Content available at: https://www.ipinnovative.com/open-access-journals

Journal of Preventive Medicine and Holistic Health

Journal homepage: https://www.jpmhh.org/

Original Research Article

Assessment of nutritional status of school going adolescents in rural and urban area of north karnataka: A comparative study

Sweta Sinha[1], Manjula S Patil[2,*], Sunanda Halki[2], Shubham Mohan Sharma[1]

[1]*Dept. of Community Medicine, Jaipur National University-Institute of Medical Science and Research Centre, Jaipur, Rajasthan, India*
[2]*Dept. of Community Medicine, Belagavi Institute of Medical Sciences, Belagavi, Karnataka, India*

ARTICLE INFO

Article history:
Received 24-05-2022
Accepted 02-06-2022
Available online 30-06-2022

Keywords:
School
Adolescents
Rural and Urban
Nutritional

ABSTRACT

Background: Adolescence is an important stage of growth and development in the lifespan. Unmet nutritional needs lead to several public health problems such as stunted and retarded growth, impaired mental development, anaemia.
Objectives: Assessment and comparison of nutritional status of school going adolescents of rural and urban area and the factors affecting the nutritional status of adolescents.
Materials and Methods: An observational study was conducted among the school going adolescents (10-19 years) studying in government schools in rural and urban area. A pre-designed semi-structured questionnaire was used for socio-demographic profile. Detailed clinical examination including head to toe examination, anthropometry and systemic examination was done to assess the nutritional status.Data was entered in MS Excel and analysed using SPSS and MS Excel. The statistical significance was evaluated at 95% confidence level ($p<0.05$). Result will be represented in tables.
Results: Eyes appeared paler in 27.22% of rural adolescents compared to 19.44% of urban. Overall prevalence of malnutrition among adolescents was 284 (78.89%) i.e.,75.56% in rural and 82.22% in urban area, in which prevalence ofunder-weight was 269 (74.72%) more in urban 137 (76.11%) compared to rural area 132 (73.33%).
Conclusion: Prevalence of malnutrition (underweight, overweight and obesity) was more in urban area (76.11%) compared to rural area (73.33%) based on IAP-BMIcriteria.

1. Introduction

The word adolescence comes from the Latin word 'adolescere' meaning to grow and to mature. Adolescents are defined as the age group between 10-19 years according to WHO.[1,2] At present the population of adolescent is 1.2 billion globally forming 18% of the total population. Around 243 million are living in India and consists of about 21% of Indian population.[3] Today, every 5^{th} person in India is an adolescent.[4] Adolescence may be divided into three developmental stages-early adolescence- 10 to 13 years, middle adolescence- 14 to 16 years, late adolescence- 17 to 19 years.[4–7]

Adolescence is the transition period during which they gain up to 50% of their adult height and skeletal mass. Unmet nutritional needs lead to several public health problems such as stunted and retarded growth, impaired mental development, anaemia. In adolescent girls, short stature that carries on into adulthood is associated with many concurrent and future adverse health and pregnancy outcomes like obstructed labour, post-partum haemorrhage, genital infection etc. Global prevalence of underweight

* *Corresponding author*.
E-mail address: manjulapatil.2010@rediffmail.com (M. S. Patil).

https://doi.org/10.18231/j.jpmhh.2022.008

among children and adolescent is 8.4% in girls and 12.4% in boys according to worldwide pooled analysis of study published in Lancet in 2017.[8] In India, it varies from 21.4% to 47.93% according to different studies conducted across the country.[9] Poor nutrition can lead to underweight stunting and on the other hand increased risk of non-communicable diseases later in life. Most of the published literature focuses on nutritional status among adolescents, while there is a paucity of information of nutritional status of adolescents in both rural and urban area. Hence, the present study was designed to assess and compare the nutritional status and the factors affecting the nutritional status of school going adolescents in rural and urban area.

2. Material and Medhods

An observational study was conducted among the school going adolescents (10-19 years) studying in Government schools in rural and urban field practice area of Department of Community Medicine, BIMS, Belagavi during October 2019 to December 2019. There are 13 schools in Uchagoan and 9 schools in Kashbag. All the Government schools were included in the sampling frame. The calculated sample size was N=360 taking the prevalence of malnutrition 19.44% in a previous Indian study with absolute error 5%, 10% response failure and 95% confidence interval[10] A written permission from the authorities of all institutions was obtained prior to data collection. Students from standard six to ten were taken in the study and they were selected using simple random sampling technique.

