

# **Nutrient Content in Cafeteria Diet of a Female Residential Hall of Dhaka University**

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## **Abstract**

The nutrient composition of cafeteria-diet of a female residential Hall of Dhaka University, for both summer and winter menus for a period of one week was evaluated by calculation, using food composition table and was compared with RDA of the students who consumed the cafeteria-diet. Cereals constituted the main bulk of the diet (321 g in summer and 359 g in winter) followed by roots and tubers (125 g and 116 g in summer and winter respectively). Meat, fish and legumes content of the diet were found less than recommendation made for a balance diet. Leafy vegetables were found completely absent in summer diet and only 12 g in winter diet. Cafeteria diet did not provide any milk and milk products. Calorie and protein content of the diets were found sufficient to meet the RDA of the students to an extent of 104% and 120% respectfully in both seasons. Except thiamin, micronutrients content of cafeteria-diet did not fulfill the RDA of the students. Diets fulfilled only 23% and 32.3% of RDA for vitamin A in summer and winter respectively. Only 50% of RDA of riboflavin was satisfied by cafeteria diets. Among minerals, cafeteria-diets provided 33.58% and 38% of RDA for calcium in summer and winter respectively. About 80% of RDA for iron and copper and half of the zinc requirement were met by cafeteria diet. Food composition data revealed that cereals are the major sources of energy, protein, carbohydrate and quite a number of micronutrients in the diet.

*Key Words:* Cafeteria Diet, Micronutrients, Residential Hall, RDA.

## **Introduction**

Like most developing countries, malnutrition remains to be a serious public health problem for Bangladesh. A considerable number of studies have been carried out in the past decades to seek out the extent and the consequence of malnutrition in the different population<sup>1,2,3</sup>. Female resident students of Dhaka University represent a unique segment of women of childbearing age. Their nutritional status is intimately linked with the next generation. They consume food, which is supplied by hall cafeteria. Usually their diet should be nutritionally sound in all respect. So it is necessary to determine the nutrient values of cafeteria diet, in order to see whether these are able to meet their requirements properly. A very few studies on the dietary intake of

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female resident students of Dhaka University were carried out and showed that they consumed less energy than their requirements. Their calcium and protein intake were found to be adequate but iron and zinc intakes were less than optimum<sup>4,5</sup>. This study was designed to assess the nutrient content in cafeteria diet of a female resident hall of Dhaka University and the assessments include: a) identification of any deficiency or excess of nutrients (calories, protein, vitamins and minerals) in the students' daily food intake which is supplied by hall cafeteria and b) identification of seasonal effect (summer and winter) on the quality and quantity of nutrients in the diet.

## **Materials and methods**

### ***Collection of food sample***

Duplicate portions of a whole day diet usually served to a student were collected for seven consecutive days during summer and winter. A whole day diet consisted of three principle meals, namely breakfast, lunch and dinner. Snacks between the meals were also included. A total of fourteen diets – seven diets in summer and seven diets in winter were collected. These diets were the representative diets usually served by the cafeteria of Rokeya Hall, a female residential Hall of Dhaka University. Individual food item of each whole day diet was collected separately in an individual polythene bag. After collection, the samples were brought to the laboratory and weighed.

### ***Dietary calculation***

From the cooked weight of individual food item of each whole day diet, equivalent raw weight was calculated using conversion table<sup>6</sup> for the Bangladeshi foods formulated at the INFS, Dhaka University. A programmed package, based on Bangladeshi and Indian food composition table<sup>7</sup> developed at the INFS was used to calculate the nutrient composition of foods. These were added together to estimate the energy, protein, fat, carbohydrate, vitamins and minerals content of the diet. All these values of each seven days diet of summer and winter were averaged to calculate the mean nutrient content of the diet consumed by a student each day.

### ***Statistical calculation***

Two tailed students' t- test was done to check the difference in nutrient and food content of the cafeteria diet due to seasonal variation.

## **Results**

Food items usually served during summer and winter menus are presented in Table 1. Mean distribution of different foods of cafeteria diet by food groups and sources of energy, protein, fat and carbohydrate of each seven days of summer and winter season consumed per person per day are presented in the Tables 2, 3 & 4. Total amount of food for summer and winter seasons was found to be almost same. Cereals were the main sources of energy, protein and carbohydrate. Visible fat was the principal source of fat.

