

## Assessment of Animal Source Food Intake among School Going Children

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### Abstract

**Background:** Malnutrition is a condition in which body does not get enough nutrients to function properly and is a major public health problem. According to National Nutrition Survey 2018 prevalence of stunting (40.2%), wasting (17.7%) and underweight is (28.9%). Because childhood is the rapid growth period of life, animal source food is of prime importance (i.e. meat and dairy) as they are the main source of protein and calcium which are important for the physical growth of children.

**Methods:** The population of this study includes 8 - 15 years of school going children. A semi-structured questionnaire was developed consisting questions regarding eating patterns of children and their anthropometric measurements (weight and height). Prior permission was taken from the school principal and parents of children. Sample size was 384.

**Results:** The data of 384 children were available for analysis. 34.6% were males while 65.4% females in the study. Results showed that 39.8% children were underweight, 43.6% were normal, 12.2% were overweight and 4.4% were obese. Majority of the school going children were not fulfilling their recommended energy intake. Average animal source protein intake was also less than the RDA. Average iron intake among school going children was less than the RDA especially in girls. 4 - 8 years of age group children were fulfilling their RDA of vitamin B12 (i.e., 1.2 µg), whereas, Vitamin B12 intake in 9 - 13 and 14 - 18 years of age group children were less than the recommendations.

**Conclusion:** It is concluded from our study that overall daily energy consumption and intake of animal source protein is very low in school going children which all together ultimately leads to nutritional deficiencies and poor physical growth and cognitive development.

**Keywords:** School Going Children; Animal Source Food; Malnutrition; Animal Source Protein; Growth and Development

### Abbreviations

ASF: Animal Source Food; BMI: Body Mass Index; RDA: Recommended Dietary Allowance

### Introduction

Good nutrition is defined as a sufficient intake of energy and all the nutrients require maintaining a healthy well-being. In childhood adequate nutrition is of prime importance for normal growth, cognitive development and overall healthy life of the children [1]. In developing countries malnutrition remains one of the major public health concerns. Generally, the word malnutrition refers to inadequate en-

ergy intake (including protein deficiency) and micronutrients. Worldwide, malnutrition affects one in every three children [2]. In Pakistan according to National Nutrition Survey 2018 prevalence of stunting (40.2%), wasting (17.7%) and underweight is (28.9%), more than half (53.7%) of Pakistani children are anemic and 5.7% are severely anemic. Childhood under-nutrition may compromise the immune system which ultimately leads to many infectious diseases and increases the global disease burden. It may also impair the cognitive and motor skills development in children and affects their school performance [3]. Initially nutritional interventions only focused on protein and energy intake of the children but now in developing countries reduced growth and development among children is likely to be linked with low intake of micronutrients especially iron. Several studies showed that different nutrients specifically iron is linked with improved growth patterns among children. In developing countries protein intake from meat is particularly low, which is only 15% of dietary protein comparatively to that of developed countries which are approximately 60% [4]. Animal source foods (ASF) are rich in some important micronutrients which help for the potential physical growth as well as cognitive development among children [5]. One of the reasons behind deficiency of micronutrients in staple foods of different countries like cereals and legumes which lack important nutrients and have high content of phytate and fiber which hinders the bioavailability of the micronutrients such as iron [6]. Iron deficiency is amongst the most common micronutrient deficiency in developing countries and results in reduced growth, cognitive and motor skills development, immune function and physical activity [7]. Vitamin B<sub>12</sub> is only present in meat and its deficiency occurs due to increased intake of plant-based foods which ultimately results in anemia, lethargy and poor school performance among children [8-10]. Studies linked poor health and nutritional status among school-going children with poor school performance, cognitive capabilities, lower physical activity and school attendance [11,12]. Health and nutrition in childhood may affect the growth and development of children but adequate nutrition for the proper growth and development of older children is also of priority and researches have shown that achievement of catch-up growth is possible in school-aged children by eliminating the factors which hinder the growth potential of the children [13].

## Materials and Methods

### Study design

A descriptive cross-sectional survey was conducted at different private and government schools of Lahore, Pakistan by using both qualitative and quantitative research methods. This study was conducted on school-going children of 8 - 15 years of age.

### Sample size

The sample size of the study was calculated by keeping the confidence level at 95% (1.96), margin of error at 5% and assumes a population proportion is 0.5, by keeping in mind the above assumptions the sample size calculated was 384 children [14].

$$N = z^2 \times \hat{p} (1 - \hat{p}) / e^2$$

$$n = 1.962 \times 0.5 (1-0.5) / 0.052 \\ = 384.16$$

### Study site

The study was conducted in Lahore Grammar School, American Lycetuff School, Saint Peter School Anarkali, Government Saleem Model School, and Government Islamia High School. The study population was school-going children.

