International Journal of Contemporary Pediatrics
Pathak S et al. Int J Contemp Pediatr. 2018 Jul;5(4):1355-1359
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20182480

Original Research Article

Prevalence of obesity among urban and rural school going adolescents of Vadodara, India: a comparative study

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Received: 31 May 2018
Accepted: 05 June 2018

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ABSTRACT

Background: Obesity is a major global problem among children. India has paradox of having both undernutrition and obesity as a major problem. This epidemic of obesity is also affecting rural population. It has both short and long term adverse health outcome.
Methods: The present study is a cross-sectional, observational and questionnaire-based study conducted in urban and rural school going adolescents.
Results: 188 subjects (89 rural and 99 urban school) school were enrolled. 17.6%(33), 20.2%(38), 59%(111) and 3.2%(6) children were obese, overweight, normal and underweight respectively. 65.22% of urban males & 62.26% females were either obese or overweight as compared to 15.78% of rural males and 3.92% females ($p<0.0001$). OR was 17.7 (95% CI of 7.6 to 40.7) in favor of urban residence. Statistically significant ($p<0.05$) differences is found in term of annual income of family, frequency of physical training sessions conducted in schools, frequency of restaurant & school canteen food. No statistically significant association was found between two categories (higher BMI & normal BMI) with other factors viz. breakfast before school, liking for fast food, involvement in outdoor sports, operating gadgets during meals and having obese family members.
Conclusions: Obesity and overweight is more prevalent in urban adolescent. There is no difference among male and female group. There is tendency of high frequency of obesity and overweight among those adolescents who have higher annual family income, frequency of restaurant and school canteen food and lesser frequency of physical training sessions conducted in schools.

Keywords: Adolescent, BMI, Obesity, Overweight, Rural, Urban

INTRODUCTION

Obesity and overweight amongst children was considered primarily as disease of developed countries with high per capita income.[1] However, developing countries like India are also joining this pool because of rapid change in food habits and life style. India has a paradox of being considered a fast weight gaining nation and is also struggling with malnutrition.[2] This could be reflection of the recent emerging socio-economic trends in childhood obesity in India. There are many long-term consequence of childhood obesity as its persistence into adulthood along with its health risks. Obesity is more likely to persist if it starts in adolescence.[3] According to various studies, the current prevalence of childhood overweight in India ranges from 4% to 22%.[4,5] Various studies points toward possible connections of childhood overweight/obesity with social and psychological

characteristics (e.g. anxiety, depression, social withdrawal etc.).[6,7] Factors leading to increased incidence of overweight and obesity among children in India include lesser outdoor physical activity, increased television and screen time use, children living in urban area, and high family income.[8-13] The purpose of the study was to compare the prevalence of obesity among urban and rural school going children of adolescent age in district of Vadodara and also to study various predisposing factors.

METHODS

The present study is a cross –sectional, observational and questionnaire- based study conducted at rural and urban private schools of Vadodara, Gujarat. The study was conducted between September to November 2016. School going children of adolescent age group (10 to 18 years of age) were included in the study.

Small pilot study was done with 10 children each from either group to validate the questionnaire. Prior consent and basic demographic information was sought from parents. All the eligible participants were subjected to standardized questionnaire. They were explained each and every question in detail. Height and weight measurement was done, and BMI was calculated and compared with the IAP chart.[8] The data was tabulated and analyzed using SPSS vs. 23.

BMI-for-age weight status categories and the corresponding percentiles were based on expert committee recommendations as Underweight $<5^{th}$ percentile, Normal Weight 5^{th} to $<85^{th}$ percentile, Overweight 85^{th} to $<95^{th}$ percentile and Obese $\geq 95^{th}$ percentile.

