

# Correlates of Overweight and Obesity Among Urban Adolescents in Bihar, India

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## ABSTRACT

**Background:** For better perception of adolescent overweight and obesity as a global public health problem, systematic collection of baseline data is urgently needed in India. **Objective:** A community-based study was undertaken for better perception of the prevalence and correlates of obesity in an adolescent urban community in Katihar, Bihar. **Materials and Methods:** A cross-sectional study was conducted among urban adolescents in the eastern part of India to find out prevalence of overweight and obesity and sociodemographic correlates by interview technique followed by clinical examination with ethical consideration. **Results:** Out of 400 adolescent study participants, 21% were overweight or obese. The study showed that there was a significant association between less consumption of vegetable foods, fruits, meals cooked outside the home, alcohol consumption, yoga practice, socioeconomic status, and the occurrence of overweight/obesity in the adolescents. **Conclusions:** We attempted to find out the prevalence and risk correlates of overweight and obesity among adolescents and found it quite alarming compared to developed countries. The urban underserved population in India has difficulty to access quality healthcare and not conscious enough to seek healthcare until critically ill. Community-based studies are required to highlight the problem of obesity among urban adolescents by a comprehensive approach.

**Keywords:** Adolescent, Bihar, obesity, urban

## Introduction

Adolescents comprise about 20% of the global population of which 80% percent live in the developing countries. In India; about 230 million, which is calculated to be 23% of the total population, are adolescents. Overweight and obesity are progressively important public health problem of global significance. Obesity has reached a pandemic proportion with more than 1 billion of them have grown up as adult overweight; of them nearly 300 million have been noted to be clinically obese. Urbanization, modern life, altered dietary habits, and lifestyle practices among adolescents contributing to the emerging chubbiness trends predisposing to adult overweight and obesity.<sup>[1]</sup>

Adolescence, as considered by World Health Organization (WHO) as from 10 to 19 years, currently recorded a prevalence of 20% in UK and Australia, 15.8% in Saudi Arabia, 15.6% in Thailand, 10% in Japan, and 7.8% in Iran.<sup>[2]</sup>

Although the growing prevalence of overweight and obesity has received much attention in the recent years, there is a dearth of data in India, partly because of the persisting high prevalence of undernutrition. Representative national data on adolescent overnutrition is lacking even from National Family Health Survey and District Level Household and Facility Survey for which on this important parameter by the Government of India will be formulated.

Although the growing prevalence of overweight and obesity among adolescent population has received much attention in the recent years, there is a dearth of data in India, partly because of the persisting high prevalence of under nutrition.

In the above scenario, this community-based study was undertaken to find out the prevalence and correlates of overweight and obesity in an adolescent urban community in Katihar, Bihar.

## Materials and Methods

This cross-sectional study was conducted amongst the adolescents (10–19 years) residing in the urban community

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under Katihar Municipal Area in Bihar to find out prevalence of overweight and obesity with their sociodemographic correlates from October 2010 to September 2011.

### Sampling method

Considering the prevalence of overweight and obesity among adolescents in the urban area as 20%,<sup>[1]</sup> the sample size was calculated to be 400 ( $P = 20\%$ ,  $L = 20\%$  of  $P$ ). By 30 clusters, study participants were sampled by probability proportional to size (PPS) method.

### Study instrument

The data collection tool used for the study was an interview schedule that was developed at the institute with the assistance from the faculty members and other experts in relation to overweight and obesity in the adolescent population with the sociodemographic situation prevailing in India. This pre-designed and pretested questionnaire contained questions relating to the information on family characteristics such as residence, type of family, family history of diabetes mellitus, and family history of chronic disease; income and personal characteristics such as age, sex, education, occupation, and dietary habit including salt intake physical activity and addiction. By initial translation, back-translation, retranslation followed by pilot study, the questionnaire was custom-made for the study. The pilot study was carried out at the institute among general subjects following which some of the questions from the interview schedule were modified.

### Data collection procedure

Study was approved by Institutional Ethics Committee and informed verbal consent was obtained from all participants. The health workers informed and motivated the families to participate in the study along with the scope of future intervention, if necessary. All the participants were explained about the purpose of the study and were ensured strict confidentiality, and then informed consent was taken from each of them before the total procedure. The participants were given the options not to participate in the study if they wanted. Data regarding family and personal characteristics were recorded by face-to-face personal interview. The weight and height of each child were recorded.