### Data collection

A semi-structured questionnaire was developed and data regarding children's demographic features, anthropometric measurements, and dietary recall was documented. Interview technique was used to fill the questionnaire. Age of the children was documented by using school records. The social group was categorized into four groups i.e., the proletariat, lower Bourgeoisie, bourgeoisie oligarchy. Anthropometric measurements were taken by using standard approaches, weight and height readings were taken using a battery-powered digital

Seca 803 weighing scale and Seca 216 portable stadiometer. Bodyweight and height was measured without any footwear. The 24-hour dietary recall was taken and the food frequency table focused on animal based food was added in the questionnaire which consisted of about 40 different food items from all the five food groups mentioned in my pyramid.

A more dominant number of children of 8 - 15 years of age group were present in classes 4 to 8. The inclusion criteria of our study were children of age 8 - 15 years and exclusion criteria were children and parents who are not willing to participate in the study. Questionnaires administered to students asked information about their personal characteristics (sex, area of residence, and religion) and dietary habits (number of meals intake per day and whether or not children receive money for food on school days. Anthropometric measurements were taken using standard procedures. Primary outcomes of the study are eating patterns of school-going children and secondary outcomes are growth parameters (weight and height).

**Ethical approval**

Prior ethical approval was taken from all the school principal of the study and also permission was granted from parents of the children in a parent-teacher meeting.

**Results and Discussion**

Data obtained was analyzed with respect to objective of the present study which was to assess the intake of animal food source among school going children. Total number of 384 school aged students of the mean age 10 ± 1.6 was enrolled in the study out of which 356 student’s complete data was available for analysis. Out of total population, 39.5% students were male and 65.5% students were female.

	Sample Size (n = 384)	Percentage (%)
Females	251	65.4%
Males	133	34.6%
Body Mass Index	Males	Females
Underweight	17.6%	22.2%
Normal	24.8%	18.8%
Overweight	7.4%	4.8%
Obese	1.9%	2.5%

**Table 1:** Shows the percentage students in different BMI categories.

Results of the study revealed, 39.8% children were found underweight, 43.6% normal or healthy, 12.20% overweight and 4.40% children obese. It had been showed that majority of the assessed population was healthy and underweight. According to another study conducted in school going children of Kenya to assess their nutritional status showed that 24.5% children were stunted, 14.9% were underweight and 9.7% were wasted. It was found that Stunting was more prevalent in boys as compared to girls [15]. A study carried out in Zambia among the school children also showed that 28.9% children were stunted, 14.5% were underweight and 3.9% children were found wasted [16]. A study conducted in Nicaragua showed that 5% of school going children found wasted [17].

A study carried out in Brazil, found 21% stunting and 13% underweight among school going children [18]. In the present study overall 39.8% children found underweight. Being underweight after normal found the most common condition among school going children.

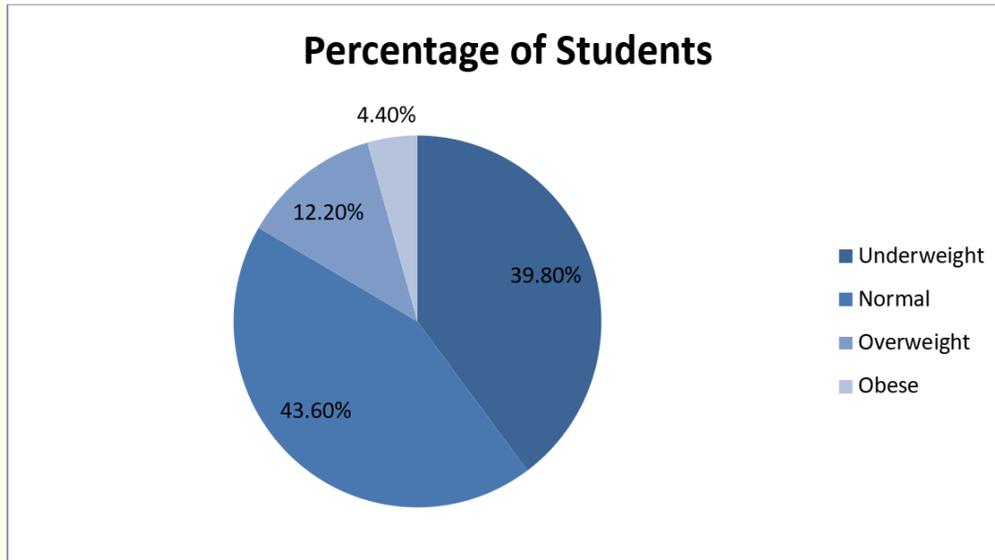


Figure 1: Shows the percentage of students categorized on the basis of BMI.

