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A comparative study on nutritional assessment of adolescent population from urban and rural areas

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Abstract
Aims: The health and nutritional status of the children affects not only physical growth but also cognitive development and country's economic growth. Adolescents are the future of the nation and more vulnerable group. The study was, therefore, carried out to determine and compare the nutritional status of adolescents among rural and urban government school students in district Patiala, Punjab. **Settings and Design:** Cross sectional study was conducted on 600 adolescents, 300 rural and 300 urban students. **Methods and Material:** The nutritional status has been assessed with the help of anthropometric measurements. The weight and height were recorded of each student and BMI was calculated. weight for age, height for age and BMI for age Z scores compared with WHO 2007 growth standards. **Statistical analysis used:** The independent sample t-test was done to assess differences in the anthropometric variables. A two-tailed p value less than 0.05 considered significant. **Results:** Among rural students 27% were undernutrition as compared to 8.3% urban students with p value is <0.001 which was significant. 11% of rural students were significantly underweight as compared to urban students of only 1% (p <0.001). 69.4% of age group 10-13 years students were significantly underweight as compare to other age groups (p value <0.001). Similarly 49.5% of age group 10-13 years students were significantly stunted with p value < 0.001. **Conclusions:** Our results reveal that undernutrition is more prevalent among rural adolescent students. So, Government should implement some more special programs for improving adolescents health.
Key-words: Nutrition, adolescent, Rural and urban students
Key Messages: Undernutrition is more prevalent among rural adolescent students even after running so many school programs. So, Government should implement some more special programs for improving adolescents health.

Introduction
Nutritional assessment provide appropriate data to implement plans that can reduce malnutrition and associated morbidity and mortality[1]. World Health Organization defined adolescence as a period of life from 10 to 19 years and about 21% of indian population[2,3,4]. During the adolescence, there is a significant gain in weight, height and skeletal mass[5]. They have more nutritional vulnerability[6]. In South East Asia Region, 20% of the population (adolescent) , suffer from malnutrition, which adversely impacts their health and development[7]. This study accessed magnitude of malnutrition among adolescent and compare the nutritional status among rural and urban students.

Subjects and Methods
A cross-sectional descriptive design study that was conducted among adolescents of 10-19 years age group of rural and urban students of patiala district (punjab) to assess the nutritional status using anthropometric measurements. Total 600 (300 rural and 300 urban)were included in this study after taking informed written consent from school authorities.

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Students with diagnosed case of any chronic disease as congenital heart disease, chronic renal failure, chronic liver failure, any blood disorder as thallasemia or leukemias were excluded from this study. Anthropometric measurements remain the most practical means for the nutritional status assessment of a population[8]. It has its own merits in being universally applicable, simple, inexpensive, and non-invasive technique and an excellent tool[9].

Weight was measured using a portable weighing machine, which was standardized by calibrating it against known weights regularly and to zero before each measurement. Students was asked to remove footwear and emptied their pockets while standing on the weighing machine.

Height in centimeter was marked on a wall with the help of a measuring tape and height of all students was measured against the wall. They asked to remove their foot wear and to stand with heels together and their heads positioned so that the line of vision (Frankfurt's plane) would be perpendicular to the body. A scale was placed above the head and height will be measured.

Body Mass Index (BMI) was calculated using the standard formula: BMI (kg/m2) =Weight (kg)/Height2 (m2).For anthropometric comparison, we followed the WHO 2007 growth standards for 10-19 years old. BMI-for-age weight status categories and the corresponding percentiles were based on expert committee recommendations as Undernutrition <5th percentile, Normal Weight 5th to <85th percentile, Overweight 85th to <95th percentile and Obese ≥95th percentile.

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Operational definitions

Adolescents are individuals in the age group of 10–19 years of age. It is categorized as early (adolescents in the age group of 10–13 years of age), middle (adolescents in the age group of 14–16 years of age), and late adolescents (adolescents in the age group of 17–19 years of age)[19]. Stunting is if the height-for-age Z score is found to be below −2 SD of the 2007 WHO growth reference. under weight is if weight for age Z score is found to be below -2SD of the 2007 WHO growth references[10,11].