A pre-designed semi-structured questionnaire was used to collect information regarding socio-demographic profile. Data was collected by using direct interview method. Detailed clinical examination including head to toe examination, anthropometry and systemic examination was done. Ethical clearance was obtained from institutional ethical committee of BIMS, Belagavi.

2.1. Inclusion criteria

1. Students of both sexes between 10-19 years age group
2. Willing to participate in the study

2.2. Exclusion criteria

Students who did not give informed written consent

Body weight of the study participants was measured to nearest 0.1 kilogram with portable machine with scale adjusted to zero before each session.Height was measuredwithout footwear using a stadiometerto nearest 0.5 centimetre. Hip and waist circumference was measured using non-stretchable tape to the nearest 0.1cm. Body Mass Index (BMI) classification is made according to IAP guidelines.

3. Statistical Analysis

Data entry was done in MS Excel and it was analysed using SPSS and MS Excel. Categorical variable was appropriately coded for data entry. Numerical data like age, weight, height, waist and hip circumference were entered as such. Statistical measures used were mean, median, standard deviation, percentage. Z-statistic, t-test, Mann Whitney U test and chi square test were applied as test of significance. The statistical significance was evaluated at 95% confidence level ($p<0.05$). Result was represented in tables.

4. Results

360 adolescents participated in the study i.e., 180 from rural and urban area respectively. Maximum participants 207(57.50%) were in middle adolescence phase (75.0%from rural and 40.0% from urban).55.0% from rural and 61.67% urban area belonged to nuclear family. As per modified B.G Prasad classification (January 2020) scale, majority of adolescents in rural area (58.33%) belonged to class IV compared to urban 39.44%. [Table 2]

5. Discussion

In Premkumar S et al. study in the rural area, the prevalence of overweight/obesity was 16.2% and 24%in the urban school going adolescents which was higher compared to our study.[2] In our study, skin appeared dry and scaly in 23.33% rural compared to 7.22% urban which was significant (p-value <0.01) and was higher compared to Karak P et al. study (17% rural and 3% in urban).[5] Prevalence underweight(74.72%) was higher in our study compared to Rahman F et al. in Kanpur (52.09%). Nearly 73.33% of rural and 76.11% urban adolescents were underweight whereas in Rahman F et al. 45.51% and 50.8% were undernourished in urban and rural areas respectively.[8,12] In Rajaretnam T et al. study in Karnataka weight among boys was 42.3±8.7 in rural 46.0±10.4 among urban whereas in girls 39.8±6.1 in rural and 42.3±7.7 in urban which was higher compared to our study.[13] Eyes were pale in 25.4% and 11.8% had flat nails in Shivaprakash and Joseph study in urban area which was higher compared to our study where 19.44% of urban adolescent eyes were pale and 1.67% had flat nails.[10,11]

Underweight finding inour study was similar to Deshmukh PR et al. (75.3%), less compared to Srinivasan K et al. (78.4%), whereas higher than Rao V G et (61.7%) and Pal A et al. (48.78%).[6,9,14,15]

6. Conclusion

Prevalence of malnutrition (underweight, overweight and obesity) was more in urban area (76.11%) compared to rural area (73.33%) based on IAP-BMI criteria. Underweight was prevalent maximum in middle adolescence phase (77.27%)

Table 1: Classification of BMI according to IAP guidelines. [11]

BMI	Categories
<18.5	Underweight
18.5-23	Normal
23-27	Overweight
>27	Obese

Waist Hip ratio ≤1 for males was considered normal while waist-hip-ratio ≤0.85 in females. [6,12]