### Case definitions used in this study

#### Overweight and obesity

Height was measured by a WHO approved wall-mounted height measuring scale and a calibrated and standardized mechanical weighing scale was used. Overweight and obesity were defined by body mass index (BMI) for gender and age. BMI >85<sup>th</sup> percentile of reference data were considered overweight and with a BMI >95<sup>th</sup> percentile were considered obese.<sup>[3]</sup> The reference data used to identify the cut-off points were taken from the Centers for Disease Control and Prevention (CDC) 2000 dataset for BMI.<sup>[4,5]</sup>

### Physical activity

Those engaged in running, fast walking, cycling, biking, dancing, and playing football for at least 60 min/day on 5 or more days per week are defined as physically active. Those who failed to fulfill the following criteria are considered as insufficiently physically active.<sup>[6]</sup>

### Smoking

Smoker was defined by any history of single puff of smoking by the participant in the last 30 days.<sup>[7]</sup>

### Alcohol consumption

A “current drinker” was defined as one who consumed one or more drinks of any type of alcohol in the year preceding the study.

### Dietary practice

Dietary practices was assessed by using semiquantitative food frequency questionnaire and the average amount and frequency of consumption of obesogenic (like fast food, cold drinks, ice cream, sweets, ghee, butter, and red meat) and protective foods (fruits and vegetables) in last week; consumption of three servings or more per week or not was calculated.<sup>[8]</sup>

Principal investigator collected the data; on an average, five to six interviews were conducted per day. Information on obesity was disseminated to participants and their caregivers in health education sessions to complement the findings of study.

### Statistical analysis

The collected data were thoroughly cleaned and entered into MS Excel spreadsheets for analysis. The statistical analyses were done using Graph Pad In Stat “version 3” software. Categorical variables were presented as percentage and chi-square tests were applied to analyze epidemiological variables at alpha level of  $P < 0.05$ .

## Results

Among 400 adolescents, majority were of 15 years of age; males were 242 (60.5%); 82 (20.5%) respondents were overweight/obese and 318 (79.5%) respondents were not overweight/obese. Out of 82 overweight/obese adolescents, 68 (17%) were overweight and 14 (3.5%) were obese [Table 1].

Most of the participants (60.25%) were educated upto primary level, and only 32 (8%) were educated upto higher secondary

**Table 1: Overweight/obesity among participants (n=400)**

Age in years	10-12		13-15		16-19		Total (%)
	Male	Female	Male	Female	Male	Female	
Normal	22	5	86	60	98	47	318 (79.5)
Overweight	10	13	8	10	13	14	68 (17)
Obese	1	3	3	2	1	4	14 (3.5)
Total	33	21	97	72	112	65	400 (100.0)

level; mostly from lower middle class (39%), 129 (32.25%) were from upper lower class. Majority of them (70.5%) consumed fruit occasionally; 25 (6.25%) consumed fruit daily, 76 (19%) consumed fruit three to four times/week, and the remaining 17 (4.25%) did not consume fruit. In the majority (69.75%), percentage of weekly meals consisting of food cooked outside the home was <25%. In 102 (25.5%) of the respondents it was 25–50%, in eight (2%) of the respondents it was >50%, and remaining 11 (2.75%) respondents did not consume outside food. Out of 400 adolescents, 62 (15.5%) practiced yoga and 46 (11.5%) used tobacco [Table 2].

There was significant association between less consumption of vegetable and occurrence of overweight/obesity (chi-square =7.73, degrees of freedom (df) =2, P < 0.05), less consumption of fruit and overweight/obesity (chi-square=42.3, df =3, P < 0.001), consumption of meals cooked outside the home and overweight/obesity (chi-square=16.32, df =2, P < 0.002), and no yoga practicing and overweight/obesity (chi-square (Yate’s corrected) =7.89, df =1, P < 0.01); alcohol consumers were 4.98 times more at risk than nonconsumers [Table 3a].

