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Nutritional Status of School Going Adolescents in Rural and Urban Areas of Visakhapatnam

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Abstract
Introduction: One of the greatest health problems globally as well as in India is under-nutrition among children. Early adolescence is a nutritionally vulnerable time when rapid physical growth increases nutrient demands. Inspite of several heath programs, conditions such as infections and malnutrition continue to be major threat leading to morbidities. This research intends to study and compare the nutritional status of school going adolescents aged between 11 yrs to 15 yrs in rural and urban areas of Visakhapatnam. **Methods:** A cross sectional study was conducted among 800 early adolescents aged between 11 yrs to 15 yrs in government schools of rural and urban areas of Visakhapatnam. BMI-for-age was measured for assessment of nutritional status and BMI z scores were calculated based on WHO growth reference data for 5-19 yrs. **Results:** Among boys, 43.1% from rural and 35.11% from urban areas were thin ie having BMI for age < - 2SD. About 7.52% of boys in urban areas are in overweight or obese. Among girls (BMI for age <-2SD is almost similar in rural and urban areas. Anaemia is found to be more among adolescents residing in urban areas compared to rural. **Conclusion:** Malnutrition in both forms is more prevalent in boys both from rural and urban areas. Stringent implementation of Govt. schemes is needed to improve the nutritional status.
Keywords: Adolescents, BMI, Malnutrition, Rural Urban schools.

Introduction

World Health Organization defines adolescence as 10-19 years[1]. It is a period of rapid growth and development, with dramatic biological, psychological changes often shaped by socio-cultural factors. It is usually divided into two phases: early adolescence (10–14 years) and late adolescence (15–19 years) [2]. The second stage of late adolescence may be further divided in to middle(15-17yrs) and late (18-19 yrs) phases[3].

The early phase is the developmental period where adolescents experience the beginning stages of puberty and significant physical growth. It is a nutritionally vulnerable time when rapid physical growth increases nutrient demands. Dietary behaviours established during this time may contribute to nutrition-related problems that have consequences for long-term health[4]. Therefore, protecting and promoting the health of children in this phase is very crucial.

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One of the greatest health problems globally as well as in India is under-nutrition among children. Undernutrition weakens the immune system and causes significant growth and cognitive delay. Not only at individual level , the developmental, economic, social and medical impacts are serious and lasting for the family, communities and the countries[5].

Combating malnutrition in all its forms is one of the greatest global health challenges. The United Nations General Assembly adopted a resolution proclaiming a United Nations Decade of Action on Nutrition from 2016 to 2025 which aims to trigger intensified action to end hunger and eradicate all forms of malnutrition worldwide, and ensure universal access to healthier and more sustainable diets – for all people, and through this, to contribute to achieving the SDG2 of ending all forms of malnutrition[5].

India is home to 253 million adolescents accounting for one fourth of the population. Data from National Family health survey shows 24% of adolescents were thin for their age (BMI-for-age <-2 SD), 5% of adolescents were overweight or obese (BMI-for-age >+1 SD)[6]. The BMI in children is called: BMI-for-age. Body mass index is a measure of weight adjusted for height. The BMI is well correlated with the more direct fatness measures. Weight and height are simple, inexpensive, non-invasive measurements that are recorded routinely in clinical and research settings[7].

India is caught in a nutrition paradox where stunting and underweight coexist with overweight and obesity in children[8]. Double burden of under nutrition and obesity makes it more challenging to address the

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problem of malnutrition. A study by Srivastava A et al showed a growth lag in the basic parameters of height and weight[9]. In contrast a systematic review by Ranjani et al showed that overweight and obesity rates in children and adolescents are increasing not just among the higher socio-economic groups but also in the lower income groups where underweight still remains a major concern[10].

In India, school health program provides one of the most efficient means for improving wellbeing of the children[5]. Under NHM, the RastriyaBalSwasthyaKaryakram, was launched in 2013 with objectives to screen school children for identified diseases including malnutrition and provide early intervention and thus improve quality of life. Mid-day meal program is designed to improve the nutritional status of school-age children nationwide. The program supplies free lunches on working days for children in primary and upper primary classes in government, government aided schools[8]. The National Nutrition Mission, or POSHAN Abhiyaan, launched in 2018 by the Prime Minister, also directs the country's attention towards malnutrition.

Inspite of several heath programs in existence, conditions such as infections and malnutrition continue to be major threat leading to morbidities among these adolescents. Research indicates that malnutrition and poor health are among the most common causes of low school enrolment, high absenteeism, early dropout and poor classroom performance. This study was conducted with an objective to assess and compare the nutritional status of early school going adolescent children in urban and rural areas of Visakhapatnam.

