

## Research Article

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## Food Intake Pattern of Anemic Adolescent Girls of Samastipur District of Bihar from India



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### ABSTRACT

Adolescent girls form a crucial segment of the population and constitute, as it were, the vital "bridge" between the present generation and the forthcoming generation. At present, the frequency of anemia among adolescent girls is on the hike in India mainly due to low socio-economic status and poor access to health-care services. Iron deficiency anemia (IDA) is the most common type of nutritional anemia which affects people globally. Food plays a key role in the effective development of the body in order to maintain an individual's health. The present study was undertaken to know the food intake pattern of anemic adolescent girls of Samastipur district, Bihar, India. The pattern of dietary intake and consumption of appropriate nutrients are essential elements for determining nutritional status. The findings indicated that the experimental adolescent girl's adequacy level was lower than the control girl's adequacy level while considering both food and nutrient intake.

**Keywords:** Adolescent girls, Anemia, Food, Iron, Nutrition

### INTRODUCTION

Adolescence age which is considered between 10 to 19 years distinguished by distinct physical activity and a rapid growth spurt. Adolescents have covered almost one-fifth of the population nowadays in the world and their numbers are kept growing but most of them are undernourished [10]. Adolescent girls form a crucial segment of the population and constitute, as it were, the vital "bridge" between the present generation and the forthcoming generation. Nutritional anemia is a comprehensive problem with tremendous health consequences affecting persons of all ages and economic groups. Specifically adolescent period symbolizes the initiation of the menstrual period in girls hence, they are at a larger risk for nutritional anemia. At present, the frequency of anemia among adolescent girls is on the hike in India mainly due to low socio-economic status and poor access of health-care services. Especially in rural areas of India, girls get married and become pregnant during the late adolescent period, thus multiplying the risk of adolescent anemia and low birth weight babies [8].

Anemia is a state of hematological abnormalities that includes depletion in oxygen-carrying capacity or as a deduction in the proportion of healthy red blood cells in the body. Iron deficiency anemia (IDA) is the most common type of nutritional anemia

which affects people globally. Being an important element in a living system, iron plays a significant role in many biological functions like energy production, cell proliferation, and respiration. Iron deficiency anemia is the terminal point of lack of iron in the body due to inadequate iron consumption, excessive iron requirements, and increased menstrual loss of iron as a consequence of insufficiency of red blood cells to meet the adolescent's physiological needs.

According to WHO [9], globally 29.9 per-cent of women aged 15-49 years suffered from anemia. Among them 59.1 per-cent of women aged 15-19 years in India were anemic. In Bihar, the prevalence of anemia among all females aged 15-19 years was 65.0 per-cent. The prevalence rate of anemia in rural areas was 65.4 per-cent. The prevalence rate of anemia among all females aged 15-19 years in the Samastipur district was 65.9 per-cent [6].

Deficient intake, inadequate and impaired absorption, greater demand, perinatal and postnatal wastage of blood, unusual intracellular transport, scanty presentation to erythroid precursors, etc. are some etiologies of IDA [4]. IDA is a chronic condition that often goes undiagnosed because it is asymptomatic. Patients are usually affected between the ages of 6 months and 3 years, or between the ages of 11 and 17 years due to expeditious growth and enlarging blood volume at these ages. Food plays a key role in the effective development of the body in order to maintain an individual's health [1]. The interactions among physiological function, illness, and diet have continued to improve in the current scenario [7]. Hence, Keeping all these points in view, the present study was undertaken to know the food intake pattern of anemic adolescent girls of Samastipur district, Bihar, India.

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## MATERIALS AND METHODS

### Selection of subjects

A total of forty adolescent girls aged 17-19 years who gave their consent for the study were purposively selected from Uma Pandey College in Pusa block in Samastipur district. The hemoglobin level of selected girls was carefully examined by using Sahli's technique. Based on their hemoglobin level, they were split into two groups i.e. experimental group (30) who fell in the Hb level range of <8 to 11.9 g/dl and the control group (10) who fell in the Hb level range of  $\geq 12$  g/dl.