Parameters (n=400)	Frequency (%)
<b>Socioeconomic status</b>	
Upper	45 (11.25)
Upper middle	56 (14)
Lower middle	156 (39)
Upper lower	129 (32.25)
Lower	14 (3.5)
<b>Education</b>	
Illiterate	2 (0.5)
Just literate	16 (4)
Primary	241 (60.25)
Secondary	109 (27.25)
Higher secondary	32 (8)
<b>Nature of work</b>	
Sedentary	384 (96)
Moderate	16 (4)
<b>Fruit consumption</b>	
Daily	25 (6.25)
3-4 times/week	76 (19)
Occasionally	282 (70.5)
Never	17 (4.25)
<b>Smoking</b>	
Smokers	46 (11.5)
Nonsmokers	354 (88.5)
<b>Alcohol intake</b>	
Positive	2 (0.5)
Negative	398 (99.5)
<b>Dietary habit</b>	
Nonvegetarian	34 (8.5)
Vegetarian	349 (87.25)
<b>Yoga</b>	
Yes	62 (15.5)
No	338 (84.5)

There was significant association between the socioeconomic status and the occurrence of overweight/obesity (chi-square =33.81, df =3, P < 0.002) [Table 3b].

## Discussion

In the present study, one-fifth had over-nutrition. Hyderabad study found prevalence of overweight of 6.1% among boys and 8.2% among girls; prevalence of obesity was 1.6 and 1.0%, respectively.<sup>[9]</sup> The Kerala study reported that overweight children increased from 4.94% in 2003 to 6.57% in 2005.<sup>[10]</sup> The prevalence of childhood obesity was lower than comparable studies.<sup>[11-15]</sup>

## Vegetable consumption

A significant association between less consumption of vegetable foods and occurrence of over-nutrition was noted by us. An UK

**Table 3a: Risk correlates of overweight and obesity among adolescents**

	Overweight/obesity (%)		Total (%)	Chi-square value
	Present	Absent		
Food items consumed (vegetables)				
Vegetables				
Regularly	59 (14.75)	264 (66)	323 (80.75)	Chi-square=7.73, df = 2, P<0.05
Sometimes	21 (5.25)	53 (13.25)	74 (18.5)	
None	2 (0.5)	1 (0.25)	3 (0.75)	
Food items consumed (milk product)				
Dairy product				
Regularly	6 (1.5)	29 (7.25)	35 (8.75)	Chi-square=0.52, df=2, P>0.05
Sometimes	68 (17)	264 (66)	332 (83)	
None	8 (2)	25 (6.25)	33 (8.25)	
Fruit consumption				
Daily	3 (0.75)	22 (5.5)	25 (6.25)	Chi-square=42.3, df=3, P<0.001
3-4 times/week	15 (3.75)	61 (15.25)	76 (19)	
Occasionally	50 (12.5)	232 (58)	282 (70.5)	
Never	14 (3.5)	3 (0.75)	17 (4.25)	
Addiction				
Tobacco use				
Yes	6 (1.5)	40 (10)	46 (11.5)	Chi-square=1.77, df = 1, P>0.05
No	76 (19)	278 (69.5)	354 (88.5)	
Percentage of weekly meals of food cooked outside the home				
Never	2 (0.5)	9 (2.25)	11 (2.75)	Chi-square=16.32, df=2, P<0.002
<25%	50 (12.5)	229 (57.25)	279 (69.75)	
25-50%	24 (6)	78 (19.5)	102 (25.5)	
>50%	6 (1.5)	2 (0.5)	8 (2)	
Yoga practice				
Yes	4 (1)	58 (14.5)	62 (15.5)	Chi-square (Yate’s corrected) =7.89, df=1, P<0.01
No	78 (19.5)	260 (65)	338 (84.5)	

df: Degrees of freedom

**Table 3b: Risk correlates of overweight and obesity among adolescents**

	Overweight/obesity (%)		Total (%)	Chi-square value
	Present	Absent		
Socioeconomic status				
Upper	19 (4.75)	26 (6.5)	45 (11.25)	Chi-square=33.81, df=3, P<0.002
Upper middle	22 (5.5)	34 (8.5)	56 (14)	
Lower middle	23 (5.75)	133 (33.25)	156 (39)	
Upper lower	18 (4.5)	111 (27.75)	129 (32.25)	
Lower	0 (0)	14 (3.5)	14 (3.5)	
Nature of physical activity at work				
Light	80 (20)	304 (76)	384 (96)	Chi-square (Yate's corrected) =0.24, df=1, P>0.05
Moderate	2 (0.5)	14 (3.5)	16 (4)	
Educational status				
Illiterate	1 (0.25)	1 (0.25)	2 (0.5)	Chi-square=2.1, df=3, P>0.05
Just literate	4 (1)	12 (3)	16 (4)	
Primary	46 (11.5)	195 (48.75)	241 (60.25)	
Secondary	26 (6.5)	83 (20.75)	109 (27.25)	
Higher secondary	5 (1.25)	27 (6.75)	32 (8)	

