consumed meals twice a day (table 2).

**Table 2:** Food consumption pattern: Frequency of meals

Frequency of meals	Boys (n =124)		Girls (n =114)	
	Number	Percentage	Number	Percentage
Five times a day	13	10.48	12	10.53
Four times a day	31	25.00	28	24.56
Thrice a day	79	63.71	72	63.16
Twice a day	1	0.81	2	1.75

All the children consumed lunch and dinner regularly. 45.16% boys and 42.10% girls took tea, biscuit or puffed rice in the morning. In the mid-morning, 47.58% boys and 48.24% girls took breakfast. Only 18.55% boys and 16.66% girls consumed afternoon snacks (table 3).

**Table 3:** Food consumption pattern: Timing of meals

Timing of meals	Boys (n =124)		Girls (n =114)	
	Number	Percentage	Number	Percentage
Morning (Tea, Biscuit etc.)	56	45.16	48	42.10
Mid-morning (Breakfast)	59	47.58	55	48.24
Noon (Lunch)	124	100.00	114	100.00
Afternoon (Snacks)	23	18.55	19	16.66
Night (Dinner)	124	100.00	114	100.00

When we consider food consumption pattern in respect of frequency of food groups (table 4A and table 4B), it was found that all the children consumed cereals, sugar/jaggery and fats & oils daily. 15.32% boys and 14.91% girls consumed pulses daily, 30.65% boys and 28.95% girls consumed pulses 4-6 times in a week and 54.03% boys and 56.14% girls consumed pulses 2-3 times in a week. Regarding the consumption of roots and tubers, it was found that a good proportion of the children (68.55% boys and 71.05% girls) consumed these items daily some of the children (31.45% boys and 28.95% girls) consumed 4-5 times in a week. Only a small proportion of the children (8.87% boys and 8.77% girls) consumed green leafy vegetables daily. Similarly only 13.71% boys and 10.53% girls consumed milk and milk products daily. Most of the children (73.39% boys and 74.56% girls) consumed fruits rarely. Consumption of meat, fish or egg was infrequent. Nobody consumed these foods daily; only a small section of the children (12.90% boys and 10.53% girls) consumed these foods 4-6 times in a week.

**Table 4A:** Food consumption pattern: Frequency of food groups (Boys, n = 124)

Food groups	Daily		4-6 times in a week		2-3 times in a week		Once in a week		Rarely		Never	
	f	%	f	%	f	%	f	%	f	%	f	%
Cereals	124	100	-	-	-	-	-	-	-	-	-	-
Pulses	19	15.32	38	30.65	67	54.03	-	-	-	-	-	-
Roots and tubers	85	68.55	39	31.45	-	-	-	-	-	-	-	-
Green leafy vegetables	11	8.87	13	10.48	49	39.52	23	18.55	28	22.58	-	-
Other vegetables	87	70.16	21	16.94	16	12.90	-	-	-	-	-	-
Fruits	-	-	-	-	10	8.06	23	18.55	91	73.39	-	-
Milk and milk products	17	13.71	20	16.13	32	25.81	24	19.35	31	25.0	-	-
Meat/fish/egg	-	-	16	12.90	43	34.68	64	51.61	-	-	1	0.81
Sugar/ jaggery	124	100	-	-	-	-	-	-	-	-	-	-
Fats and oils	124	100	-	-	-	-	-	-	-	-	-	-

**Table 4B:** Food consumption pattern: Frequency of food groups (Girls, n = 114)

Food groups	Daily		4-6 times in a week		2-3 times in a week		Once in a week		Rarely		Never	
	f	%	f	%	f	%	f	%	f	%	f	%
Cereals	114	100	-	-	-	-	-	-	-	-	-	-
Pulses	17	14.91	33	28.95	64	56.14	-	-	-	-	-	-
Roots and tubers	81	71.05	33	28.95	-	-	-	-	-	-	-	-
Green leafy vegetables	10	8.77	12	10.53	47	41.23	21	18.42	24	21.05	-	-
Other vegetables	84	73.68	16	14.04	14	12.28	-	-	-	-	-	-
Fruits	-	-	-	-	8	7.02	21	18.42	85	74.56	-	-
Milk and milk products	12	10.53	18	15.79	27	23.68	21	18.42	36	31.58	-	-
Meat/fish/egg	-	-	12	10.53	38	33.33	62	54.39	-	-	2	1.75
Sugar/ jaggery	114	100	-	-	-	-	-	-	-	-	-	-
Fats and oils	114	100	-	-	-	-	-	-	-	-	-	-

### 3.3 Nutrient intake of the children

Intake of energy and other nutrients is presented as means and standard deviations (table 5). After comparing intake with requirement, it was found that the intake of energy and all

nutrients (except carbohydrate) by the children (both boys and girls) are significantly lower than the requirement. There was no significant difference between intake and requirement of carbohydrate of the children.