Objective

To study and compare the nutritional status of school going adolescents aged between 11 yrs to 15 yrs in rural and urban areas of Visakhapatnam.

Methodology

A cross sectional study was conducted in October 2019 among early adolescents aged between 11 yrs to 15 yrs studying in 6th to 10th class in government schools. The study setting was Government schools in rural and urban areas of Visakhapatnam.

The sample size was calculated taking the prevalence of anaemia which the most common nutritional deficiency disorder found among adolescents. Assuming that atleast 50 % of the adolescents were anaemic, the sample size was calculated as [50% prevalence was considered] as 400 using the formula

$$N= \frac{Z^2 (1\text{-}a/2)\, p\, q}{d^2}$$

where p= 0.5, q =0.5, & d (L) = 10 % of p.

To compare the nutritional status of adolescents in rural and urban areas, a sample of 400 school going adolescents were included from rural areas and 400 from urban areas. After obtaining the list of government schools in rural and urban areas from District Education Officer and the Commissioner of Greater Visakhapatnam Municipal Corporation, six schools were selected randomly, three from the urban and rural areas, each, of Visakhapatnam . Inclusion criteria – Adolescents in the age group of 11-15 years studying in classes 6th to 10th, present on the day of study and consented to participate. Exclusion criteria - absent on the day of the study or seriously ill were excluded.

Study tools include pretested semi structured interview schedule, weighing scales and stadiometer. Study variables - age, sex, religion, type of family, anthropometric measurements (height, weight, BMI) were taken to assess the nutritional status of school children. BMI z scores were calculated based on WHO growth reference data for 5-19 yrs.

BMI-for-age (interpretation of cut offs):(11)

1. Thinness: <-2SD, 2) Overweight: >+1SD, 3) Obesity: >+2SD
Assessment of Anaemia was done based on clinical assessment of palmar pallor as per IMNCI guidelines.

Statistical Analysis

Data entry was done using MS EXCEL-2010. Analysis was done using SPSS version 21. Test of significance in the form of Chi-square test was applied for finding the statistical difference between categorical variables. P value <0.05 was considered as statistically significant.

IEC Approval and other Permissions

Approval from the Institutional Ethics Committee was taken for the study. Permissions from District Education Officer and Head / Principal of the school was taken to conduct the study. The study was conducted in presence of teacher. Consent of the parent was obtained in addition to the accent from the child. Study information sheet along with consent and accent form was notified to the parent through the school diary.

Results

This study was conducted among early adolescents aged between 11 yrs to 15 yrs studying in 6th to 10th class in government schools.
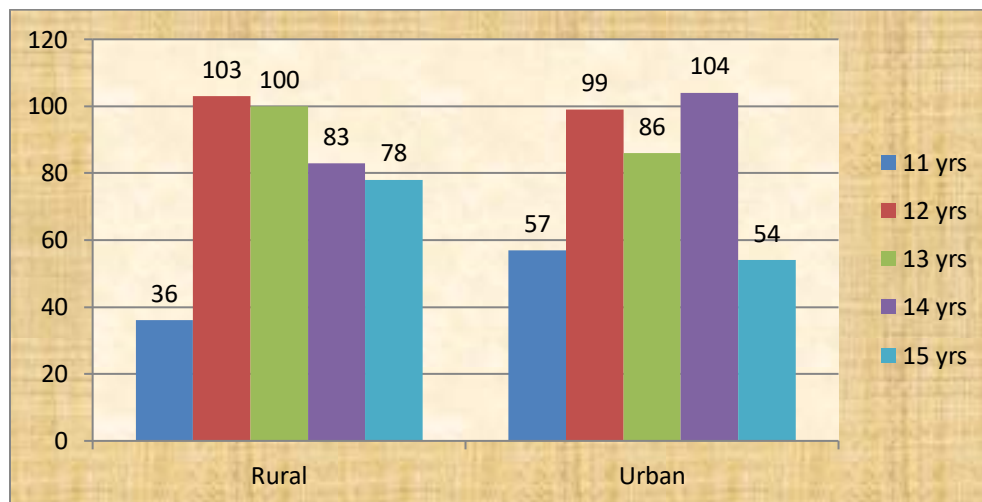

Fig. 1: shows the distribution of study population as per age. The mean age was found to be 12.9 yrs ±1.4 SD

Table 1 shows the gender distribution of study population and type of family they belong to. Over all equal number of males and females are enrolled but more number of females in rural areas are enrolled as compared to urban and more males are enrolled in urban as compared to rural areas.