### Collection of data

The data collection occurred through personal interaction with selected adolescent girls for the accumulation of appropriate information regarding their food and nutrient intake patterns.



**Plate 1: Collecting information from adolescent girls**

### Dietary Assessment

The pattern of dietary intake and consumption of appropriate nutrients are essential elements for determining nutritional status. Information related to selected girls' food intake was obtained by using 24 hours dietary recall method. The consumption of food was converted into raw equivalents and the average daily food and nutrient consumption were computed.

## RESULTS AND DISCUSSION

### General information

This section summarized the interpretation of general information of selected adolescent girls.

**Table 1: General information of selected adolescent girls**

Sl. No	Attributes	Experimental Group (N = 30)		Control Group (N = 10)	
		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
1.	<b>Religion</b>				
	Hindu	30	100.00	10	100.00
	Muslim	-	-	-	-
2.	<b>Caste</b>				
	General	9	30.00	-	-
	OBC	16	53.34	8	80.00
	SC	5	16.66	2	20.00
3.	<b>Family Type</b>				
	Extended	5	16.66	-	-
	Joint	18	60.00	9	90.00
	Nuclear	7	23.34	1	10.00

4.	<b>Family Size</b>				
	<5	-	-	-	-
	5 - 10	29	96.66	10	100.00
	>10	1	3.34	-	-
5.	<b>Family Income (Rs/-) Per Annum</b>				
	50,000 - 1,00,000	5	16.66	-	-
	1,00,001 - 2,00,000	19	63.34	4	40.00
	2,00,001 - 3,00,000	5	16.66	6	60.00
	3,00,000 and above	1	3.34	-	-
6.	<b>Food Habits</b>				
	Vegetarian	18	60.00	5	50.00
	Non-vegetarian	12	40.00	5	50.00
7.	<b>Meal Pattern</b>				
	>3 times	-	-	4	40.00
	3 times	19	63.34	6	60.00
	2 times	11	36.66	-	-

The findings revealed that all the respondents of both the experimental and control group belonged to the religion, of Hinduism. From Table 1, it was evident that the majority of the respondents of the experimental group were fall under the category of OBC which comprised 53.34 per-cent whereas 80 per-cent of the respondents of the control group belonged to the OBC category. Further the data indicated that 30 per-cent of respondents of the experimental group were of general category. In addition, 16.66 per-cent and 20 per-cent of respondents fell under the category of SC in both the experimental and control groups respectively. The data disclosed that most of the families of the experimental and control group followed a joint family norm which comprised 60 per-cent and 90 per-cent, while 23.34 per-cent of respondents of the experimental group and 10 per-cent of respondents of the control group followed nuclear family. However, only 16.66 per-cent of respondents of the experimental group had an extended type of family.

According to the findings (Table 1), it was found that the experimental and control group nearly had same percentages of family members i.e. 96.66 per-cent and 100 per-cent within the range of 5-10 members in their family whereas only 3.34 per-cent of the experimental group had more than 10 members in their family. A close perusal of table depicted that largest percentage of respondents of the experimental group i.e. 63.34 per-cent had an annual family income that ranged from 1,00,001 to 2,00,000 Rs/- which contradicted the total percentage of respondents from control group i.e. 40 per-cent while in case of control group 60 per-cent had an annual income ranged from 2,00,001 - 3,00,000 Rs/-. The respondents of the experimental group which make up 16.66 per-cent of the study had annual earnings of 50,000 - 1,00,000 Rs/- and 2,00,001 - 3,00,000 Rs/- respectively. In addition, 3.34 per-cent of the same experimental group earned more than 3,00,000 Rs/- annually. On the basis of food habits, it had been observed that 60 per-cent of respondents of the experimental group were vegetarian followed by 40 per-cent were non-vegetarian. A substantial percentage of vegetarians and non-vegetarians were present in control group. The results showed that in terms of meal pattern, nearly 63.34 per-cent of respondents in the experimental group and 60.00 per-cent of respondents of the control group were eating meal three times per day whereas 36.66 per-cent of respondents in the experimental group was eating meal two times per day. 40 per-cent of respondents from the control group reported consuming meals more than three times per day.

