

**AN EXPLORATORY STUDY ON THE NUTRITIONAL STATUS AND  
DETERMINANTS OF MALNUTRITION OF URBAN AND RURAL ADOLESCENT  
CHILDREN ( 12-16) YEARS OF VADODARA CITY**

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**ABSTRACT:** Approximately 21.4 % of Indian population comprises of adolescents. In India, large number of adolescents suffers from chronic malnutrition which adversely affects their health. The study assessed the nutritional status of urban and rural adolescents of Vadodara district and found the determinants of malnutrition. Anthropometric measurements, dietary history, activity pattern were collected on a sample of 376 children. Location specific factors that influence adolescence nutritional status and lifestyle were studied. There were 120 urban and 256 rural students. The overall prevalence of obesity ranged from 0.4-0.8 % in rural setup and 0.8-3.3 % in urban setup. Thus dual burden of malnutrition was seen in both the settings. With regard to dietary assessment, it was seen that nutrient intake of the adolescent children was grossly inadequate in relation to energy, protein, iron and fiber, which was more pronounced in the rural children than urban. The determinants for undernutrition were mother's education, Per Capita Income (PCI) and energy intake of the children. Dual burden of malnutrition scenario calls for health promotion approaches to tackle the problem in adolescent children.

**Key Words:** Adolescence, malnutrition, urban, rural

**INTRODUCTION**

Adolescence is the age group between 10-19 years as defined by World Health Organization (WHO) <sup>[1]</sup>. They account for more than 1/5<sup>th</sup> of the world's population. In India, this age group forms 21.4 % of the total population (National Youth Policy, 2002). Past fertility decline in India has reduced the proportion of young people (NFHS III), however more than 200 million are projected to be in this age group, thus this group still merits separate attention.

This phase of life is marked by special attributes. These include rapid physical growth and development, physical, social and psychological maturity along with sexual maturity. Adolescents are overlooked in most health programs as they are basically considered healthy population but the scenario varies. Nutrition is usually taken as a significant indicator of the health and overall status of adolescents. Adequate nutrition is practically critical for adolescents as it is a primary determinant of the spurt of growth that characterizes adolescence <sup>[2]</sup>.

Nutrition research in India has focused primarily on the problem of under nutrition, particularly among vulnerable women and children. There is some evidence of an emerging nutrition transition in India. The rising urbanization and improvements in economic development has lead to concurrent under and over nutrition in the population. The nutrition transition is closely related to the demographic and epidemiological transition. Large shifts have occurred in diet and in physical activity patterns, particularly in the last decades.

Globally diets are increasing in calories. At the same time high fiber foods are being replaced by processed varieties. In higher income group, increased portion sizes, and eating away from home and snacking are shifts in eating pattern that accompany these changes. Water and milk is replaced by calorically sweetened beverages [3].

Research on physical activity pattern has focused mainly on the role of leisure activities, particularly television viewing. Relations have been established with type of occupation, level of activity at each occupation and mode of transportation [4]. The research suggests that the major shifts in this area are linked with the use of more modern technologies in the workplace, in the shopping arena and at home. The picture of overall shifts in activity, their causes and their consequences are still incomplete for adolescents.

There is dearth of data on nutritional status of urban rural adolescent children. More heterogeneity in lifestyle and diet exists in both the settings. Looking into adolescents living and eating patterns in the context of urban and rural differences may give an idea of the changes taking place in a society. Research should focus on documenting location specific factors that influence adolescents' nutrition status and lifestyle in order to be in a better position for timely school based health promotion action plans. Therefore the present study has been undertaken to look at the nutritional differences that exist between rural and urban adolescent children. An attempt was also made to identify the determinants accountable for under nutrition in both rural and urban setting.

## METHODOLOGY

One school each from urban and rural school of Vadodara, Gujarat state was selected. All the adolescent children studying in 8<sup>th</sup> and 9<sup>th</sup> standard were enrolled for the study. The sample size was 376 children in which 120 were from urban setup while 256 were from rural setup.

**Background information** which included age, sex, and family composition was collected. Other details like education of parents, socio economic status and mode of transportation to school were collected. **Anthropometric measurements** like weight, height, waist and hip were measured and recorded using standard methods and quality control measures.

**Dietary intake** was taken using 24 hour dietary recall method. The nutritive values were calculated using Nutritive value of Indian foods [5]. Information on general activity pattern was obtained using a structured questionnaire and activity profile of the children was taken using self administered pre tested questionnaire.

**Statistical Analysis** was done using Microsoft excel and epi info package. Frequency distribution, percentages, means and standard deviation were calculated for the parameters expressed numerically. Independent student's t test was used to compare differences between the means in different group. All the tests were considered significant at  $p < 0.05$  level.