Analysis of average nutrient content of the cafeteria diet (Table 5) reveals that energy and protein content of the diet of both seasons are the same. Total fat content was found to be higher in summer (51.74 g±11) than winter diet (43.5 g±7.3) whereas carbohydrate content was found to be higher in winter

diet. Winter diet contained higher amount of vitamin A than summer diet. But the differences were not found statistically significant. Water-soluble vitamins such as thiamin, riboflavin and vitamin C content of cafeteria diet for both seasons were found more or less same. Minerals content were also found almost same in both seasons.

**Table 1. Food items served by Rokeya Hall cafeteria**

	Summer	Winter
<b>Breakfast</b>	Parata with egg / suji / vegetables / dal, bread / cake with banana.	Parata with suji / dal / vegetables, bread with egg / banana, cake with banana.
<b>Lunch</b>	Rice, mutton with potato / fish with potato or patal / chicken liver with potato, vegetables, dal and lemon.	Rice, fish with beans or potato, vegetables and dal.
<b>Dinner</b>	Rice, khichuri, chicken with potato / mutton with potato / egg with potato, green chili and cucumber.	Rice, chicken with potato / chicken liver with potato / egg with potato.
<b>Snacks</b>	Samucha, singara, cake, biscuit, chop and banana.	Singara, samucha, cake, biscuit, nimki, chop, bread and banana.

**Table 2. Distribution of cafeteria diet of Rokeya Hall by different food groups<sup>1,2</sup>**

Food	Summer		Winter	
	Mean±SD (n = 7)	Range	Mean±SD (n = 7)	Range
Total (g)	723±71	625-838	718±69	618-808
Cereals (g)	321±51	216-389	359±57	261-428
Pulses (g)	38±16	23-63	44±23	23-81
Leafy vegetables (g)	0	0	12±14	0-33
Roots and tubers (g)	125±56	72-257	116±49	51-204
Non-leafy vegetables (g)	40±17	19-73	35±28	0-87
Fruits (g)	48±49	0-127	35±31	0-70
Milk and milk products (g)	0	0	0	0
Egg (g)	39±25	0-80	30±23	0-61
Meat and other flesh foods (g)	36±26	5-87	17±14	0-33
Fish (g)	11±11	0-30	22±5	18-34
Sugar (g)	20±18	0-54	11±11	0-32
Fats and oil (g)	45±11 <sup>a</sup>	30-60	36±7 <sup>a</sup>	35- 45

<sup>1</sup>Results were expressed as mean ± SD of 7 estimation ( from 7 day's diet).

<sup>2</sup> Means with the same superscripts ' a ' were statistically significant( p < 0.05)

Table 6 shows the nutrient content of cafeteria diet in relation to RDA of the students who consumed the diet. Mean energy and protein content of the diet fulfill the RDA of the students in both seasons. Vitamin A of the cafeteria diet meets only 23% of RDA in summer and 32% RDA in winter. Thiamin

**Table 3. Sources (%) of energy, protien, fat and carbohydrate in cafeteria diet served during summer**

Food	Energy		Protein		Fat		Carbohydrate	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Cereals	56.57	46.23-66.07	46.7	38.31-58.11	3.36	1.95-4.71	74.93	70-87.21
Pulses	6.6	3.52-10.2	17.77	10.05-28.6	1.94	0.29-6.77	6.81	3.49-10.62
Leafly vegetables	0	0	0	0	0	0	0	0
Roots and tubers	5.95	3.13-12.75	4.01	2.02-8.5	1.54	0.84-4.24	8.57	4.39-16.63
Non-leafly vegetables	0.68	0.38-0.94	1.21	0.43-2.52	0.44	0.15-1.02	0.75	0.54-1.11
Fruits	1.96	0-5.86	0.7	0-1.98	0.53	0-1.47	2.9	0-8.65
Milk/milk products	0	0	0	0	0	0	0	0
Egg	3.29	0-6.12	10.11	0-20.61	9.27	0-15.56	0	0
Meat afood	2.1	0.26-5.41	16.22	1.85-34.16	1.76	0.35-5.19	0	0
Fish	0.44	0-1.27	3.33	0-8.52	0.38	0-1.34	0.07	0-0.18
Sugar	3.28	0-9.79	0	0	0	0	5.96	0-14.08
Fats And oil	17.9	13.79-22.87	0	0	80.71	75.8-86.6	0	0

content of the diet satisfies RDA to an extent of 165% while riboflavin and vitamin C fail to satisfy the RDA of the students. Minerals such as iron, zinc, copper and calcium in cafeteria diet fail to meet the RDA in both seasons.