### Dietary assessment

Dietary assessment is gathering information on foods and beverages consumed during a particular time period, which is

categorized and processed to estimate calorie, nutritional, and other dietary element intake using food composition tables.

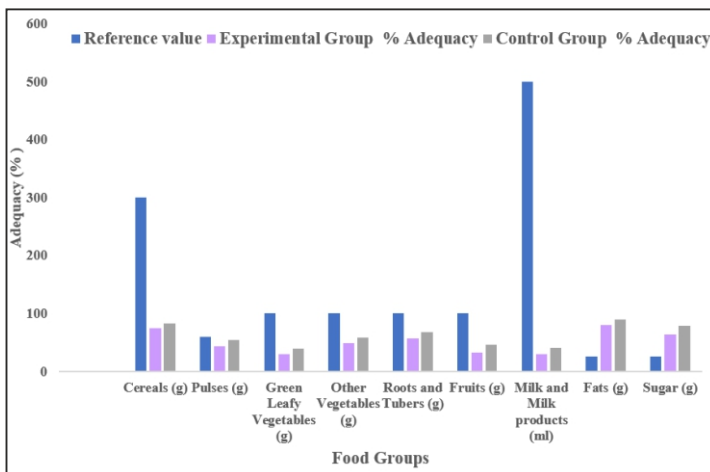
Dietary components must be chosen with care so that all the nutrients are provided in proper amounts and quantities. Table 2. represented the mean daily food intake and per-cent adequacy of food intake by selected adolescent girls.

**Table 2: Food intake pattern of adolescent girls**

Food groups	Reference value	Experimental group (30)		Control group (10)	
		Mean Consumption	% Adequacy	Mean Consumption	% Adequacy
Cereals (g)	300	224.23 ± 15.81	74.74	248.20 ± 22.04	82.73
Pulses (g)	60	26.16 ± 3.03	43.60	32.40 ± 3.86	54.00
Green Leafy Vegetables (g)	100	29.10 ± 4.38	29.10	39.70 ± 6.68	39.70
Other Vegetables (g)	100	49.30 ± 7.45	49.30	58.50 ± 4.60	58.50
Roots and Tubers (g)	100	56.30 ± 14.16	56.30	67.30 ± 4.71	67.30
Fruits (g)	100	32.20 ± 5.89	32.20	45.70 ± 3.83	45.70
Milk and Milk products (ml)	500	150.43 ± 32.75	30.08	200.50 ± 14.23	40.10
Fats (g)	25	20.16 ± 4.82	80.64	22.40 ± 4.52	89.60
Sugar (g)	26	16.66 ± 4.33	64.07	20.50 ± 2.27	78.84

Values expressed as Mean±SD for mean consumption

Source: Recommended Dietary Intake [3]



**Fig 1: Food intake pattern of adolescent girls**

### Cereals

Despite the fact that cereals are widely consumed food among Indians, the intake of cereal was less than RDI [3] among adolescent girls. The data obtained from Table 2. highlighted that the mean intake of cereals was 224.23 ± 15.81 g and 248.20 ± 22.04 g per day for the experimental group and control group respectively which reached to 74.74 per-cent and 82.73 per-cent adequacy of recommended diet suggested for adolescent girls.

### Pulses

In the Indian diet, pulses are excellent sources of protein. However, adolescents were uninterested to consume it. As a result of this, the mean intake of pulses per day was found to be very low i.e. 26.16 ± 3.03 g which met only 43.60 per-cent adequacy of recommended diet in the experimental group. On the other hand, the mean intake of pulses per day was found to be a bit higher i.e. 32.40 ± 3.86 g with 54.00 per-cent adequacy in the control group.