## RESULTS

### Background Information

The study comprised of total 376 adolescents of which 120 (32%) were from urban set up and 256 (68%) were from rural set up. In urban school set up, out of 120 students 69 (58 %) were boys and 51 (42 %) were girls. In the rural set up there were 164 (64%) boys and 92(36%) girls.

There was difference in the educational level and occupation of parents in the urban and rural set up. Higher percentage of parents (56.7% fathers and 45 % mothers) of the urban children had graduate and higher degree than those parents of rural children (9.3% fathers and 2 % mothers). Fathers of urban children were predominantly in service (47.9%) while that rural children's father were engaged in farming (33.2%).

### Anthropometric Details

Anthropometric indicators were significantly higher for both boys and girls in urban set up as compared to rural set up (**Table 1**). Prevalence of overweight and obesity in rural setup was 2.84 %. A five times higher prevalence of overweight and obesity was seen in urban adolescent children than rural. Using CDC standards 11.59 % boys and 7.84 % girls were found to be overweight, where as 2.89 % and 3.92% of boys and girls were found to be obese. Using the same standards 1.21% boys in rural setting were found to be obese. As per Must et al <sup>[5]</sup> about 13.04 % boys in urban school were found to be obese. The prevalence of obesity was 1.44 % and 1.96 % amongst the boys and girls respectively in urban setup.

The prevalence of underweight was determined by using the 5<sup>th</sup> percentile values of BMI of Must et al, Agrawal standards <sup>[6]</sup> and CDC standards. Prevalence of under nutrition was found in both urban and rural setup (**Table 2**). The prevalence of underweight and stunting was high in both rural and urban adolescent children, with magnitude and severity being higher in rural children than urban.

**Table 1: Anthropometric profile of the adolescent boys and girls (Mean  $\pm$  SD)**

Variables	Boys		Girls	
	Urban n= 69	Rural n= 164	Urban n= 51	Rural n= 92
Weight (Kg)	43.77 $\pm$ 10.45	33.33 $\pm$ 7.30	43.43 $\pm$ 8.78	35.88 $\pm$ 7.95
Height (m)	1.56 $\pm$ 0.09	1.46 $\pm$ 0.09	1.52 $\pm$ 0.06	1.47 $\pm$ 0.07
BMI	17.85 $\pm$ 3.17	15.33 $\pm$ 2.18	18.46 $\pm$ 2.98	16.38 $\pm$ 3.05
MUAC (cm)	21.93 $\pm$ 3.13	18.79 $\pm$ 4.29	22.07 $\pm$ 2.82	19.42 $\pm$ 2.63
WC (cm)	66.69 $\pm$ 8.11	59.23 $\pm$ 6.27	66.89 $\pm$ 7.17	60.61 $\pm$ 5.59
WHR	0.80 $\pm$ 0.03	0.79 $\pm$ 0.05	0.77 $\pm$ 0.04	0.78 $\pm$ 0.05

**Table 2 Prevalence of undernutrition among the rural and urban adolescents by different standards**

Standards	Urban		Rural	
	Boys	Girls	Boys	Girls
MUST et al				
%	30.43	11.76	70.73	46.73
CDC				
%	30.4	5.88	66.4	40.2
Agrawal				
%	8.6	3.9	32.9	32.6

## Dietary Intake

The mean nutrient intake of adolescent urban and rural children is given in **Table 3**. The mean nutrient intake was significantly higher in urban setup as compared to rural. The mean intake for all the nutrients was lower for underweight children than normal or obese children in urban setup. However such trend was not seen in rural area. Only 11-17% of the urban adolescent children consumed < 50 % of calories as against 52-57% in rural adolescent children. Thus a gross deficit in energy was seen in rural adolescent children.

**Table 3 Nutrient consumption of the adolescent children as % RDA (Mean  $\pm$  SD)**

% RDA FROM	Normal		Underweight		Total	
	Urban	Rural	Urban	Rural	Urban	Rural
Energy (Kcal)	78 $\pm$ 23	52 $\pm$ 23	70 $\pm$ 24	47 $\pm$ 18	76 $\pm$ 24	49 $\pm$ 20
Protein (gm)	71 $\pm$ 33	46 $\pm$ 25	64 $\pm$ 32	43 $\pm$ 21	69 $\pm$ 32	44 $\pm$ 22
Fat (gm)	317 $\pm$ 150	205 $\pm$ 110	269 $\pm$ 150	185 $\pm$ 94	312 $\pm$ 142	192 $\pm$ 99
Iron (mg)	60 $\pm$ 46	39 $\pm$ 21	46 $\pm$ 19	33 $\pm$ 15	55 $\pm$ 39	35 $\pm$ 18
Vitamin C (mg)	109 $\pm$ 73	58 $\pm$ 74	94 $\pm$ 77	56 $\pm$ 75	105 $\pm$ 79	56 $\pm$ 74

Skipping the breakfast was more common in urban setup as compared to rural (42.14% vs. 18.4%). Nearly 82.6 % of urban children carried packed lunch to school as against only 10.5 % among rural children. During recess it was observed that 30 % of the rural children purchased food from the street vendors. All urban children had lunch after going home to the contrast only 47.3 % of the children had lunch in rural setup.