Table 1: Gender and type of family of study subjects (n=800)

Gender	Rural	Urban	
Female	233(29.12)	175(21.87)	408(50.99)
Male	167(20.87)	225(28.12)	392(48.99)
Type of family			
Nuclear	394(49.25)	383(47.87)	777(97.12)
Joint	6(0.75)	17(2.12)	23(2.87)

Regarding the type of family, nearly half of the adolescents were from nuclear families both in rural and urban areas. (49.25 % & 47.87 % respectively).

Nutritional Status of school going adolescents as per BMI for age - Z scores

Table 2: Nutritional status of Boys in Rural Areas as per BMI for age - Z scores

	Rural				
Age (yrs)	Thin (<2SD) (%)	Normal (%)	Overweight (>+1SD) (%)	Obese (>+2SD) (%)	Total
11	10(52.6)	8(42.1)	1(5.2)	0	19
12	23(48.9)	23(48.9)	1(2.1)	0	47
13	19(46.3)	21(51.2)	1(2.4)	0	41
14	13(40.6)	19(59.3)	0	0	32
15	7(25)	21(75)	0	0	28
Total	72(43.1)	92(55.0)	3(1.79)	0	167

Table 3: Nutritional status of Boys in Urban Areas as per BMI for age - Z scores

	Urban				
Age (yrs)	Thin (<2SD)(%)	Normal (%)	Overweight (>+1SD)(%)	Obese (> +2SD)(%)	Total
11	10(41.6)	13(54.16)	0	1(4.1)	24
12	22(41.5)	30(56.6)	1(1.8)	0	53
13	19(35.8)	29(54.7)	4(7.5)	1(1.8)	53
14	22(34.9)	34(53.96)	7(11.1)	0	63
15	6(18.7)	23(71.8)	2(6.25)	1(3.12)	32
Total	79(35.11)	129(57.33)	14(6.22)	3(1.3)	225

The table 2 and 3 show that 55 % of the boys in rural and 57.33 % of boys in urban areas are normally nourished. It is observed that, 43.1% of boys from rural areas and 35.11% of boys from urban areas are thin ie having BMI for age < - 2SD. Also it is seen that 1.79% of boys in rural and 7.52% of boys in urban areas are in overweight or obese category.

Table 4: Nutritional status of Girls in Rural Areas as per BMI for age - Z scores

	Rural				
Age (yrs)	Thin (<2SD)(%)	Normal (%)	Overweight (>+1SD)(%)	Obese (>+2SD)(%)	Total
11	8(47.05)	9(52.9)	0	0	17
12	15(26.7)	40(71.4)	1(1.75)	0	56
13	8(13.5)	47(79.66)	3(5.08)	1(1.69)	59
14	13(25.4)	37(72.5)	1(1.96)	0	51
15	4(8)	40(80)	6(12)	0	50
Total	48(20.6)	173(74.24)	11(4.72)	1(0.42)	233

Table 5: Nutritional status of Girls in Urban Areas as per BMI for age - Z scores

	Urban				
Age (yrs)	Thin (<2SD)(%)	Normal (%)	Overweight (>+1SD)(%)	Obese (>+2SD)(%)	Total
11	6(18.18)	23(69.69)	4(12.12)	0	33
12	13(28.2)	27(58.69)	6(13.04)	0	46
13	9(27.27)	22(66.6)	2(6.06)	0	33
14	8(19.51)	31(75.6)	2(4.8)	0	41
15	5(22.7)	16(72.7)	1(4.54)	0	22
Total	41(23.4)	119(68)	15(8.57)	0	175

Table 4 & 5 show that 74.24 % of the girls in rural and 68% of girls in urban areas are normally nourished. The prevalence of underweight/thinness (BMI for age <-2SD) among girls is almost similar in rural and urban areas with 20.6 % in rural and 23.4% in urban being thin. The present study also shows that 5.14 % of girls from rural areas and 8.57% of girls from urban areas are either overweight or obese i.e. having BMI for age >+1 SD and >+2SD.