df: Degrees of freedom

longitudinal study on parents and children noted that risk factors at 3 years of age junk foods based food habits (fizzy drinks, sweets, chocolates, chips, fried foods, and others) was associated with obesity at 7 years of age; no significant relationship with obesity for a healthy, traditional, or fussy dietary pattern was noted.<sup>[16]</sup> In contrast, Gupta *et al.*, found 84.29% adolescent consume vegetables among rural adolescent in Bengal.<sup>[17]</sup>

### Fruit consumption

There was a significant association between less consumption of fruit and the occurrence of overweight/obesity in the adolescents. Yusuf *et al.*, showed that abnormal lipids; smoking; hypertension; diabetes; abdominal obesity; psychosocial factors; consumption of fruits, vegetables, and alcohol; and regular physical activity accounted for most risks.<sup>[18]</sup>

### Meals cooked outside

The study revealed that proportion of overweight/obesity was significantly high among those consuming cooked food from outside. Tiwari and Sankhala from Rajasthan reported that higher consumption of outside food was linked with overweight in urban adolescent girls.<sup>[19]</sup>

### Role of yoga and physical inactivity

This study showed that there was significant association between no yoga practicing and physical inactivity with the occurrence of overweight/obesity in the adolescents. A study observed that lack of physical activity and high consumption of junk food was found to be associated with obesity in children.<sup>[20]</sup> A Karnataka study demonstrated that overweight was twice higher among adolescents of high socioeconomic status, 21 times higher

among those participating less than 2 h/week of physical activity, 7.3 times higher among television watchers and playing games on the computer for more than 4 h/day.<sup>[21]</sup> Another study from Karnataka found high energy snacks and lack of physical activity as the important influencing factors.<sup>[22]</sup>

### Role of alcohol consumption

We observed a significant relationship between adolescent's overweight and obesity with consumption of alcohol. However, significant relationship was not reported in the Balearic Islands comparable study.<sup>[23]</sup> Recent USA data indicated that female and male adolescents report similar rates for current drinking, 13.5 and 13.7%, respectively.<sup>[24]</sup>

### Smoking

Smoking was not significantly associated with the obesity in the present study. In a review of 19 studies, Potter *et al.*, noted a positive relationship between smoking and body weight among adolescents,<sup>[25]</sup> yet others did not find a positive association.<sup>[25-31]</sup>

### Socioeconomic status

The study showed a significant association between socioeconomic status and overweight/obesity among adolescents. Wang *et al.*, reported that the prevalence of obesity and overweight was 11.1 and 14.3% in United States; 6.0 and 10.0% in Russia; and 3.6 and 3.4% in China; respectively; relationship between obesity and socioeconomic status varied across countries. Higher socioeconomic status subjects were more likely to be obese in China and Russia, but in the USA, low socioeconomic status groups were at a higher risk.<sup>[32]</sup>

### Strengths of the study

To the horizon of our knowledge, no related publication on adolescent lifestyle has been reported so far from in this part of Bihar.

### Limitations of the study

We had several limitations. Firstly, a larger sample size could have provided more vital information, due to resource constraint that could not be achieved. Further, the study survey was cross-sectional with no causal inferences possible.

### Future directions of the study

Any short-term solution may not help us to reach the goal of control of obesity-related diseases in a multicultural, multilingual, and geographically uneven country like India. Further, health professionals alone are unable to deal with this mammoth task. Strategic interventions to obviate the cause for noncompliance to intervention need holistic responsibility of professionals, health services, governments, and teaching institutions. For a substantial impact on this burden, unique preventive healthcare strategies need to be clearly formulated and tested. Behavior change communication supported by the screening is important

for early detection to prevent complications is needed initiated by the political will.

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