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Rittu Dhir
Assistant Professor, Department
of Home Science, Master Tara
Singh Memorial College for
Women, Ludhiana, Punjab,
India

Dr. Parveen Grover
Associate Professor, Department
of Home Science, G.H.G.
Harparkash College of
Education, Ludhiana, Punjab,
India

Assessment of nutritional status of secondary school students of Ludhiana district: A review

Rittu Dhir and Dr. Parveen Grover

Abstract

The nutritional status of school students, the future of the nation, contributes significantly to the development of any nation. The following study was undertaken with the objective of investigating the nutritional status of secondary school students. A total of 200 secondary school students were randomly selected from 6 different schools of Ludhiana district, Punjab. Structured and validated questionnaire was used in data collection. Data collected included general information of the students, anthropometric measurements, and dietary intake of the students and food consumption frequency of different food groups. Data on dietary intake was collected using 3 days dietary recall method and averaged out for one day. Heights and weights were measured; frequencies of consumption of different food groups were also assessed. Data on anthropometry revealed that the urban secondary school students have higher BMI values than their rural counterparts. It also reported that male secondary school students have more intakes of protein, carbohydrate, iron, calcium and have more height and weight as compared to their female counterparts. The data, hence, collected during the study revealed that secondary school students belonging to rural background had better overall nutritional status as compared to their urban counterparts and the male secondary school students had better nutritional status as compared to the female secondary school students.

Keywords: Nutritional status, anthropometric, BMI, food groups, secondary school students, food consumption frequency

1. Introduction

Good nutrition is essential if one is to travel the road to good health. Not only good nutrition is vital for the normal growth of the children but it helps to maintain the physical and mental fitness in adults throughout their life span. Nutritional status is the condition of the body as a result of the intake, absorption and use of nutrients and the influence of disease-related factors. Nutritional status is a global term that encompasses a number of specific components ^[1]. Nutritional status assessments enable one to determine whether the individual is well-nourished or under nourished by measuring four parameters; ABCD i.e. Anthropometric measurements, Biochemical analysis, Clinical examination and Dietary survey. Nutritional status is defined as the assessment of the state of the nourishment of a patient or a subject ^[2]. An ideal nutritional status occurs when the supply of nutrients conforms to the nutritional requirements or needs. Insufficient daily consumptions of foods have been found to affect health status; and poor health and nutritional status may hinder a child's ability to learn. Moreover, school children constitute one of the important segment of any nation, they account for over 20% of the Indian population.

It is well known that school age is a dynamic period of growth and development as children undergo physical, mental, emotional and social changes. Nutritional status during these periods retard the growth and hamper the brain development; which leads to poor cognitive development, impaired learning abilities and results in poor scholastic achievements. The nutritional status of school students, the future of the nation, contributes significantly to the development of any nation. Therefore, it becomes very important to study the nutritional status of secondary school students and hence the present study was carried out in Ludhiana with the following objectives:

1. To assess the nutritional status of secondary school students of Ludhiana district.
2. To study the frequency of consumption of different food groups.

Correspondence
Rittu Dhir
Assistant Professor, Department
of Home Science, Master Tara
Singh Memorial College for
Women, Ludhiana, Punjab,
India

- To investigate the intake of different nutrients in secondary school students in relation to their locale and gender.
- To study the anthropometric measurements of secondary school students in relation to their locale and gender.

2. Materials and Methods

6 schools were selected from the Ludhiana district, Punjab. A total of 200 secondary school students were randomly selected with 100 each belonging to rural and urban background. And of the total; 98 (49%) were male and 102 (51%) were female. A combination of dietary survey and anthropometric measurement was used to obtain the information required.

Tool used: A well-structured and validated questionnaire was used to collect the information on general profile, anthropometric status, dietary intake and food consumption frequency of different food groups.

Dietary Survey: For conducting the dietary survey, the food consumption frequency was recorded in terms of cereals, pulses, milk and milk products, green leafy vegetables, roots and tuber, fruits, meat and poultry, fats and oils, and sugar. The daily dietary recall for 3 consecutive days was taken and was averaged out for 1 day. The average daily nutrient intake was calculated with the help of the MSU Nutriguide Computer

Program. The daily nutrient intakes for protein, carbohydrate, fat, vitamin, iron and calcium were also calculated.

Anthropometric Survey: Nutritional status of all the secondary school students was assessed by measuring body height (cm) and weight (kg). Height of each subject was measured in a standing position to the nearest of 0.1 cm using anthropometric rod. A personal weighing machine was used to measure the body weight to the nearest of 0.1 kg. The individuals were weighed with minimum clothing and without shoes^[3].