### Discussion

In this study an attempt has been made to estimate the nutrient content in cafeteria diet of Rokeya Hall, a female resident hall of Dhaka University and to see whether these fulfill the requirements of the students who consume the diet. A total of fourteen whole day diets (seven consecutive days of each season: Summer and winter) were evaluated. The average food content was found almost similar (723 g in summer and 718g in winter) in both seasons. Total food intake of Bangladeshi population was found to be 883<sup>3</sup> g which was higher than the present value. Bulk of the cafeteria diet consists of cereals in which principle share is contributed by rice alone and reflects the traditional food habit of population of Bangladesh. The 1981-82 Nutrition

**Table 4. Sources (%) of energy, protein, fat, carbohydrate in cafeteria-diet served during winter**

Food	Energy		Protein		Fat		Carbohydrate	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Cereals	62.48	54.09-69.71	51.17	43.29-64.73	4.45	2.52-6.27	78.74	71.44-83.99
Pulses	7.62	3.73-14.38	20.11	9.23-30.89	2.29	0.39-8.72	7.63	3.71-13.54
Leafy vegetables	0.14	0-0.41	0.28	0-0.73	0.05	0-0.17	0.15	0-0.43
Roots and tubers	4.92	2.89-6.99	3.42	2-5.79	1.51	0.66-2.71	6.61	4.21-8.88
Non-leafy vegetables	0.86	0-3.19	1.39	0-2.76	0.17	0-0.55	1.04	0-4.49
Fruits	1.9	0-4.41	0.5	0-1.26	0.63	0-1.19	2.59	0-6.32
Milk/ milk products	0	0	0	0	0	0	0	0
Egg	2.54	0-5.25	7.71	0-15.51	8.59	0-15.04	0	0
Meat and other flesh food	0.93	0-1.75	8.41	0-16.13	0.43	0-1.08	0	0
Fish	1.02	0.79-1.52	6.99	5.5-9.35	1.08	0.8-1.95	0.14	0.1-0.21
Sugar	2.09	0-5.71	0	0	0	0	3.07	0-7.65
Fats and oil	15.49	12.07-21.74	0	0	80.66	74.89-88.81	0	0

Survey of Rural Bangladesh reported cereal consumption of Bangladeshi population to be 488 g per day<sup>3</sup>. Cafeteria diet contains less cereals than the survey findings. Roots and tubers of the diet – the major part of which composed of white potato were found to be higher than the Nutrition Survey Report<sup>3</sup> and also higher than the value recommended for a balance diet<sup>8</sup>. Cafeteria diet was found completely devoid of green leafy vegetables during summer and only 12 g was found in menu during winter. Milk and milk products were found completely absent during both the seasons. Fats and oils (visible) content of cafeteria diet were found to be 45 g and 36 g respectively in summer and winter. Rural population of Bangladesh are reported to consume 3 g of fat per person per day<sup>3</sup>. A balance diet should contain a total of 60 g of fish and meat<sup>8</sup>. Cafeteria diet provides only 36 g of meat and 11 g of fish in summer and 17 g of meat and 22 g of fish in winter. In winter fishes are more available than summer. National Nutrition Survey of Bangladesh<sup>3</sup> reported that fish and meat consumption of Bangladeshi population is 25 g and 6 g per person per day respectively.

**Table 5. Nutrient content of cafeteria diet (consumed per person per day) <sup>1</sup>**

Nutrient	Summer		Winter	
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range
Energy (Kcal)	2047 $\pm$ 212	1692-2281	2065 $\pm$ 157	1728-2236
Protein (g)	51.27 $\pm$ 5.43	41.89-58.72	52.23 $\pm$ 6.14	38.74-58.81
Fat (g)	51.94 $\pm$ 11	36.32-68.83	43.59 $\pm$ 7.53	33.95-54
Carbohydrate (g)	333 $\pm$ 43.7	247.65-382.1	353.62 $\pm$ 43.1	276.93-416.58
Vitamin A <sup>2</sup> ( $\mu$ g)	173.22 $\pm$ 79.53	52.21-294.13	242.27 $\pm$ 214.36	15.44-585.7
Thiamin (mg)	1.32 $\pm$ 0.42	0.8-2.2	1.33 $\pm$ 0.27	0.94-1.64
Riboflavin (mg)	0.65 $\pm$ 0.11	0.52-0.84	0.69 $\pm$ 0.11	0.50-0.82
Vitamin C (mg)	27.54 $\pm$ 11.86	13.06-47.28	26.63 $\pm$ 8.81	12.33-42.97
Calcium (mg)	151.123 $\pm$ 5.78	110.76-202.55	171.37 $\pm$ 39.84	129.95-51.93
Iron (mg)	16.812 $\pm$ .65	13.19-21.64	18.48 $\pm$ 2.42	13.35-21.58
Zinc (mg)	6.9 $\pm$ 40.52	6.23-7.72	6.83 $\pm$ 0.62	5.38-7.36
Copper (mg)	1.42 $\pm$ 0.16	1.22-1.59	1.47 $\pm$ 0.14	1.26-1.72