Table 2: Socio-demographic distribution of the study participants. N=360

Socio-demographic characteristics		Rural N (%)	Urban N (%)	Total N (%)
Age (Adolescence phase)	Early	45(25.0%)	106 (58.89%)	151 (41.94%)
	Middle	135(75.0%)	72(40.0%)	207(57.50%)
	Late	0(0.00)	2(1.11%)	2(0.56%)
	Total	180	180	360
Gender	Boys	73 (40.56%)	65 (36.11%)	138 (38.33%)
	Girls	107 (59.44%)	115 (63.89%)	222 (61.67%)
	Total	180	180	360
Standard (class)	6^{th}	23 (12.78%)	48 (26.67%)	71(19.72%)
	7^{th}	22 (12.22%)	48 (26.67%)	70(19.44%)
	8^{th}	45 (25.0%)	42 (23.33%)	87(24.17%)
	9^{th}	45 (25.0%)	22 (12.22%)	67(18.61%)
	10^{th}	45 (25.0%)	20 (11.11%)	65(18.06%)
	Total	180	180	360
Type of family	Nuclear	99 (55.0%)	111 (61.67%)	210(58.33%)
	Joint	22 (12.22%)	26 (14.44%)	48(13.33%)
	Three generation	59 (32.78%)	43 (23.89%)	102(28.33%)
	Total	180	180	360
Religion	Hindu	172 (95.56%)	178 (98.89%)	350(97.22%)
	Muslim	7 (3.89%)	1(0.56%)	8(2.22%)
	Christian	1 (0.56%)	0(0.00)	1(0.28%)
	Others	0(0.00)	1(0.56%)	1 (0.28%)
	Total	180	180	360
Socio-Economic Status	Class I & II	6 (3.33%)	43 (23.89%)	49 (13.61%)
	Class III	37 (20.56%)	40 (22.22%)	77 (21.39%)
	Class IV	105 (58.33%)	71 (39.44%)	176 (48.89%)
	Class V	32 (17.77%)	26 (14.44%)	58 (16.11%)
	Total	180	180	360
Fathers Education	Illiterate	13 (7.22%)	9 (5.0%)	22 (6.11%)
	Primary school	8(4.44%)	10 (5.56%)	18 (5.00%)
	Middle school	46 (25.56%)	30 (16.67%)	76 (21.11%)
	High school	80 (44.44%)	55 (30.56%)	135 (37.50%)
	Pre-university	22 (12.22%)	40 (22.22%)	62 (17.22%)
	Graduate and Higher	6(3.33%)	19 (10.56%)	25 (6.94%)
	*Not Applicable	5 (2.78%)	17 (9.44%)	22 (6.11%)
	Total	180	180	360
Mothers Education	Illiterate	13 (7.22%)	8 (4.44%)	21 (5.83%)
	Primary school	2 (1.11%)	7 (3.89%)	9 (2.50%)
	Middle school	51 (28.33%)	55 (30.56%)	106 (29.44%)
	High school	95(52.78%)	68 (37.78%)	163 (45.28%)
	Pre-university	19 (10.56%)	26 (14.44%)	45 (12.50%)
	Graduate and Higher	0 (0.00)	13 (7.22%)	13 (3.61%)
	*Not Applicable	0 (0.00)	3 (1.67%)	3 (0.83%)
	Total	180	180	360

*Not Applicable: either not staying together or death

Significant statistical difference was seen for built and nourishment (thin), hair (thin & sparse), ear discharge, pale tongue, spongy gums, enlarged thyroid gland, dry and scaly skin and flat nails. [Table 3]

