

# Nutrition and Health Status of School Girls in Bangalore City

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**Abstract-** Over the last three decades, eating habits/ pattern and physical activity levels of children have also changed. The changed social environments associated to the increased incidences of malnutrition obesity and possibly micronutrient deficiencies. The changed social environments associated to the increased incidences of malnutrition and possibly micronutrient deficiencies. In this backdrop, this research attempts has been made to study the nutritional and health status of the school girls belonging to different socio-economic groups Representative sample of one hundred and twenty school girls each belonging to low and middle income group, in the age group of Eleven to Fifteen years were selected by simple random sampling technique. Results revealed that, Low income group girls consumed fewer nutrients when compared with middle income group. Somatic statuses of the children indicating that, height of the children of 11-13 ages from both the groups were slightly higher than NCHS standards but decreased in older children showing the long term nutritional deficiency. The BMI remained almost constant despite a significant increase in terms of increment in height and weight over the age of 11-15 years. Morbidity status of respondents indicated that, Low income group girls showed the high percent of clinical symptoms than middle income group. It was observed that, low income group girls were more prone to infections and diseases than the middle income group girls. Thus, the findings of the study are indicative of the fact that the prime reason for nutrition and health status of present day school girls is quality and quantity of food.

**Index Terms-** Diet survey, Anthropometric measurements, Body mass index, Clinical symptoms

## I. INTRODUCTION

Despite recent achievement in economic progress in India, the fruit of development has failed to secure a better nutritional status of children in the country. India presents a typical scenario of South-Asia, fitting the adage of 'Asian Enigma'; where progress in childhood malnutrition seems to have sunken into an apparent under nutrition trap, lagging far behind the other Asian countries characterized by similar levels of economic development. Nutritional needs of the 11- 15 years girls are higher because of the growth spurt, sexual maturation, changes in body composition, skeletal mineralization and changes in physical activity. Reports have revealed that anthropometry parameters and indices used for assessing the nutritional status of girls indicated that a large percentage of rural

and urban poor girls have deficit in body weight. The nutrient intakes of these girls were also below the RDA.

In most of the developing countries, the intake of flesh foods, which are rich sources of readily available iron, zinc, and pre-formed vitamin A, is small because of socioeconomic, cultural, or religious constraints, instead staple diets are predominantly plant-based and therefore contain high levels of polyphenols, dietary fibre, oxalates and phytate, components known to inhibit the absorption of non-haem iron and zinc (Gibson *et al.* 2000). Green leafy vegetables are rich in carotenoids as well as iron, calcium, ascorbic acid, riboflavin, folic acid and appreciable amount of other minerals. Natural micronutrient rich foods can turn out to be a better strategy for remedying the micronutrient malnutrition as emphasized in the WHO. (WHO, 2001)

Hence, it becomes important to identify the needs and problems and to generate evidence for strategic intervention. Given the prevailing trends, nutritional and health status of older school children especially girls is expected to emerge as a problem, which needs to be assessed. The focus on children also needs to address the nutritional needs/ problems that are common to different socio economic groups. In this backdrop, this research attempts to shed light on the precisely nutritional and health status of the school girls belonging to different socio-economic groups.

## II. RESEARCH ELABORATIONS

Representative sample of one hundred and twenty school girls each belonging to low and middle income group, in the age group of Eleven to Fifteen years were selected by simple random sampling technique. The samples were drawn from two types of schools from Bangalore city, i.e. one was Corporation School from Ganganagar, where low income group girls were randomly selected. Another being a University of Agricultural Sciences Campus School, private establishment with fee structure of Rs. 500/month consisted of middle income group. Required sample was randomly selected from this school. The selection of the girls was based on the family income (family income was collected from school records) and age. Total Income less than Rs. 15000/ month are considered as low income and income between Rs. 15000- 30000 was considered as middle income. Thirty girls from each age group of both the categories were selected randomly thus comprising a total of Two hundred forty girls; one hundred twenty from each income group.

A detailed questionnaire schedule was developed to elicit information on background information, socioeconomic status, nutritional status, dietary status, clinical and health status.