Energy kcal/day	For Boys		For Girls	
Age (years)	RDA (kcal/day)	Average Intake (kcal/day)	RDA (kcal/day)	Average Intake (kcal/day)
4 - 8	1750	1155 ± 139	1650	1003 ± 136
9 - 13	2250	1447 ± 376	2000	1277 ± 418
14 - 18	3000	2153 ± 325	2300	1549 ± 233

Table 2: Average caloric intake per day in girls and boys.

Results showed that majority of the school going children were not fulfilling the RDA of energy. Average caloric intake of Children of age group 4 - 8 years was 1155 ± 139 in boys and 1003 ± 136 in girls. Whereas, in age group 9 - 13 years it was 1447 ± 376 in boys and 1277 ± 418 in girls, Moreover, in age group 14-18 years age group average caloric intake found in boys was 2153 ± 325 and 1549 ± 233 in girls. The mean energy intake of children did not meet the energy needs for all the children. Another study showed that 63.7% children consume energy intake which meet their recommended daily allowance [19]. In accordance with, the study conducted by Mwaniki, *et al.* (2013) also compared the average intake of calories among school going children with recommended dietary allowance reported 1352kcal calorie intake among 4 - 6 and 1698 kcal among 7-9 year age group. Study concluded only 17.3% children did not meet the recommended daily allowance of energy intake whereas rest of them successfully fulfilled recommended daily allowance of energy intake [15]. Another Western Kenya study findings showed that 63.7% children meet their recommended dietary allowance of energy [17].

Results of the present study revealed that protein intake of school going children were not so good and not fulfilling the RDA. Poor Protein intake both in boys and girls was found among age group 14 - 18 years of age. Another study reported that 22% school going children consumed Protein rich foods whereas only 8% consumed fish and meat [20].

Protein g/day	For Boys		For Girls	
Age (years)	RDA (mg/day)	Average Intake (mg/day)	RDA (mg/day)	Average Intake (mg/day)
4 - 8	19	14 ± 1.2	19	12 ± 2.6
9 - 13	34	25 ± 3.6	34	23 ± 4.8
14 - 18	52	27 ± 3.3	46	25 ± 1.5

Table 3: Illustrates the average protein intake in different age groups among boys and girls.

Iron mg/day	For Boys		For Girls	
Age (years)	RDA (mg/day)	Average Intake (mg/day)	RDA (mg/day)	Average Intake (mg/day)
4 - 8	10	4.4 ± 1.6	8	4.7 ± 0.5
9 - 13	8	6.8 ± 0.6	8	5.3 ± 1.2
14 - 18	11	9.1 ± 2.0	15	10.6 ± 0.7

Table 4: Average iron intake in boys and girls.

Average iron intake of the current study revealed that school going children was not fulfilling their RDA of protein. Whereas it has been found that iron intake of boys in group 14 - 18 years of age found much better as compared to the girls of same age group with respect to their RDA i.e. 11 for boys and 15 for girls. Kumari., *et al.* (2005) illustrates that 50% of girls fulfilled their recommended daily allowance of iron whereas other 50% did not receive iron according to recommended daily allowance [21]. Sati., *et al.* (2005) reported that intake of vitamin B complexes, vitamin C, iron (28.6%) and vitamin B12 (7%) was low among school going children [22]. Another study revealed that only 34% school going children fulfill iron requirements [20]. Iron deficiency is one of the cause of decreased intelligence level among school going children [23].

Vit.B12 µg/day	For Boys		For Girls	
Age (years)	RDA (mg/day)	Average Intake (mg/day)	RDA (mg/day)	Average Intake (mg/day)
4 - 8	1.2	1.6 ± 0.3	1.2	1.3 ± 0.1
9 - 13	1.8	1.4 ± 0.1	1.8	1.6 ± 0.8
14 - 18	2.4	2.2 ± 0.7	2.4	2.0 ± 0.6

Table 5: Average vitamin B12 intake.

Results of average intake of vitamin B12 among school going children showed that both boys and girls of age group 4 - 8 years fulfilled the RDA of vitamin B12. Whereas intake of vitamin B12 among age group 9 - 13 years and 14 - 18 years was also near to fulfilling the RDA. Another study revealed that if some animal food sources were added to diets of school going children it helped in improving height, weight and vitamin B12 also [13]. Murphy., *et al.* (1995) found that majority of school going children not fulfilling the requirement of Vitamin B12 and it is the most likely inadequate nutrient among them [24].

### Conclusion

It is concluded that energy, protein and iron intake of school going children of age 8 - 15 years are variable and not fulfilling the recommended dietary allowance while their vitamin B12 intake is near recommended. Intake of animal source protein is very low among school-aged children which lead to poor physical and cognitive development. Our study findings highlight the need for application of school-based nutritional interventional plans and research on nutritional status of this age group is required on larger scale.

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### Conflict of Interest

There was no conflict of interest.

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