Table:6 Comparison ofNutritional status of Girls and boys in Rural and Urban Areas

	Rural			Urban			Total
	normal	Thin	Overweight/ obese	normal	Thin	Overweight/ obese	
Girls	173(74.2)	48(20.6%)	12(5.14%)	119(68)	41(23.4%)	15(8.57%)	408
Boys	92(55)	72(43.1%)	3(1.79%)	129(57.33)	79(35.11%	17(7.52%)	392

As per the above table, boys from both rural and urban areas are found to be more thin than girls. And the difference is significant.

Table: 7 Distribution of Anaemia among rural and urban adolescents

Anaemia	Rural	Urban	Total	X^2 P value
Present	146(36.5)	231(57.75)	377(47.12)	0.0001
Absent	254(63.5)	169(42.25)	423(52.87)	
	400	400	800	

Anaemia is found to be significantly higher among adolescents residing in urban areas compared to rural.

Nutritional Status as depicted by Body Mass Index

The nutritional status is crucial for the adolescents to grow to his/her full potential. Under nutrition among early adolescent girls leads to high mortality and morbidity among mothers during pregnancy. The prevalence of under nutrition among adolescents is an indicator of community health status. Nutritional assessment of adolescent helps in planning to reduce morbidity due to malnutrition[10]. In the present study the Z- score for BMI for age was used to find out the nutritional status of the early adolescent school going children.

Unlike for adults, the BMI values in children vary with the age and sex of the child. BMI provides a good indicator for levels of body fat, and it is known that having a BMI that is either too low or too high is associated with an increased risk of ill health during childhood as well as later in life.As per WHO, the double burden of malnutrition is characterized by the coexistence of under -nutrition along with overweight, obesity or diet-related NCDs, within individuals, households and populations, and across the life-course[5].

Underweight/thinness among adolescents (10-19 y) is defined as a BMI-for age below -2 Z-scores of a reference. In the present study it is found that the overall prevalence of underweight/ thinness (BMI for age <-2SD) is more among rural adolescent boys(43%) compared to those from urban areas(35.1%).The prevalence of underweight / thinness (BMI for age <-2SD) among girls is almost similar in rural and urban areas .

 In adolescents, underweight is generally used as an indicator of current nutritional status, reflecting decreased fat and muscle mass. Because underweight can reflect both low weight and low height, BMI is useful to assess the extent of weight deficit in relation to height. Similar findings are reported by other researchers [12,13,14] in studies done at various places in the country. Some researchers have reported higher prevalence of undernutrition/thinness[15,16]and some have reported lower prevalence[17,18,19,20,21].

The present study also shows that 7 % of boys from urban areas are either overweight or obese ie having BMI for age >+1 SD and >+2SD. Similarly 8% girls from urban areas are found to be either overweight or obese. Overweight and obesity in adolescent girls is associated with obesity in adult women, which increases the risk of diabetes, hypertension and infant overweight and obesity[4].Inadequate diet and nutrition may produce stunted growth of the body that is failure of full manifestation of genetic endowment of an individual. Malnutrition during childhood delays growth and malnutrition in the years preceding adolescent delays the appearance of the adolescent spurt[22].

In the present study, Anaemia is found to be more among adolescents residing in urban areas compared to rural. In India, 40 per cent of adolescent girls and 18 per cent of adolescent boys of are anaemic. Anaemia among adolescents adversely affects growth, resistance to infections, cognitive development and work productivity[4].As per the 2016-18 Comprehensive National Nutrition Survey, a quarter of adolescent girls are deprived of the four school-based services including mid-day meal, bi-annual health check-up and deworming, and weekly iron and folic acid supplementation[23].

The United Nations-mandated Sustainable Development Goals (SDG 2) aims to eliminate hunger and all forms of malnutrition by 2030. There are programs for adolescents which focus on several aspects of health including nutrition. Despite several programmes and schemes, the nutritional status of adolescents remains neglected / unanswered in our community, further influenced by social and economic factors.It may even be attributed to challenges in implementation of schemes or inadequate investment in health.

Poor nutrition is more common among rural areas with uneducated or unskilled parents from lower-income households. With changing diets and physical activity levels, overweight and obesity are also emerging problems, particularly among urban residents[4].

Analyzing the status of anemia and overweight it can be concluded that prevalence of both under-nutrition leading to anemia on one end and overweight on other end of spectrum making them susceptible to various conditions including many infections and noncommunicable diseases. Ending all forms of malnutrition is the global goal. The double burden of malnutrition offers an important point for intervention and action[5].

Conclusion

This study concludes that malnutrition more among boys both in rural and urban areas and needs to be addressed. Anaemia is more among adolescents residing in urban areas. Implementation of government schemes has to be more stringent to achieve the national objective.

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