### III. RESULTS

Eighty percent of the girls from middle income and 93.4 percent from low income were found to be non-vegetarian by their food habit. Three meals a day pattern was the trend among respondents (85.83 and 86.7%) of the present study.

The mean energy and other nutrient intake of the respondents is presented in table 1 and 2. From the Table it could be seen that both groups were deficit in all the nutrients except energy and fat when compared to RDA. The difference between low and middle income group was not statistically significant. The inadequate intake of food had influence on the nutrient intake of both groups.

It is regretting to note that the intake of blood forming nutrients was found to be less than RDA in case of both low and middle income group respondents. Eventually this leads to anemia, since these age group girls are more prone to anemia due to their physiological demands. Anemia in turn has profound effect on their physical activity and work performance.

The pattern of mean percentage of energy contributed from carbohydrate, protein and fat was found to be in the ratio of 88: 8: 10 in both low and middle income group. Nutrient density as proportion of energy was found to be low in girls from both the groups. the significant difference was observed for all the nutrients except for thiamine in low income and thiamine and riboflavin in middle income group when compared with RDA. But, it appeared no significant difference for all the nutrients when compared between the groups of control and experimental. Somatic status of the study group showed an increment with increasing years over the age gradient of 11-15 years in both the groups. The mean height of both groups differed significantly whereas other parameters such as weight, MUAC and triceps of 11-13 years were not significant. But triceps measures of 13- 15 years girls differed significantly between the two groups. The increment was significant for all the measurements between the two age groups i.e 11-13 and 13- 15 irrespective of income level.

The results of the classification of the girls by anthropometric measurements indices are presented in table 4. Body mass index (BMI) of the subjects revealed that equal percentage i.e 26.7 per cent of girls belonged to chronic energy deficiency with BMI less than 16. A small percentage of a low and middle income group were found moderately energy deficit. None of the subjects from both the group belonged to obese category. Twenty four and 26 per cent of low and middle income group belonged to normal BMI respectively. The difference between the grades of BMI was found to be statistically significant.

The results of the somatic status based on Broka's Index (BI) and Lean Body Mass Index (LBMI) indicated that both low income and middle income respondents did not meet the normal values. According to Broka's Index prevalence of under nutrition in the low and middle income girls was found to be 50 and 45.8 per cent. 51.7 per cent respondents belonging to middle income group were found to be normal as against 46.7 per cent of their counterparts from low income group. The statistical results

between the categories of the Broka's Index was found to be non significant.

According to classification based on Lean Body Mass Index (LBMI), higher percentage of lower income (75%) and middle income (74.2%) respondents were found to be in the category of chronic energy deficiency. The results were found to be statistically significant at one per cent level.

Age wise classification of the respondents based on anthropometric indices showed that girls belonged to under nutrition (55%) in 11-13 years and 87 per cent chronic energy deficiency in both the income groups. It is interesting to note that according to BI 3.3 percent from low income and 10 percent from middle income belonged to overweight. But according to LBMI none of the respondents from both the groups belonged to obese category.

School children were observed for clinical symptoms for nutrient deficiency and health status in past 6 months. The results revealed that spongy bleeding was observed in 13.3 per cent of middle income and 10.0 per cent in girls of low income group. Dental caries was observed more among low income group (40.0 %) than middle income group (36.6 %). The higher percentage of low income group girls had symptoms like fatigue (33.4 %), breathlessness (30.0 %) and giddiness (20.0 %) than middle income group. No one had pallor of skin in middle income group whereas, 3.4 per cent in low income group of children were found to have pallor of skin. Frequency of infections was observed more in middle income (46.7 %) as compared to low income group. Significant difference was observed for clinical symptoms between the groups studied. No one had dried scaly skin in low income group, while 20.0 per cent of children in middle income group had this problem. Some of the symptoms like angular stomatitis, cheilosis, red tongue and raw were also observed in small percentages in both the groups.