Table 3: Distribution of adolescents according to clinical assessment. N=360

Category	Clinical Sign (General appearance)	Rural N, (%)	Urban N, (%)	Z-statistic & p-value	Total N, (%)
Built & nourishment	Thin	29 (16.11%)	59 (32.77%)	3.74901 &<0.01*	88 (24.44%)
	Obese	12 (6.67%)	10 (5.56%)	0.439607 &>0.05	22 (6.11%)
	Normal	139 (77.22%)	111 (61.67%)	–	250 (69.44%)
Hair	Thin & sparse	12 (6.67%)	03(1.67%)	2.391639 &<0.05*	15 (4.17%)
	Lack of lustre	05 (2.78%)	11 (6.11%)	1.53789 &>0.05	16 (4.44%)
	Dyspigmentation	01(0.56%)	01 (0.56%)	0 &>0.05	02 (0.56%)
	Normal	162 (90.0%)	165 (91.67%)	–	327 (90.83%)
Eyes	Pallor present	49 (27.22%)	35 (19.44%)	1.752571 &>0.05	84 (23.33%)
	Pallor absent	131 (72.78%)	145 (80.56%)	–	276 (76.67%)
Ears	Discharge	01 (0.56%)	09 (05.0%)	2.58583 &<0.05*	10 (2.78%)
	Hearing aid	0 (0.00)	02 (1.11%)	1.42142 &>0.05	02 (0.56%)
	Normal	179 (99.44%)	169 (93.88%)	–	348 (96.67%)
Teeth	Caries	79 (43.88%)	81 (45.0%)	0.21384 &>0.05	160 (44.44%)
	Enamel attrition	7 (3.88%)	5 (2.78%)	0.581902 &>0.05	12 (3.33%)
	Normal	94 (52.22%)	94 (52.22%)	–	188 (52.22%)
Tongue	Pale	16 (8.89%)	03 (1.67%)	3.103517 &<0.01*	19 (5.27%)
	Fissured	10 (5.56%)	05 (2.78%)	1.322512 &>0.05	15 (4.17%)
	Normal	154 (85.56%)	172 (95.56%)	–	326 (90.56%)
Lips	Stomatitis & cheilosis	15 (8.33%)	08 (4.44%)	1.514246 &>0.05	23 (6.39%)
	Normal	165 (91.67%)	172 (95.56%)	–	337 (93.61%)
Gums	Spongy	07 (3.89%)	0 (0.00)	2.699148 &<0.05*	07 (1.94%)
	Bleeding	06 (3.33%)	03 (1.67%)	1.010117 &>0.05	09 (2.5%)
	Normal	167 (92.78%)	177 (98.33%)	–	344 (95.56%)
Thyroid gland	Enlarged	0 (0.00)	06 (3.33%)	2.49008 &<0.05*	06 (1.67%)
	Normal	180 (100%)	174 (96.67%)	–	354 (98.33%)
Skin	Dry & scaly	42 (23.33%)	13 (7.22%)	4.359025 &<0.01*	55 (15.28%)
	Normal	138 (76.67%)	167 (92.78%)	–	305 (84.72%)
Nails	Flat	12 (6.67%)	03 (1.67%)	2.391639 &<0.05*	15 (4.17%)
	Normal	168 (93.33%)	177 (98.33%)	–	345 (95.83%)

Table 4: Comparison of mean weight, height, BMI and WHR of rural and urban adolescents (Mean ± SD). N=360

Parameters	Boys		Test statistic & p-value	Girls		Test statistic & p-value
	Rural (73)	Urban (65)		Rural (107)	Urban (115)	
Weight (kg) Mean ± SD	37.74 ±7.98	34.15±9.11 32	Z=3.061 &	39.33±7.66	38.60±9.2 149	Z=1.299 &
Median IQR	37 8.5	11.5	0.002*	151 7	12	P=0.194
Height (cm) Mean ± SD	151.33±10.86	146.15±9.11	t= 2.92 &	149.66±8.49	149.43±8.69	Z= 0.66 &
Median IQR			p=0.003*	151 7	149 12	P=0.508
BMI (kg/m^2) Mean ± SD	16.33±2.16	15.81±3.15	Z= 2.09 & P=	17.50±2.86	17.18±3.27	Z=1.096 &
Median IQR	15.82 2.92	14.88 3.45	0.037*	17.1 3.89	16.44 4.26	P= 0.273
WHR Mean ± SD	0.79 ± 0.05	0.83±0.06	t= 4.073 & p <0.001*	0.77±0.05	0.80±0.04	t= 5.287 & p =0.007*

Z= MW U test has been applied as the data was not normal. t= t test has been applied

The weight of adolescent boys in rural was 37.74 ± 7.98 and of urban 34.15±9.11, weight of adolescent girls in rural 39.33±7.66 and urban38.60±9.2 and there was a significant statistical difference seen. Similarly, there was a significant difference in height, BMI and Waist-to-hip ratio of rural and urban boys. [Table 4]

Table 5: Overall prevalence of malnutrition according to IAP-BMI cut off among school adolescents. N=360

Nutritional status	Rural	Urban	Total
Normal weight	44 (24.44%)	32 (17.7%)	76(21.11%)
Under weight	132 (73.33%)	137 (76.11%)	269 (74.72%)
Overweight	3 (1.67%)	9 (5.0%)	12(3.33%)
Obese	1 (0.56%)	2(1.11%)	3 (0.83%)