### Vegetables

Vegetables are mainly classified as GLV, other vegetables, and roots and tubers. Vegetables include varieties of nutrients in large quantities. However adolescent girls preferred fast food and peer-accepted dietary patterns over conventional diets. This was the reason for the lower consumption of vegetables.

The mean GLV intake for experimental girls was only 29.10 ± 4.38 g while it was 39.70 ± 6.68 g for control girls, meeting 29.10 per-cent and 39.70 per-cent of adequacy levels respectively. GLV consumption was remarkably low when compared to other vegetables, roots, and tubers.

In control subjects, the mean consumption of other vegetables per day was 58.50 ± 4.60 g i.e. 58.50 per-cent adequacy of RDI whereas the mean intake of other vegetables among experimental subjects per day was 49.30 ± 7.45 g i.e. 49.30 per-cent adequacy of RDI.

Adolescent girls consumed more roots and tubers on a daily basis in comparison with GLV and other vegetables. The mean consumption was 56.30 ± 14.16 g for experimental girls whereas 67.30 ± 4.71 g for control girls with similar values for per-cent adequacy. In terms of vegetables, adolescent girls in both groups were unable to reach the RDI recommended adequacy percentage.

### Fruits

The intake of fruits among adolescent girls was very low although fruits are packed with therapeutic properties. The average fruit consumption was 32.20 ± 5.89 g in experimental girls whereas 45.70 ± 3.83 g in control girls with similar values for per-cent adequacy.

### Milk and Milk products

According to the data represented in Fig 1. experimental girls consumed 150.43 ± 32.75 ml and control girls consumed 200.50 ± 14.23 ml milk and milk products per day on average, accounting for 30.08 per-cent and 40.10 per-cent of a balanced diet respectively. Milk intake was particularly lower among girls, despite the fact that there doesn't seem to be a suitable substitute for milk.

### Fats

Fats intake was somehow close to recommended dietary intake values i.e. 20.16 ± 4.82 g for experimental adolescent girls and 22.40 ± 4.52 g for control adolescent girls. The adequacy among experimental girls was 80.64 per-cent and for control, girls were 89.60 per-cent.

### Sugar

To achieve the required palatability, sugars were commonly added to tea, milk, and so on. This food group's average consumption was 16.66 ± 4.33 g making up for 64.07 per-cent of the balanced diet among experimental girls and 20.50 ± 2.27 g making up 78.84 per-cent of the balanced diet among control girls. The above mean consumption of food groups of selected adolescent girls was somehow identical with an average intake of foodstuffs among adolescent girls of India based on NNMB [5].

### Nutrient intake pattern of adolescent girls

Food is the carrier of nutrients and a sufficient diet is essential for the body's regular maintenance, regeneration, growth, and

development. Lack of any nutrient can significantly contribute to poor anthropometric and biochemical nutritional status. The average nutritional component of the diet in terms of raw weight was determined and the findings were compared to the recommended dietary consumption. The mean daily nutrient intake and per-cent adequacy of nutrient intake of selected adolescent girls can be depicted in the Table 3.

**Table 3: Nutrient intake pattern of adolescent girls**

Nutrients	Reference value	Experimental group (30)		Control group (10)	
		Mean Consumption	% Adequacy	Mean Consumption	% Adequacy
Protein (g)	46.20	30.18 ± 4.71	65.32	35.92 ± 4.87	77.74
Fat (g)	35.00	29.16 ± 6.17	83.31	33.41 ± 4.06	95.45
Carbohydrates (g)	130.00	270.66 ± 26.90	208.20	299.00 ± 26.85	230.00
Dietary fibre (g)	38.00	20.84 ± 4.65	54.84	25.20 ± 3.21	66.31
Iron (mg)	32.00	14.77 ± 2.63	46.15	21.54 ± 4.53	67.31
Zinc (mg)	14.20	5.54 ± 2.09	39.01	7.13 ± 1.81	50.21