The health status of the girls was statistically significant when compared between the groups. Cold (46.6 and 40.0 %), cough (46.6 and 36.6 %), fever (56.6 and 53.4 %), constipation (16.6 and 13.3 %), diarrhoea (10.0 and 6.6 %), vomiting (16.6 and 10.0), back ache (20.0 and 10.0), headache (53.3 and 33.4), pain in legs and arms (53.3 and 20.0), and tooth pain (23.3 and 10.0). Percent of respiratory, digestive and other general ailments was high in low income when compared to middle income group. Both groups had similar percent of children having stomach ache, acidity, fatigue and eyestrain. No one had skin infection in middle income group whereas, 3.3 per cent of children had skin infection in low income group.

### IV. CONCLUSION

Thus, the findings of the study are indicative of the fact that the prime reason for nutrition and health status of present day school girls is quality and quantity of food. These conditions may be due to household food security, food availability, food choices, life style changes and lack of nutrition knowledge and Government initiative programmes. The hemoglobin status of the girls showing low intake of iron rich foods mainly green leafy vegetables. Hence, school girls can be motivated through nutrition education to adopt nutrition behaviors that improve their nutrition and promote healthy life style. Government should

take initiative to promote nutrition related activities in schools  
such as maintaining nutrition gardens in school premises.

**Table 1: Mean nutrient intake of 11-13 years' girls**

Nutrients	RDA•	Low Income				Middle Income				't' value Between the Groups
		Mean	SD	% Adequacy	't' value	Mean	SD	% Adequacy	't' value	
Protein (gm)	57	50.93	2.39	89.4	13.89**	51.47	3.44	90.3	8.8**	0.70 <sup>NS</sup>
Fat (gm)	15	17.87	2.46	119.1	6.38**	17.57	3.09	117.1	4.55**	0.42 <sup>NS</sup>
Energy (Kcal)	1970	2017	97.31	102.4	2.64*	2018	152.02	102	1.74 <sup>NS</sup>	0.04 <sup>NS</sup>
Calcium (mg)	600	564.23	36.43	94.0	5.38**	570.6	40.48	95.1	3.97**	0.64 <sup>NS</sup>
Iron (mg)	19	15.4	2.01	81.1	8.13**	14.83	2.80	78.1	9.81**	0.90 <sup>NS</sup>
Carotene (µg)	2400	2171	216.4	90.5	5.68**	2193.5	210.95	91.4	4.95**	0.38 <sup>NS</sup>
Ascorbic Acid (mg)	40	37.23	3.25	93.1	4.67**	38.4	4.62	96.0	1.87 <sup>NS</sup>	1.12 <sup>NS</sup>
Thiamine (mg)	1	0.94	0.21	94.3	1.52 <sup>NS</sup>	0.95	0.21	95.0	1.27 <sup>NS</sup>	1.23 <sup>NS</sup>
Riboflavin (mg)	1.2	1.04	0.16	87.0	5.32**	1.12	0.18	92.1	2.52*	1.60 <sup>NS</sup>

\* Significant at 5% Level

\*\* Significant at 1% Level

NS – Non Significant

**Table 2: Mean nutrient intake of 13-15 years' girls**

Nutrients	RDA	Middle Income				Low Income				't' value Between the Groups
		Mean	SD	% Adequacy	't' value	Mean	SD	% Adequacy	't' value	
Protein (gm)	65	62.2	3.01	95.7	5.09**	60.53	2.3	93.05	10.64**	2.41*
Fat (gm)	15	19.17	3.64	127.8	6.59**	19.17	3.08	127.8	7.42**	-
Energy (Kcal)	2460	2520	248.73	102.4	1.32 <sup>NS</sup>	2524	177.1	102.6	1.98 <sup>NS</sup>	0.07 <sup>NS</sup>
Calcium (mg)	600	590.1	26.52	98.4	2.04*	575	27.13	95.8	5.05**	2.18*
Iron (mg)	28	20.9	2.84	74.7	13.67**	20.53	2.66	73.3	15.29**	0.51 <sup>NS</sup>
Carotene (µg)	2400	2270.7	209.55	94.6	3.38**	2233.3	253.9	95.05	3.59**	0.62 <sup>NS</sup>
Ascorbic Acid (mg)	40	39.87	3.29	99.7	0.22 <sup>NS</sup>	37.13	3.76	92.82	4.17**	2.99**
Thiamine (mg)	1	0.97	0.22	97.0	0.74 <sup>NS</sup>	0.96	0.21	96.30	0.96 <sup>NS</sup>	0.12 <sup>NS</sup>
Riboflavin (mg)	1.2	1.1	0.19	91.7	2.86**	1.06	0.17	88.58	4.37**	0.78 <sup>NS</sup>