Body Mass Index (BMI) was calculated using the formula given by Garrow^[4]:

$BMI (kg/m^2) = Weight/(Height)^2$; where weight is in kilograms and height is in meters.

3. Results and Discussion

Data obtained was analyzed with respect to the objectives of the present study which were to assess the nutritional status of secondary school students of Ludhiana district, Punjab. 200 students were surveyed out of which 49% (98) were male and 51% (102) were female. The sample was equally distributed on the variable of locale i.e. rural and urban (Figure 1).

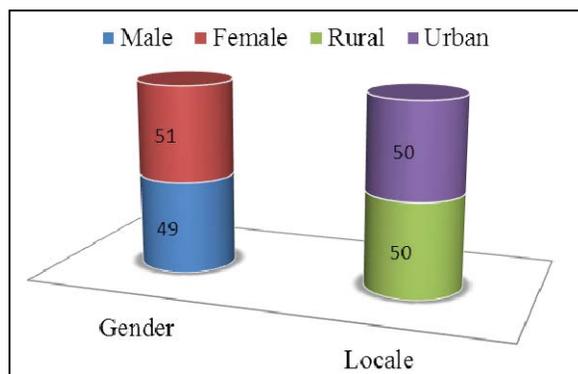


Fig 1: Percentage Distribution of Sample according to Gender (Male and Female), Locale (Rural and Urban)

3.1 Food Consumption Frequency: For the consumption of cereals, pulses, fats and oils, sugar and jaggery; 100% (200) of the subjects consumed them daily. Milk and milk products were consumed maximum by rural boys i.e. 94.12% (48) whereas minimum consumption was seen in urban girls i.e. 43.40% (23) only, as depicted in Table 1 and Table 4. Regarding the consumption of green leafy vegetables it was found that 66.66% (34) of the rural boys and 63.26% (31) of the rural girls consumed it 4-6 t/wk (Table 2) which was maximum in their locale. But in the urban locale, the maximum consumption frequency of green leafy vegetables

for the boys was found to be 2-3 t/wk i.e. 48.93% (23) whereas the maximum frequency was 1-2 t/wk in the case of girls i.e. 35.85% (19). The survey showed regarding the consumption frequency of roots and tubers; it was maximum for rural boys, i.e. 62.74% (32) with 4-6 t/wk; for rural girls it was 53.06% (26) with 2-4 t/wk; for urban boys it was 48.94% (23) with 4-6 t/wk (Table 3) and for urban girls it was 43.40% (23) with 2-4 t/wk. Urban subjects had better consumption frequency of fruits than their rural counterparts. The data clearly revealed that the girls irrespective of their locale had lower consumption of meat and poultry than their male counterparts.

Table 1: Food Consumption Frequency of Rural Boys of Secondary School Students (N = 51)

Food groups	Daily		4-6t/wk		2-4t/wk		1-2t/wk		Occasionally		Never	
	f	%	f	%	f	%	f	%	f	%	f	%
Cereals	51	100	-	-	-	-	-	-	-	-	-	-
Pulses	51	100	-	-	-	-	-	-	-	-	-	-
Milk and Milk Products	48	94.12	3	5.88	-	-	-	-	-	-	-	-
Green Leafy Vegetables	4	7.84	34	66.66	13	25.49	-	-	-	-	-	-
Roots and Tubers	-	-	32	62.74	16	31.37	3	5.88	-	-	-	-
Other Vegetables	-	-	5	9.80	39	76.47	7	13.72	-	-	-	-
Fruits	-	-	8	15.69	6	11.76	16	31.37	21	41.18	-	-
Meat and Poultry	-	-	-	-	-	-	7	13.72	11	21.57	33	64.70
Fats and Oils	51	100	-	-	-	-	-	-	-	-	-	-
Sugar and Jaggery	51	100	-	-	-	-	-	-	-	-	-	-

Note: 4-6t/wk = 4-6 times per week, 2-4t/wk = 2-4 times per week, 1-2t/wk = 1-2 times per week

Table 2: Food Consumption Frequency of Rural Girls of Secondary School Students (N = 49)

Food groups	Daily		4-6t/wk		2-4t/wk		1-2t/wk		Occasionally		Never	
	f	%	f	%	f	%	f	%	f	%	f	%
Cereals	49	100	-	-	-	-	-	-	-	-	-	-
Pulses	49	100	-	-	-	-	-	-	-	-	-	-
Milk and Milk Products	41	83.67	6	12.24	2	4.08	-	-	-	-	-	-
Green Leafy Vegetables	-	-	31	63.26	9	18.37	7	14.28	2	4.08	-	-
Roots and Tubers	1	2.04	17	34.69	26	53.06	5	10.20	-	-	-	-
Other Vegetables	-	-	9	18.37	23	46.94	17	34.69	-	-	-	-
Fruits	3	6.12	5	10.20	13	26.53	19	38.77	9	18.37	-	-
Meat and Poultry	-	-	-	-	-	-	-	-	3	6.12	46	93.88
Fats and Oils	49	100	-	-	-	-	-	-	-	-	-	-
Sugar and Jaggery	49	100	-	-	-	-	-	-	-	-	-	-