Independent sample test (Kruskal-Wallis test) was used to compare the distribution of BMI in Urban and rural groups and to compare the distribution of BMI in male and female groups. Spearman's rho was calculated to find out correlation between type of residence and BMI percentiles. Odds ratio was calculated to find out strength of association between type of residence and BMI categories. Comparison was also done between these two groups using Mann-Whitney U test to find out the differences in term of socioeconomic status, food habits and physical activities. Chi square test of association was used to compare categorical variables. p value of <0.05 was considered as statistically significant.

RESULTS

Out of two hundred twenty four (224) eligible adolescent students, (106 from rural and 118 from urban habitat respectively) 36 data record sheets were incomplete so 188 subjects were analyzed. Out of this, 99(52.7%) children were from urban and 89(47.3%) were from rural area.

Age, sex and height distribution were similar in both rural and urban groups. There was significant difference in weight (38.79(22-60) kg in rural vs 48.88(30-68) kg in urban) and BMI (19.39(13.2-29.34) kg/m^2 rural vs 22.79(15.7-27.89) kg/m^2 in urban) distribution among two groups (Table 1).

Table 1: Baseline profile of urban and rural adolescents.

	Urban (n=99)	Rural (n=89)
Male	46(46.46%)	38(42.7%)
Females	53(53.53%)	51(57.3%)
Mean Age in years (range)	13.45 (11-16)	13.53 (10-17)
Mean Weight in kg (range)	48.88 (30-68)	38.79 (22-60)
Mean Height in cm (range)	147.57 (118-168)	143.65 (120-162)
Mean BMI kg/m^2 (range)	22.79 (15.7-27.89)	19.39 (13.2-29.34)
Obese	31 (31.3%)	02 (2.2%)
Overweight	32 (32.3%)	06 (6.7%)
Normal weight	36 (36.4%)	75 (84.3%)
Underweight	0 (0%)	06 (6.7%)

Authors found significant difference (p <0.0001) in the distribution of different BMI categories among urban and rural males, similarly significant difference (p <0.0001) was there in the distribution of different BMI categories among urban and rural females (Table 2). A positive correlation was found between type of residence and BMI categories which was statistically significant (p <0.001). The difference between male and female groups for distribution of BMI categories was statistically not significant (p=0.129).

Table: 2 Gender wise comparison of distribution of overweight and normal weight of two groups.

	Obese and overweight	Normal weight	p value
Urban male	30(65.22%)	16(34.78)	< 0.0001
Rural male	6(15.78%)	31(81.57%)	
Urban female	33(62.26%)	20(37.73%)	<0.0001
Rural female	2(03.92%)	44(86.27%)	

To determine the factors responsible for this statistically significant higher prevalence of obese and overweight children in urban group, analysis of distribution of socio-economic factors, level of physical activities and eating habits of children belonging to these two groups were compared. These two groups showed statistically significant (p < 0.05) differences in term of annual income of family, frequency of physical training sessions conducted in schools, frequency of restaurant and school canteen food (Table 3).

Table: 3 Comparison between urban and rural children for various risk factors.

Factor of comparison	p value
Parental Annual income	<0.001
Total meals per day	0.410
Frequency of Food from school canteen	0.011
Frequency of Restaurant food	<0.001
Frequency of Consumption of cold drink	0.470
Fast food frequency	0.067
Frequency of physical trainings in school	0.001
Frequency of Physical activity at home	0.284
Time spent in Television watching	0.062
Time spent with computer	0.912

To find out the strength of association between type of residence and BMI categories, the odds ratio (OR) was calculated and the OR was 17.7 (95% CI of 7.6 to 40.7).

The comparison between children belonging to higher BMI (obese and overweight) and normal BMI enabled us to determine the factors responsible for development of overweight and obesity. Statistically significant differences were found between these two groups in terms of parental annual income, number of meals per day and frequency of restaurant food (Table 4).

Table 4: Comparison between children belonging to higher BMI (obese and overweight) and normal BMI for various ordinal variables.