Values expressed as Mean ± SD for mean consumption

Source: Recommended Dietary Allowances & Estimated Average Requirement<sup>[2]</sup>

### Protein

Protein is required for the growth, maintenance, and repairment of body tissues. The mean intake of protein per day was 30.18 ± 4.71 g and 35.92 ± 4.87 g in the experimental group and control group respectively, which was found to meet 65.32 per-cent and 77.74 per-cent adequacy of recommended diet suggested for adolescent girls. Low consumption of mean intake of protein was attributed to inadequacy of protein-rich foods such as pulses and legumes, milk and milk products, etc. in their diet.

### Fat

Fat is considered as a concentrated source of energy. This nutrient acts as a catalyst to impart texture and flavor to the diet. In contrast to other nutrients, a close look at Table 3. revealed that participants from both groups consumed a good amount of fat i.e. 29.16 ± 6.17 g for the experimental group and 33.41 ± 4.06 g for the control group with per-cent adequacy of 83.31 and 95.45 respectively which indicated their preference towards fatty foods.

### Carbohydrates

Generally, carbohydrates supply the largest proportion of energy to the body. The Indian diet is laden with carbohydrates. Contrary to other nutrients, the consumption of carbohydrates per day in the case of both the control group and the experimental group was so high i.e. 299.00 ± 26.85 g and 270.66 ± 26.90 g with per-cent adequacy of 230.00 and 208.20. This highlighted their likeness towards the consumption of cereals, starch-based foods, roots, and tubers.

### Dietary fibre

Dietary fibre is identified as a part of food produced from plant cell that is resistant to digestion by the human basic enzyme system. In control subjects, the mean consumption of dietary fibre per day was 25.20 ± 3.21 g i.e. 66.31 per-cent adequacy of RDA [2]. The mean intake of dietary fibre among experimental subjects per day was 20.84 ± 4.65 g i.e. 54.84 per-cent adequacy

of RDA [2]. In both group the adequacy per-cent was nutritionally insufficient in terms of a balanced diet. Decreased mean intake of dietary fiber in both groups was caused by inadequate intake of green leafy vegetables, whole grains, and fruits among selected adolescent girls.

### Protein

Iron is required for the formation of hemoglobin and the transportation of oxygen; hence its nutritional importance is very high. The experimental respondents consumed 14.77 ± 2.63 mg of iron per day which consist of only 46.15 per-cent of the recommended values. On the other hand, the control respondents consumed 21.54 ± 4.53 mg of iron per day which also comprised only 67.31 per-cent of the balanced diet. This level of adequacy in both the groups, particularly the experimental group, indicated lack of awareness and concern about their hematological health.

### Zinc

Zinc acts as a co-factor for many enzymes and crucial for protein metabolism. The average intake of zinc was 5.54 ± 2.09 mg per day which comprised only 39.01 per-cent of an adequate diet for experimental participants. In case of control participants, the mean intake of zinc was 7.13 ± 1.81 mg per day which was 50.21 per-cent of the recommended diet. In both groups the adequacy percentage of zinc intake was low. The reason was lack of awareness and negligence among adolescent girls regarding their health.

## CONCLUSION

Both the experimental and control group were unable to meet the per-cent adequacy level suggested by RDI with respect to all the food groups based on the food intake pattern of adolescent girls. Regarding the nutrient intake pattern of adolescent girls it was observed that consumption of iron and zinc was low whereas for carbohydrates it was high for both groups. The findings also indicated that the experimental adolescent girl's adequacy level was lower than control girl's adequacy level while considering both food and nutrient intake.

### Future scope of the study

- Food intake pattern of different age groups, especially on vulnerable populations can be evaluated.
- Nutritional education and dietary intervention on micronutrient-rich foods can be provided in order to ameliorate micronutrient deficiency.

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### Conflicts of interest

The authors declare that there are no conflicts of interest in the course of conducting the research. All the authors had final decision regarding the manuscript and decision to submit the findings for precaution.

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