Note: 4-6t/wk = 4-6 times per week, 2-4t/wk = 2-4 times per week, 1-2t/wk = 1-2 times per week

Table 3: Food Consumption Frequency of Urban Boys of Secondary School Students (N = 47)

Food groups	Daily		4-6t/wk		2-3t/wk		1-2t/wk		Occasionally		Never	
	f	%	f	%	f	%	f	%	f	%	f	%
Cereals	47	100	-	-	-	-	-	-	-	-	-	-
Pulses	47	100	-	-	-	-	-	-	-	-	-	-
Milk and Milk Products	25	53.20	11	23.40	9	19.15	2	4.25	-	-	-	-
Green Leafy Vegetables	-	-	3	6.38	23	48.93	21	44.68	-	-	-	-
Roots and Tubers	-	-	23	48.94	20	42.55	4	8.51	-	-	-	-
Other Vegetables	-	-	20	42.55	15	31.91	12	25.53	-	-	-	-
Fruits	13	27.66	7	14.89	17	36.17	8	17.02	2	4.25	-	-
Meat and Poultry	-	-	-	-	-	-	6	12.76	19	40.43	22	46.81
Fats and Oils	47	100	-	-	-	-	-	-	-	-	-	-
Sugar and Jaggery	47	100	-	-	-	-	-	-	-	-	-	-

Note: 4-6t/wk = 4-6 times per week, 2-4t/wk = 2-4 times per week, 1-2t/wk = 1-2 times per week

Table 4: Food Consumption Frequency of Urban Girls of Secondary School Students (N = 53)

Food groups	Daily		4-6t/wk		2-4t/wk		1-2t/wk		Occasionally		Never	
	f	%	f	%	f	%	f	%	f	%	f	%
Cereals	53	100	-	-	-	-	-	-	-	-	-	-
Pulses	53	100	-	-	-	-	-	-	-	-	-	-
Milk and Milk Products	23	43.40	7	13.21	5	9.43	6	11.32	6	11.32	6	11.32
Green Leafy Vegetables	-	-	3	5.66	17	32.07	19	35.85	11	20.75	3	5.66
Roots and Tubers	-	-	11	20.75	23	43.40	18	33.96	-	-	-	-
Other Vegetables	-	-	33	62.26	12	22.64	8	15.09	-	-	-	-
Fruits	19	35.85	10	18.87	21	39.62	3	5.66	-	-	-	-
Meat and Poultry	-	-	-	-	-	-	-	-	17	32.07	34	64.15
Fats and Oils	53	100	-	-	-	-	-	-	-	-	-	-
Sugar and Jaggery	53	100	-	-	-	-	-	-	-	-	-	-

Note: 4-6t/wk = 4-6 times per week, 2-4t/wk = 2-4 times per week, 1-2t/wk = 1-2 times per week

3.2 Nutrient Intake: Intakes of 6 nutrients were calculated from the collected data and t-scores were calculated to observe the difference between mean scores of nutrients among rural and urban secondary school students. The urban secondary school students had higher mean scores for protein (39.48), carbohydrates (159.73), fat (41.54), vitamins (43.83), iron (16.16) and calcium (720.87) as compared to their rural secondary school students (Table 5). But there existed no significant difference between mean scores of calculated nutrients among rural and urban secondary school students, as revealed by the calculated t-ratios.

The mean scores of different nutrients showed higher consumption of protein (47.72), carbohydrates (196.67), fat (41.36), vitamins (43.53), iron (22.16) and calcium (831.39) by males than their female counterparts (Table 6). The t-ratios, thus calculated, revealed that a significant difference existed between mean scores of protein, carbohydrate, iron and calcium but no significant difference exists between mean scores of fats and vitamins among male and female secondary school students.

Anthropometric Measurements: All the subjects were measured for their heights and weights; and BMI were calculated. The data clearly revealed the mean scores for height (cm) were higher in the case of rural secondary school students (166.17) but the mean scores for weight (kg) were higher for urban secondary school students (54.00) as depicted in Table 5. The data also revealed that the mean scores for BMI (kg/m²) were more for urban secondary school students i.e. 19.67. The data revealed that no significant difference existed between the mean scores of height and weight but a significant difference existed between mean scores of BMI among rural and urban secondary school students.