Factor of comparison	p value
Parental Annual income	<0.001
Number of meals per day	0.016
Frequency of Food from school canteen	0.460
Frequency of Restaurant food	<0.001
Frequency of Consumption of cold drink	0.074
Fast food frequency	0.092
Frequency of physical trainings in school	0.947
Frequency of Physical activity at home	0.357
Time spent in Television watching	0.287
Time spent with computer	0.432

Neither of the categories higher BMI (obese and overweight) and normal BMI showed any statistically significant association with factors mentioned in Table 5 (viz. breakfast before school, liking for fast food, involvement in outdoor sports, operating gadgets during meals, having obese family members).

Table: 5 Comparison between obese and overweight and normal BMI categories for various nominal variables.

	Breakfast before school		Liking for fast food		Play outdoor sports		Eating with gadgets		Obese family member	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Obese and overweight	49	22	52	18	38	30	39	30	24	43
Normal BMI	90	21	85	27	73	41	60	53	45	70
Pearson chi-square	2.858		0.005		0.872		0.088		0.081	
p value	0.09		0.94		0.35		0.76		0.77	

DISCUSSION

Since last two decades, Indian economy is growing at rapid pace leading to major transitions in lifestyle, demographic pattern, nutritional status and epidemiology of diseases. These change in lifestyle and food habits leads to increased prevalence of obesity and overweight in all age groups.

The prevalence of obesity and overweight increased from 16.3% in 2001 to 19.3% in studies reported after 2010.[15] Therefore, there is increasing trend in prevalence of overweight and obesity among children and adolescents in India.

In current study the prevalence of obese, overweight, normal and underweight children was 17.6% (33), 20.2% (38), 59% (111) and 3.2% (6) respectively. The result similar to as reported by Khadilkar et al.[16] Prevalence of obesity among male 17(20.2%) was slightly higher vs. female 16(15.4%) but statistically not significant and similar to the result reported by Khadilkar et al 12.4 vs 9.9%, Harish Ranjani et al, and Sidhu et al 5 vs 6 %.[9,16,17]

There was statistically significant difference (p <0.001) between urban and rural groups for the distribution of BMI categories A and B.

Among urban children 31.3% were obese while 63.6% were either obese or overweight as compared to only 2.2% obese and 8.9% either obese or overweight among rural children. The OR of 17.7 (95% CI of 7.6 to 40.7) favors urban adolescents for risk of obesity.

A similar study done by Saraswathi et al among children of Mysore also found the prevalence of obesity and overweight among urban children 10 times higher than rural children (8.75% vs. 0.8%).[18]

On analyzing the factors responsible for higher prevalence of obese and overweight children in urban group, it was found that higher familial income, frequency of restaurant and school canteen food and lesser frequency of physical training sessions conducted in schools are the factors significantly associated.

The study by Goyal et al and Kotian et al also indicated toward higher prevalence of overweight and obesity among children of higher and middle socioeconomic status.[11,19-21] Reduced Physical activity at school is significantly related with overweight and obesity as also reported in other studies.[20,22]

Skipping breakfast, liking for fast food and involvement in outdoor sports activity or operating gadgets (TV viewing or using mobiles) during meals have not been found significantly associated with obesity or overweight. In one of the studies by Nicole et al a strong association was reported.[22]

Obesity running in families is a well-known entity probably either due to genetic or lifestyle factors, but current study did not find any such relation. This may be due to limitation of this study as it did not include objective criteria of familial obesity (e.g. weight, height, BMI, body fat composition etc.), perception of ones' own look may vary and be very subjective.

The limitation of this study was that it did not determine a causal association. The present study did not include nutritional assessment of adolescents and their families, preventing further assessment of their life style.

ACKNOWLEDGEMENTS

Authors would like to thank Mr. Bharat Patel and Mr. Deepak Puri for their support during the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Pathak S, Modi P, Labana U, Khimyani P, Joshi A, Jadeja R, et al. Prevalence of obesity among urban and rural school going adolescents of Vadodara, India: a comparative study. Int J Contemp Pediatr 2018;5:1355-9.