## Physical activity

As far as physical activity was concerned, it was more in rural setup. In rural set up 73 % of children came to school walking while 2.4 % children came walking in urban setup. TV viewing was slightly higher in urban than in rural area (89% vs. 81%). An imbalance of energy expenditure and intake was seen in rural setup (**Table 4**).

## Determinants or malnutrition

An attempt was made to look into some of the variables on the prevalence of under nutrition and over nutrition. The variable studied were per capita income (PCI), literacy levels of parents, energy and protein intake. All the variables had significant influence on the prevalence of under nutrition but not on over nutrition. Further when the data was looked between rural and urban setting, it was found to have an influence only in rural and not on urban setting. The factors which had an influence were mother's education, PCI and energy intake (**Table 5**).

**Table 4 Routine activities performed by the adolescent children**

Variable	Urban		Rural	
	N	%	N	%
<b>Mode of Transport</b>				
Walking	3	2.47	187	73.0
Cycle	63	52.06	14	5.5
Scooter	7	5.78	1	0.4
Bus	11	9.91	52	20.3
Rickshaw	36	29.75	2	0.8
<b>T.V. Viewing</b>				
Yes	98	80.99	228	89.1
No	22	19	28	10.9
<b>Computer Usage</b>				
1 hr	77	63.6	103	40.2
>1-3 hr	5	4.1	9	3.5
>3-6 hr	-	-	1	0.4
Non Users	38	32.2	143	55.9
<b>Evening Play</b>				
Yes	44	36.4	157	61.3
No	76	63.6	99	38.7
<b>Household work</b>				
Yes	-	-	94	36.7
No	120	100	162	63.3
<b>Tuitions</b>				
Yes	115	95	31	12.1
No	5	5	225	87.9
<b>Visit to Temple<sup>75</sup></b>				
Yes	8	6.6	75	29.3
No	113	93.4	189	73.8

**Table 5 Determinants of undernutrition in Urban and rural adolescent children (Chi Square Values)**

Variable	Criteria	UN Vs N	ON Vs N
PCI	(>Rs. 1000 & < Rs.1000)	-	20.19***
Mother's Education	(< primary & > primary)	2.96	26.03***
Father's Education	(< primary & > primary)	4.29	5.30
Protein	(<75 % RDA & >75 % RDA)	1.92	2.59
Energy	(<75 % RDA & >75 % RDA)	4.24	27.31***

\*\*\* Significantly different at p&lt;0.001

## DISCUSSION

Adolescence is a period of rapid changes. The transition may extend over variable periods of time, depending upon socio economic factors. Even in given culture, adolescents are not a homogeneous group, with wide variations in development, maturity and lifestyle.

Simple measurements of height and weight serve as reliable measure to evaluate the growth of the child and also to detect gross abnormalities even when no other clinical sign of illness is manifested <sup>[7]</sup>. The overall prevalence of overweight ranged from 9.1% to 13.3% in urban children and that of obesity 0.8% to 3.3%. In rural area for overweight it was 1.9% to 2.3% and for obesity 0.4 % to 0.8%. A study conducted by kapil et al <sup>[8]</sup> in 2002 showed the prevalence of obesity as 7.4 % and that was higher in males as compared to females. Under nutrition ranged from 6.6% to 22.5% in urban children while it was 32.8% in rural setup.

Physical activity profile of urban and rural children were different. Urban students were busy with tuitions rather than playing. Some good practices in rural children was going to temple and also going to school by bicycle or walking. Most of the rural children also had access to T.V and computer. Therefore, this medium can be used to promote nutritional health messages.

The study has attempted to look at some of the important determinants that characterize the nutrition transition. India is a country of stark inequalities in income and health risks. The determinants identified for under nutrition (PCI, mother's education and energy intake) stresses the role of socioeconomic and dietary factors on nutritional status. Therefore there is a need for health promotion activities in school children by providing an enabling environment and improving nutritional status of the adolescents will go a long way in maintaining the health of the country. Routine height and weight of children should be maintained in school. The nonograms should be developed which would help to quickly identify malnutrition.

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