\* Significant at 5% Level

\*\* Significant at 1% Level

NS – Non Significant

**Table 3: Mean  $\pm$  SD Anthropometric Measurements of Girls by their Income Statu**

Anthropometric Measurements	Age (Years)	Respondents						't' Value
		Low Income			Middle Income			
		N	Mean	SD	N	Mean	SD	
Height (cm)	11 -13	60	140.01	6.45	60	145.32	6.99	<b>4.32**</b>
	13 - 15	60	152.12	4.51	60	155.2	5.25	<b>3.45**</b>
't' Value		<b>11.9**</b>			<b>8.76**</b>			
Weight (kg)	11 -13	60	35.62	6.45	60	36.72	6.16	<b>0.96<sup>NS</sup></b>
	13 - 15	60	44.43	6.65	60	46.62	5.46	<b>1.97<sup>NS</sup></b>
't' Value		<b>7.37**</b>			<b>9.32**</b>			
MUAC (cm)	11 -13	60	17.48	5.05	60	16.4	3.4	<b>1.38<sup>NS</sup></b>
	13 - 15	60	20.37	3.70	60	18.53	3.5	<b>2.79**</b>
't' Value		<b>3.57**</b>			<b>3.39**</b>			
Triceps (mm)	11 -13	60	8.93	<b>1.65</b>	60	9.61	2.60	<b>1.69<sup>NS</sup></b>
	13 - 15	60	9.65	<b>1.64</b>	60	10.5	2.41	<b>2.44*</b>
't' Value		<b>2.39*</b>			<b>2.05*</b>			

\* Significant at 5% Level

\*\* Significant at 1% Level

NS – Non Significant

**Table 4: Mean  $\pm$  SD Anthropometric Indices of Girls by their Income Status**

Anthropometric Measurements	Age (Years)	Respondents					
		Low Income			Middle Income		
		N	Mean	SD	N	Mean	SD
Body Mass Index (BMI)	11+	60	15.74	2.06	60	15.64	2.18
	12+	60	18.04	2.17	60	18.16	2.57
	13+	60	19.18	2.62	60	19.10	2.68
	14+	60	19.34	3.12	60	19.09	3.50
Broka's Index (BI)	11+	60	77.32	12.69	60	77.15	13.57
	12+	60	83.17	11.03	60	82.87	12.30
	13+	60	86.66	11.27	60	86.69	14.40
	14+	60	84.52	15.43	60	83.81	17.95
Lean Body Mass	11+	60	645.18	78.74	60	651.08	86.34
	12+	60	557.09	61.04	60	560.73	73.70
	13+	60	525.15	76.36	60	533.91	78.07

<b>Index (LBMI)</b>	14+	60	519.80	71.05	60	542.12	108.51
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**Table 5: Classification of Respondents by Anthropometric Indices**

Anthropometric Indices	Respondents						$\chi^2$ Value
	Low Income		Middle Income		Combined		
	N	%	N	%	N	%	
<b>Body Mass Index (BMI)</b>							
Severe CED [Grade III(<16.0) ]	32	26.7	32	26.7	64	26.7	1.0 <sup>NS</sup>
Moderate CED(16.0 – 17.0)	17	14.1	13	10.8	30	12.5	
Mild CED(17 – 18.5)	23	19.2	23	19.2	46	19.2	
Low Weight (18.5 – 20.0)	19	15.8	21	17.5	40	16.6	
Normal (20.0 – 25.0)	29	24.2	31	25.8	60	25.0	
Obese Grade I (25.0 – 30.0)	0	0.0	0	0.0	0	0.0	
<b>Broka's Index (BI)</b>							
Under Nutrition (< 80)	60	50.0	55	45.8	115	47.9	0.98 <sup>NS</sup>
Normal ( 80 - 120)	56	46.7	62	51.7	118	49.2	
Over Weight (> 120)	4	3.3	3	2.5	7	2.9	
<b>Lean Body Mass Index (LBMI)</b>							
CED (> 500)	90	75.0	89	74.2	179	74.6	10.65 <sup>**</sup>
Normal (300-500)	30	25.0	31	25.8	61	25.4	
Obese (< 500)	0	0.0	0	0.0	0	0.0	