Results

Table 1: Comparison of age, weight, height and BMI of urban and rural adolescent students

	Rural	Urban	P value
	Mean (Standard deviation)	Mean (Standard deviation)	
Age	15.23 (2.05)	13.73 (1.92)	<0.001
Weight	40.62 (10.18)	42.28 (9.46)	0.040
Heights	151.45 (18.19)	151.59 (12.27)	0.911
BMI	17.59 (3.50)	18.39 (3.21)	0.003

Table 2: Comparison of the nutritional status of rural and urban participants

Nutritional status	Rural	Urban	P value
	Number (Percentage)	Number (Percentage)	
Undernutrition	81 (27%)	25 (8.3%)	<0.001
Under weight	33 (11%)	3 (1%)	<0.001
Stunted	49 (16.3%)	46 (15.3%)	0.737
Overweight	2 (0.7%)	3 (1%)	0.686
Obese	2 (0.7%)	2 (0.7%)	

Table 3: Comparison of nutritional status of male and female participants

Nutritional status	Male	Female	P value
	Number (Percentage)	Number (Percentage)	
Undernutrition	40 (14.7%)	66 (20.1%)	0.083
Under weight	18 (6.6%)	20 (7.2%)	0.562
Stunted	35 (12.9%)	60 (18%)	0.070
Overweight	4 (1.5%)	1 (0.3%)	0.182
Obese	2 (0.73%)	2 (0.61%)	0.998

Table 4: Comparison of nutrition status among different age groups

Nutritional status	Age (years)			P value
	10-13	14-16	17-19	
	Number (Percentage)	Number (Percentage)	Number (Percentage)	
Undernutrition	21 (19.8%)	53 (50%)	32 (30.2%)	0.001
Under weight	25 (69.4%)	10 (27.8%)	1 (2.8%)	<0.001
Stunted	47 (49.5%)	39 (41.1%)	9 (9.4%)	<0.001
Overweight	4 (80%)	1 (20%)	0 (0.0%)	0.084
Obese	2(50%)	2 (50%)	0 (0.0%)	0.657

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In this study, 600 adolescent students (10-19yrs)were included. Of these, 300 from rural government school and 300 from urban government school. Table 1 compares the age, weight, height and BMI of the rural and urban school adolescent students. It showed that in all the parameters (weight, height and BMI) the means in the urban students were higher than those of rural. In our study, we compared the nutritional status by calculating BMI, weight for age and height for age. The nutritional status among rural and urban population is shown in table 2. Among rural students 27% were undernutrition as compared to 8.3% urban students with p value is <0.001 which was significant. 11% of rural students were significantly underweight as compared to urban students of only 1% (p <0.001). It was observed that 16.3% rural students and 15.3% urban students were stunted (p value= 0.737). Only 0.7% of rural students and 1% of urban students were overweight.

Table 3 shows that the females(20.1%) were more undernutrition as compared to male(14.7%) (p value=0.083). 6.6% of males were underweight as compare to females of 7.2% (p value = 0.562). Among female students 18% stunted, 0.3% overweight and 0.61% obese as compared to male students of 12.9% stunted, 1.5% overweight and 0.73% obese, statistically nonsignificant.

The comparison of nutritional status among different age groups is shown in table 4. 50% of undernutrition was seen in 14-16 years age group as compared to 19.8% in 10-13 years age group and 30.2% in 17-19 years age group which was statically significant with p value of 0.001.69.4% of age group 10-13 years students were significantly underweight as compare to other age groups (p value <0.001). Similarly 49.5% of age group 10-13 years students were significantly stunted with p value < 0.001. Among 10-13 year age group 80% were overweight as compared to age group 14-16 year 20% overweight, 50% obese among both 10-13 year age and 14-16 year age but among 17-19 years age group, none of the students were obese and overweight