**Table 5:** Intake of energy and nutrients by the children

Energy & nutrients	Boys (n = 124)			Girls (n = 114)		
	Mean intake	Requirement/RDA	t value	Mean intake	Requirement/RDA	t value
Energy (Kcal)	1382.13 ± 243.24	1690	14.094**	1355.43 ± 237.63	1690	15.033**
Protein (gm)	25.05 ± 8.32	29.5	5.956**	24.27 ± 7.96	29.5	7.015**
Carbohydrate (gm)	268.32 ± 172.69	287.38	1.229	262.93 ± 166.53	287.38	1.567
Fat (gm)	23.17 ± 7.43	46.94	35.625**	22.94 ± 7.31	43.17	29.548**
Iron (mg)	12.33 ± 4.58	16	8.923**	12.17 ± 4.46	16	9.169**
Calcium (mg)	376.27 ± 173.21	600	14.383**	349.5 ± 167.94	600	15.926**
Zinc (mg)	5.29 ± 1.54	8	19.596**	5.28 ± 1.43	8	20.308**
Vitamin A (mcg)	548.13 ± 237.95	600	2.427*	529.43 ± 227.96	600	3.305**
Vitamin B <sub>1</sub> (mg)	0.56 ± 0.21	0.8	12.726**	0.54 ± 0.22	0.8	12.618**
Vitamin B <sub>2</sub> (mg)	0.57 ± 0.21	1.0	22.801**	0.55 ± 0.26	1.0	18.479**
Vitamin C (mg)	24.63 ± 7.94	40	21.556**	22.93 ± 8.42	40	23.388**

Level of significance \* $P < 0.05$ ; \*\* $P < 0.01$

### 4. Discussion

School going children are the future of any nation and their nutritional needs are critical for the well being of society [13]. But the problem of undernutrition is prevalent among children in almost all the states of our country [14]. In this context, an understanding of food consumption pattern and nutrient intake level of primary school going children has immense importance for better development of future generation. For this reason the present study was conducted to know the food consumption pattern and nutrient intake level of rural primary school children.

In the present study, food consumption and dietary intake data of the children was collected by interviewing their caregivers. Food consumption pattern of the children was recorded in terms of frequency of meals, timing of meals and frequency of food groups. From this study it was found that most of the children (63.71% boys and 63.16% girls) consumed meals

thrice a day. Out of three meals, the children consumed two meals at home and one meal at school i.e. midday meal. In a study conducted on school children, Katte *et al.* [15], observed that about 60 per cent of the children consumed three meals per day which indicates the consistency of our findings with the past study. It was observed in the present study that nearly half of the children (47.58% boys and 48.24% girls) consumed their breakfast. Handa *et al.* [2], observed in a study that 43.3% primary school children skips breakfast on daily basis and 12.66% skips breakfast 3-4 times in a week.

Regarding the consumption of nutrient intake, the result of the present study revealed that the intake of energy and all nutrients (except carbohydrate) by the children (both boys and girls) are significantly lower than the requirement. In a study conducted in Bhilwara district of Rajasthan, it was found that mean intake of energy and all nutrients by the rural school children was lower than RDA [16]. In another study conducted

at Himachal Pradesh, it was observed intake of protein, energy, calcium, iron, carotene, thiamine, riboflavin and niacin were comparatively less than the RDA [17]. All the children of this study consumed rice as their staple food which is the good sources of carbohydrates. Moreover, a good proportion of children consumed roots and tubers daily. For this reason, no deficiency of carbohydrate was found among the participants. But they infrequently consumed pulses and animal foods which is the major cause of protein deficiency. Though the children consumed fat regularly as cooking oil, the quantity of consumption was inadequate to fulfill the requirement. Inadequacy of fats and proteins was the cause of energy deficiency. Only a small proportion of the children consume green leafy vegetables regularly and most of the children consumed fruits rarely. Micronutrient deficiencies were resulted from inadequate intake of green leafy vegetables and fruits. Several study in different parts of the world reported positive association of dietary diversity with the quality of diet, intake of micronutrients and nutritional status of the children [18-20]. Nutritional status of the primary school children is greatly influenced by their food consumption pattern. Availability and accessibility to the nutritious foods depends mainly on economic condition of the family as well as the nutritional awareness of the mothers [21]. Diet lack in nutritious food causes inadequate intake of nutrients which results malnutrition in children.

## 5. Conclusion

From this study it can be concluded that the primary school children of the study area consumed inadequate energy and most of the macro and micro nutrients which in turn affect the nutritional status of the children. The foods consumed by the children usually lack in variety and are monotonous staples and cereals with little intake of animal foods, green leafy vegetables and fruits. Inclusion of all food groups in daily diet of school children is the solution to improve the nutritional status of the children. It can be possible by growing fruits and green leafy vegetables and farming poultry at the backyard of the houses. Moreover, enhancement of nutritional awareness by nutrition education programme and improvement of economic condition of the rural people by effective economic, social and political measures can bring about change in nutritional status of the rural school children.

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