The mean scores of height (cm) and weight (kg) calculated for male and female secondary school students showed that male subjects had higher mean scores 172.67 and 56.79 respectively compared to their female counterparts as depicted in Table 6. It was also revealed that female subjects had higher mean scores for BMI (kg/m²) i.e. 19.23 than male subjects who had mean scores of 18.95. Thus, the t-ratios were calculated to see any difference between mean scores of male and female secondary school students. It was revealed that a significant

difference exists between mean scores of height and weight among male and female secondary school students but no

significant difference existed between mean scores of BMI among male and female secondary school students.

Table 5: Significance of the Difference in Nutritional Status of Rural and Urban Secondary School Students

S. No.	Group	Variable	N	M	S.D	SEM	t-ratio
1.	Rural	Protein	100	38.57	14.21	1.42	0.44
	Urban		100	39.48	14.91	1.49	
2.	Rural	Carbohydrates	100	158.06	52.95	5.29	0.22
	Urban		100	159.73	56.15	5.61	
3.	Rural	Fat	100	33.08	24.63	2.46	1.98
	Urban		100	41.54	35.04	3.50	
4.	Rural	Vitamins	100	39.93	46.80	4.68	0.65
	Urban		100	43.83	36.89	3.69	
5.	Rural	Iron	100	15.50	16.00	1.60	0.29
	Urban		100	16.16	16.38	1.64	
6.	Rural	Calcium	100	700.40	411.88	41.19	0.38
	Urban		100	720.87	349.04	34.90	
7.	Rural	BMI (kg/m ²)	100	18.52	2.70	0.27	2.57*
	Urban		100	19.67	3.58	0.36	
8.	Rural	Height (cm)	100	166.17	9.81	0.98	0.56
	Urban		100	165.38	10.04	1.00	
9.	Rural	Weight (kg)	100	51.30	9.79	0.98	1.76
	Urban		100	54.00	11.80	1.18	

*Significant at .05 level

**Significant at .01 level

Table 6: Significance of the Difference in Nutritional Status of Male and Female Secondary School Students

S. No.	Group	Variable	N	M	S.D	SEM	t-ratio
1.	Male	Protein	98	47.72	14.21	1.44	10.23**
	Female		102	30.67	8.85	0.88	
2.	Male	Carbohydrates	98	196.67	49.33	4.98	13.12**
	Female		102	122.60	28.06	2.78	
3.	Male	Fat	98	41.36	30.84	3.11	1.85
	Female		102	33.42	29.82	2.95	
4.	Male	Vitamins	98	43.53	45.66	4.61	0.54
	Female		102	40.29	38.48	3.81	
5.	Male	Iron	98	22.16	16.85	1.70	5.88**
	Female		102	9.75	12.85	1.27	
6.	Male	Calcium	98	831.39	385.62	38.95	4.61**
	Female		102	594.62	339.64	33.63	
7.	Male	BMI (kg/m ²)	98	18.95	2.76	0.28	0.63
	Female		102	19.23	3.61	0.36	
8.	Male	Height (cm)	98	172.67	7.57	0.76	13.19**
	Female		102	159.15	6.92	0.68	
9.	Male	Weight (kg)	98	56.79	10.82	1.09	5.67**
	Female		102	48.67	9.43	0.93	

*Significant at .05 level

**Significant at .01 level

4. Conclusion

To sum up all these observations among secondary school students of Ludhiana district; it was revealed that firstly, the rural secondary school students consumed more green leafy vegetables, roots and tubers and, milk and milk products. It may be due to easier availability of these food groups in their locale. But their consumption of other vegetables, fruits, meat and poultry is less which may be due to lesser availability and higher cost associated with these food groups which they can ill afford. The study also revealed that urban subjects had higher mean scores of all nutrients i.e. protein, carbohydrates, fat, vitamins, iron and calcium which may be due to overall better availability of variety of food groups in their locale. It was also concluded that urban secondary school students had higher BMI values than their counterparts which may be due to dietary differences – rural students have less access to convenience foods and as such have less consumption of empty calorie containing foods but are more physically active. The study revealed that the male secondary school students had better consumption levels of green leafy vegetables, roots

and tubers and, milk and milk products but female students had better consumption levels of other vegetables and fruits. The data collected during the dietary survey also showed that the female secondary school students had lower intakes of all nutrients i.e. protein, carbohydrates, fat, vitamins, iron and calcium as compared to male secondary school students which may be due to male dominance pattern in our Indian society and females’ desire to look slim. The female secondary school students had higher BMI mean scores as compared to their male counterparts. This difference is clearly because of the height-weight ratios, thus, concluded by the study. Hence, it can be concluded from the study that rural secondary school students had better overall nutritional status as compared to their urban counterparts and, the male secondary school students had better nutritional status as compared to the female populace.

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