Discussion

Adolescent population will play an important role not only as future work force but biological role a so, hence it is important to identify nutritional status of adolescents. Undernutrition increases the morbidity and mortality among adolescent population. The growth spurt during this second decade of life has been seen as a period of potential interest for catching up deficits of childhood and for the purpose growth monitoring by anthropometric measurements can provide an important health indicator for both undernutrition and overnutrition issues. Globally in 2020, 149 million children were estimated to be stunted, 45 million were estimated to be wasted, and 38.9 million were overweight or obese[12]. Around 45% of deaths are linked to undernutrition[13]. According to United Nations International Children's Emergency Fund (UNICEF) reports, India is home to 40% of the world's malnourished children[14].

We observed that rural school students were more undernutrition (27%) and underweight (11%) as compared to urban school students that is statistically significant. Malnutrition is more in rural sectors of India as compared to urban because of poor health care system, not financially sound, illiteracy and less health awareness[15]. Stunting(16.3%) was also more in rural students as compared to urban school students. Adolescent undernutrition is a serious public health problem in both developed and developing countries, especially in Asia (32–65%) and Africa (4–30%), making them more vulnerable to low productivity, poor health, and early deaths.[15]The prevalence of thinness in adolescent boys and girls is 58.1% and 46.8% in National Family Health Survey (NFHS)-3, and 45% and 42% in NFHS-4 respectively[16]. Stunting in boys and girls respectively was 25.2% and 31.2% in NFHS-3 and 32.2% and 34.4% in NFHS-4. High prevalence of under nutrition is accounted to the consumption of only two-thirds of the recommended energy requirement according to National Nutrition Monitoring Bureau (NNMB) report[17].

Similarly a study conducted by Malti S et al in 2011, suggested rural adolescent girls were undernutrition(26.3%), underweight(35.7%) and stunted (35.5%) then urban girls compared to urban students

(13.6%),(29.5%),(19.6%) respectively[18]. In another study from Kanpur also showed 45.51% urban and 50.81% adolescents are undernutrition.4 Similar results were seen in the study conducted by I Answer et al[19]. One may consider low literacy , low socioeconomic status, women's education and gender discrimination etc among rural population that effect the nutrition status of the students[20]. Another important factors like intestinal parasitic infections, inadequate food intake, traditional beliefs and practices are more commonly seen in rural areas that contributes to undernutrition among rural population[21].

In our study, females was more undernutrition (20.1%), underweight(7.2%) and stunted (18%) as compared to male students (not statistically significant). Among adolescents, girls constitute a more vulnerable group particularly in developing countries like India with 243 million adolescents and where, of the total female population 10.7% and 9.7% are adolescent girls in age groups 10-14 years and 15-19 years respectively[22]. In the age group 15 to19, nearly half of the girls (47%) are thin and at the same time, 2.4 percent of the girls in this age group are overweight in India[23]. In study from Kanpur females (56.9%) were found to be underweight as compared to males (44.3%). A similar trend has been reported by Answer I et al and Oninla SO et al[19,21].On the contrary under nutrition was higher among males than females in the studies by Mukhopadhyay, et al[24]. The prevalence of undernutrition (50%) was more among age group 14-16 years, underweight (69.4%) and stunting (49.5%) among age group 10-13 years. It was statistically significant. Over weight and obesity was also more among age group of 10-13 years. Maiti S et al[18] revealed higher prevalence of underweight and stunting among early adolescent population. It might be due to the high prevalence of undernutrition, stunting, underweight among rural students attributed to social and economical disparities. Better living conditions, better nutrition and improved medical facilities in urban areas improves nutritional status of urban students. Females are more undernutrition may be due neglected group in families as compared to boys in Indian families.

Conclusions

In the study, our results reveal that undernutrition is more prevalent among rural adolescent students. So it is important to strengthen health education and proper implementation of intervention programs to improve rural adolescents students nutrition. Government should implement some special programs for improving adolescents health.

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