According to IAP guidelines BMI categories, overall prevalence of malnutrition among adolescents was 284 (78.89%) i.e., 75.56% in rural 82.22% in urban area in which prevalence ofunder-weight was 269 (74.72%) more in urban 137 (76.11%) compared to rural area 132 (73.33%). Over-weight 12 (3.33%) higher in urban area 5.0% compared to rural 1.67%. [Table 5]

Table 6: Distribution of adolescents according to IAP- BMI cut off. N=360

BMICut off(kg/m^2)	Boys			Girls			Total		
	Rural N (%)	Urban N (%)	Total N (%)	Rural N (%)	Urban N (%)	Total N (%)	Rural N (%)	Urban N (%)	Total N (%)
<18.5 Under-Weight	61 (83.56%)	55 (84.62%)	132 (73.33%)	71 (66.36%)	82 (71.30%)	137 (76.11%)	132 (73.33%)	137 (76.11%)	269 (74.72%)
18.5-23 Normal	12 (16.44%)	7 (10.77%)	44 (24.44%)	32 (29.91%)	25 (21.74%)	32 (17.78%)	44 (24.44%)	32 (17.78%)	76 (21.11%)
23-27 Over-Weight	0 (0.0)	2 (3.08%)	3 (1.67%)	3 (2.80%)	7 (6.09%)	9 (5.0%)	3 (1.67%)	9 (5.00%)	12 (3.33%)
>27 Obese	0 (0.0)	1 (1.54%)	1 (0.56%)	1 (0.93%)	1 (0.87%)	2 (1.11%)	1 (0.56%)	2 (1.11%)	3 (0.83%)
Total	73	65	180	107	115	180	180	180	360

Prevalence of stunting was 16 (4.44%) more among rural adolescents (5.0%) compared to urban (3.89%).Underweight was higher in urban adolescent boys and girls (84.62% and 71.30%) compared to rural (83.56% and 66.36%) respectively. [Table 6]

Table 7: Age wise distribution of malnutrition among adolescents. (IAP-BMI cut off). N=360

Age in years	Rural N (%)			Urban N (%)		
	Under weight	Over- weight	Obesity	Under Weight	Over-weight	Obesity
Early adolescence	30 (22.72%)	2 (66.67%)	1 (100%)	90 (65.69%)	5 (55.56%)	0
Middle adolescence	102 (77.27%)	1 (33.33%)	0	45 (32.85%)	4 (44.44%)	2 (100%)
Late adolescence	0	0	0	2 (1.46%)	0	0
Total	132	3	1	137	9	2

Prevalence of underweight was more in middle adolescence phase 102 (77.27%) in rural compared to early adolescence phase 90 (65.69%) in urban area. [Table 7]

in rural and urban early adolescence phase (65.69%). Overweight (66.67%) was more in early adolescence phase in rural and compared to urban in middle adolescence phase (55.56%).

7. Recommendations

Adolescents must be educated at school level about the importance of regular intake of healthy nutritious food and harmful effects of non-nutritious food. Awareness campaigns in school highlighting nutritional status as a major risk factor that causes both physical and mental growth retardation.

Through adolescents are the beneficiaries of various nutritional related programmes (mid-day meal program, ARSH, weekly iron and folic acid supplementation etc.), still prevalence of malnutrition is more among them. There is an urgent need to evaluate the programmes to take corrective measures to reduce the prevalence of malnutrition.

8. Limitations

The present study included only government schools. The results whatever obtained cannot be generalized to entire adolescent population of Khasbag and Uchagaon.

Table 8: Association of nutritional status according to IAP BMI cut off with socio-demographic profile of rural adolescents. N=360