<sup>1</sup> Results were expressed as mean  $\pm$  SD of 7 estimation (from 7 day's diet) ; Statistical analysis showed no significant difference between summer and winter diets.

<sup>2</sup> Carotenes were included in vitamin A estimation.

Analysis of the cafeteria diet shows that large proportion of energy comes from carbohydrate (65% in summer and 68.3% in winter ). Fat provides only 20% of total energy. About 10% of energy comes from protein. More than 70% of protein is contributed by plant sources.

Average energy value of cafeteria diet was found to be 2046 K cal. According to National Nutrition Survey of Bangladesh <sup>3</sup> the energy requirements of this age group is 1968 K cal. So, the diet fulfills the energy requirement of the students. Cafeteria diet also satisfies the protein requirement of the students by 20% higher than the RDA.

Micronutrient content of cafeteria diet was found to be far below the students' requirements except for the thiamin. Vitamin A content was found to be extremely low, which fulfills students' requirement to an extent of 23% in summer and 32% in winter. Riboflavin content of the diet meets 50% of RDA for the students. National Nutrition Survey<sup>3</sup> showed a similar trend. Vitamin C content of the diet satisfies 89% of the RDA. Calcium content of the diet was found to be extremely low in both the seasons fulfilling only 30% of RDA. Milk and milk products are the rich sources of riboflavin and calcium. Green leafy vegetables are rich sources of provitamin A, iron and riboflavin. Cafeteria diet did not provide all these food items. So, the cafeteria diet also was found to be deficient in iron. Zinc content of the diet meets about 50% of RDA and copper content meets about 80% of RDA in both the seasons. Data on zinc and copper intake of Bangladeshi population are not available in literature.

**Table 6. Nutrient content of cafeteria diet in relation to students' RDA<sup>1</sup>**

Nutrient	RDA <sup>2</sup>	Per cent of RDA			
		Summer		Winter	
		Mean±SD. (n= 7)	Range	Mean±SD (n= 7)	Range
Energy (Kcal)	1968	103.99± 10.78	85.96-115.91	104.93±7.97	87.83-13.64
Protein (g)	42.6	120.35±12.74	98.33-137.84	122.6±±14.42	90.94-38.05
Vitamin A (µg)	750	23.1±10.6	6.96-39.22	32.3±28.6	2.06-78.09
Thiamin (mg)	0.8	164.82±52.46	100-275	166.1±33.27	117.5-205
Riboflavin (mg)	1.19	54.91±9.08	44.03-70.59	57.75±9.26	42.18-68.57
Vitamin C (mg)	30	91.82±39.53	43.53-157.6	88.76±29.36	41.1-143.23
Calcium (mg)	450	33.58±7.95	24.61-45.01	38.08±8.85	28.88-55.98
Iron (mg)	21	80.07±12.18	62.81-103.05	87.99±11.54	63.57-102.76
Zinc (mg)	12	57.86±4.3	51.93-64.33	56.92±5.18	44.83-61.33
Copper (mg)	1.75	81.34±9	68.11-90.86	84.07±8.07	72.28-98.28

<sup>1</sup>Results were expressed as mean ± SD of 7 estimation (from 7 day's diet).

<sup>2</sup>Refs. 3,9,10,11.

No significant difference was found for food and nutrient content between the diets of summer and winter. However, fats and oils content (visible) of summer diet was found to be significantly higher (< 0.05) than that of winter diet. In summer, two meals included khichuri, which needs extra oil for its preparation. This explains for higher content of fats and oils in summer.

Findings of the present study shows that the cafeteria diet of Rokeya Hall is deficient in micronutrients. Energy and protein were found sufficient to meet RDA of the students. Data on dietary patterns indicates that the diets are more or less invariant and deficient in green leafy vegetables, coloured fruits and milk and milk products.

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