NS – Non Significant

\*\* Significant at 1% Level

**Table 6: Classifications of Respondents by Age Group of Respondents**

Anthropometric Indices	Respondents							
	Low Income				Middle Income			
	Age Group (years)				Age Group (years)			
	11 – 13 (60)		13 – 15 (60)		11 – 13 (60)		13 – 15 (60)	
	N	%	N	%	N	%	N	%
<b>Body Mass Index (BMI)</b>								
Severe CED [Grade III(<16.0) ]	25	41.7	7	11.7	25	41.7	7	11.7
Moderate CED(16.0 – 17.0)	7	11.7	10	16.7	8	13.3	5	8.2
Mild CED(17 – 18.5)	14	23.2	9	15.0	11	18.3	12	20.0
Low Weight (18.5 – 20.0)	7	11.7	11	18.2	8	13.3	13	21.7
Normal (20.0 – 25.0)	7	11.7	22	36.7	8	13.3	22	36.7
Obese Grade I (25.0 – 30.0)	0	0.0	1	1.7	0	0.0	1	1.7
<b>Broka's Index (BI)</b>								
Under Nutrition (< 80)	34	56.7	26	43.4	33	55.0	22	36.7
Normal ( 80 - 120)	24	40.0	32	53.3	25	41.7	37	61.6
Over Weight (> 120)	2	3.3	2	3.3	11	18.3	1	1.7
<b>Lean Body Mass Index (LBMI)</b>								
CED (> 500)	53	88.3	37	61.7	52	86.7	37	61.7
Normal (300-500)	7	11.7	23	38.3	8	13.3	23	38.3
Obese (< 500)	0	0.0	0	0.0	0	0.0	0	0.0

**Table 7: Morbidity Status of the Respondents**

Common ailments	Respondents*				$\chi^2$ Value
	Low Income		Middle Income		
	N	%	N	%	
Cold	96	40.0	112	46.6	222.13*
Cough	88	36.6	112	46.6	
Fever	128	53.3	136	56.6	
Diarrhoea	24	10.0	16	6.6	
Vomiting	24	10.0	40	16.6	
Stomach ache	96	40.0	56	40.0	
Acidity	8	3.3	8	3.3	
Constipation	40	16.6	32	13.3	
Back ache	24	10.0	48	20.0	
Head ache	80	33.3	128	53.3	
Pain in legs and arms	48	20.0	128	53.3	
Fatigue	56	23.3	56	23.3	
Throat pain	5	16.6	5	16.6	
Tooth pain	3	10.0	7	23.3	
Eye strain	2	6.6	2	6.6	
Skin infection	1	3.3	0	0.0	

\*Significant at 1 percent level

\* Multiple Responses

**Table 8: Clinical symptoms of the Subjects**

Clinical examination	Observed *				$\chi^2$ value
	Low Income		Middle Income		
	N	%	N	%	
Spongy bleeding	24	10.0	16	13.3	79.51*
Dental caries	96	40.0	44	36.6	
Fatigue	80	33.3	24	20	
Pallor of skin	8	3.3	0	0.0	
Breathlessness	72	30	15	12.5	
Giddiness	48	20.0	12	10.0	
Frequent infections	112	46.6	40	33.33	
Dry and scaly skin	0	0.0	12	10.0	
Angular Stomatitis	11	4.58	9	3.75	
Tongue Red and Raw	8	3.33	12	5.0	
Cheilosis	2	0.83	1	0.42	

\*Significant at 1 percent level

\* Multiple Responses



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