P arameter	Rural Under weight	Over- weight & Obesity	Normal	Total	Urban Under weight	Over- weight & Obesity	Normal	Total
Sex								
Boys	61 (83.6%)	0 (0.0)	12 (16.4%)	73 (100%)	55 (84.6%)	3 (4.6%)	7 (10.8%)	65 (100%)
Girls	71 (66.4%)	4 (3.7%)	32 (29.9%)	107 (100%)	82 (71.3%)	8 (7.0%)	25 (21.7%)	115 (100%)
Total	132 (73.3%)	4 (2.2%)	44 (24.4%)	180 (100%)	137 (76.1%)	11 (6.1%)	32 (17.8%)	180 (100%)
Chi-square & p-value	7.701 & 0.021*				0.448 & 0.126			
Religion								
Hindu	127 (73.8%)	4 (2.3%)	41 (23.8%)	172 (100%)	137 (77.0%)	11 (6.2%)	30 (16.9%)	178 (100%)
Muslim	4 (57.1%)	0 (0.0)	3 (42.9%)	7 (100%)	0 (0.0)	0 (0.0)	1 (100%)	1 (100%)
Christian	1 (100%)	0 (0.0)	0 (0.0)	1 (100%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100%)	1 (100%)
Total	132 (73.3%)	4 (2.2%)	44 (24.4%)	180 (100%)	137 (76.1%)	8 (6.1%)	172 (95.6%)	180 (100%)
Chi-square & p-value	1.780 & 0.776				9.354 & 0.053*			
Type of family Nuclear	78 (78.8%)	0 (0.0)	21 (21.2%)	99 (100%)	81 (73.0%)	8 (7.2%)	22 (19.8%)	111 (100%)
Joint	15 (68.2%)	2 (9.1%)	5 (22.7%)	22 (100%)	19 (73.1%)	2 (7.7%)	5 (19.2%)	26 (100%)
3- Gen	39 (66.1%)	2 (3.4%)	18 (30.5%)	59 (100%)	37 (86.0%)	1 (78.8%)	5 (11.6%)	43 (100%)
Total	132 (73.3%)	4 (2.2%	44 (24.4%)	180 (100%)	137 (76.1%)	11 (6.1%)	322 (17.8%)	180 (100%)
Chi-square & p-value	9.471 & 0.050*				3.272 & 0.513			
Education of father								
Illiterate	11 (84.6%)	0 (0.0)	2 (15.4%)	13 (100%)	7 (77.8%)	0 (0.0)	2 (22.2%)	9 (100%)
Primary	4 (50.0%)	2 (25.0%)	2 (25.0%)	8 (100%)	7 (70.0%)	1 (10.0%)	2 (20.0%)	10 (100%)
Middle	35 (76.1%)	0 (0.0)	11(23.9%)	46 (100%)	20 (66.7%)	5 (16.7%)	5 (16.7%)	30 (100%)
High	59(73.8%)	1(1.3%)	20(25.0%)	80 (100%)	41 (74.5%)	1 (1.8%)	13 (23.6%)	55 (100%)
Pre-university	17 (77.3%)	0(0.0)	5(22.7%)	22(100%)	32(80.0%)	2(5.0%)	6(15.0%)	40(100%)
≥Graduate	2(33.3%)	1(16.7%)	3(50%)	6(100%)	16(84.2%)	0(0.0)	3(15.8%)	19(100%)
NA	4(80.0%)	0(0.0)	1(20.0%)	5(100%)	14(82.4%)	2(11.8%)	1(5.9%)	17(100%)
Total	132(73.3%)	4(2.2%)	44(24.4%)	180(100%)	137(76.1%)	11(6.1%)	32(17.8%)	180(100%)
Chi-square & p-value	30.940 & 0.002*				13.588 & 0.328			
Education of mother								
Illiterate	10(76.9%)	1(7.7%)	2(15.4%)	13(100%)	5(62.5%)	0(0.0)	3(37.5%)	8(100%)
Primary	1(50.0%)	0(0.0)	1(50.0%)	2 (100%)	6(85.7%)	1(14.3%)	0(0.0)	7(100%)
Middle	41(80.4%)	2(3.9%)	8(15.7%)	51(100%)	39(70.9%)	4(7.3%)	12 (21.8%)	55(100%
High	69(72.6%)	0(0.0)	26(27.4%)	95(100%)	52(76.5%)	5(7.4%)	11(16.2%)	68(100%)
Pre-university	11(57.9%)	1(5.3%)	7 (36.8%)	19 (100%)	24(92.3%)	0(0.0)	2(7.7%)	26(100%)
≥Graduate	0(0.0)	0(0.0)	0(0.0)	0(0.0)	9(69.2%)	1(7.7%)	3(23.1%)	13(100%)
NA	0(0.0)	0(0.0)	0(0.0)	0(0.0)	2(66.7%)	0(0.0)	1(33.3%)	3(100%)
Total	132 (73.3%)	4(2.2%)	44 (24.4%)	180(100%)	137(76.1%)	11(6.1%)	32 (17.8%)	180(100%)
Chi-square & p-value	10.599 & 0.225				10.560 & 0.567			

In rural area there was a significant association between type of family and education of father with BMI. [Table 8]

9. Source of Funding

None.

10. Conflict of Interest

None.

Acknowledgements

Authors gratefully acknowledge the participants, coordinators and Dr R. G. Viveki, Head of the department of Community Medicine, BIMS, Belagavi for assistance and support.

References

1. Phuljhele S, Dewangan S. Assessment of Nutritional Status of Adolescent Girls Between 15-18 Years Studying InGovernment High School In Raipur Chhattisgarh. *Int J Pediatr Res*. 2021;8(2):72–81. doi:10.17511/ijpr.2021.i02.06.
2. Premkumar S, Ramanan PV, Lakshmi D. Rural Childhood Obesity - An Emerging Health Concern. *Indian J Endocrinol Metab*. 2019;23(3):289–92. doi:10.4103/ijem.IJEM_649_18.
3. World Health Organization. *World Health Organization*. 2018;Available from: https://www.who.int.
4. Suryakantha AH. Community Medicine with Recent Advances; 2019. Available from: https://www.amazon.com/Community-Medicine-Recent-Advances-2019/dp/9388958810.
5. Karak P, Maiti R, Das P, Karmakar A. Assessment of nutritional status of school children in rural and urban areas of bankura, west bengal. *Int J Pharm Sci Res*. 2018;9(1):338–45. doi:10.13040/IJPSR.0975-8232.9(1).338-45.
6. Suryakantha AH. Assessment of the nutritional status of adolescent girls aged between 15 to 18 years studying in government high school in Raipur, Chhattisgarh, India. *Int J Pediatr Res*. 2018;8(2):100–8. doi:10.17511/ijpr.2021.i02.06.
7. Pal A, Pari AK, Sinha A, Dhara PC. Prevalence of undernutrition and associated factors: A cross-sectional study among rural adolescents in West Bengal. *Int J Pediatr Adolesc Med*. 2017;4(1):9–18. doi:10.1016/j.ijpam.2016.08.009.
8. Gomez L. Worldwide trend in body-mass index, underweight, overweight and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents and adults. . *The Lancet*. 2017;390(10113):2627–42. doi:10.1016/S0140-6736(17)32129-3.
9. Siddharam SM, Venketesh GM, Thejeshwari HL. Study of Anaemia among Adolescent Girls in Rural Area of Hassan district. *Int J Biol Med Res*. 2011;2(4):922–4.
10. Rajaretnam T, Hallad SJ. Nutritional status of adolescents In Northern Karnataka. *J Fam Welfare*. 2014;58(1):55–67.
11. Mehru N, Ratanoo L, Gupta PP, Gupta MK. Body Mass Index and skinfold thickness measurement as indicators of obesity in adolescents. *Int J Biomed Adv Res*. 2016;7(5):235–41. doi:10.7439/ijbar.v7i5.3267.
12. Park K. Parks text book of Preventive and Social Medicine; 2017. p. 696–7.
13. Rahman F, Tripathi VN. Nutritional status of adolescents in rural and urban area of Kanpur. *Int J Contemp Pediatr*. 2016;3(2):464–7.
14. Shivaprakash NC, Joseph R. Nutritional Status of Rural School & Going Children (6&12 Years) of Mandya District. *Int J Sci Stud*. 2014;2(2):39–43.
15. Deshmukh PR, Gupta SS, Bharmade MS, Dongre AR, Maliye C, Kaur S. Nutritional status of adolescents in rural Wardha. *Indian J Pediatr*. 2006;73(2):139–80. doi:10.1007/BF02820204.

Author biography

Sweta Sinha, Assistant Professor

Manjula S Patil, Assistant Professor

Sunanda Halki, Assistant Professor

Shubham Mohan Sharma, Associate Professor

Cite this article: Sinha S, Patil MS, Halki S, Sharma SM. Assessment of nutritional status of school going adolescents in rural and urban area of north karnataka: A comparative study. *J Prev Med Holistic Health* 2022;8(1):35-41.