Study to Evaluate the Risk Factors of Overweight and Obesity among Higher Secondary School Children in Muzaffarpur, Bihar

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Abstract

Background: Overweight and obesity are risk factors for diet-related non-communicable diseases. These diseases are the fifth leading risks for global deaths. Virtually, all age groups are affected bythe consequences of overweight and obesity.

Aims and Objectives: This study was undertakento evaluate risk factors of overweight and obesity among higher secondary school adolescents.

Methodology: A cross-sectional study was conducted among 492 school adolescents of the government sector six higher secondary schools in Muzaffarpur. This study measured height, weight and plotted Body mass Index on CDC (Child Development Centre) charts. Factors affecting obesity like physical and sedentary activities (using Bharathy et al. questionnaire) and school-based risk factors were also studied.

Results: Based of measurements taken risk factors for overweight and obesity in 492 higher secondary school students, the estimated provincial prevalence of overweight was found to be 9.7%, obesity 3%, and malnutrition 18% respectively. Students involved in household chores for 4 hours or more a week were associated with a decreased risk of overweight (OR 3.97, 95% CI 1.41-11.03) and those with less activity were at increased risk for obesity (OR 6.59, 95% CI 1.83-21.19).

Conclusion: The problems of overweight and obesity are taking place while students are still at the risk of underweight. Several factors were correlated with overweight and obesity. Therefore, interventions targeting gender, frequency of eating food out of home, vigorous activities, and frequency of doing the vigorous physical activity are recommended.

Keywords: *Obesity, Body mass index (BMI), overweight, physical measurements*

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Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation, resulting in weakening the health of an individual [1-3]. The epidemic of overweight and obesity reflects the changes in society and behavioral patterns of communities over recent

decades. Even if genes are important in determining a person's susceptibility to weight gain, energy balance is also a factor for overweight and obesity. Societal changes and worldwide nutrition transition are driving the overweight/obesity epidemic [4, 5]. Adolescence is a vulnerable period for the development of obesity and the weight of adolescents' tracks strongly into adulthood [6]. Adolescent overweight and obesity are increasing globally, raising the threat of long-term illness in later adulthood [7,8]. Overweight and obesity are a result of an imbalance between energy intake and expenditure with an increase in energy balance being closely associated with the lifestyle adopted and the dietary intake preferences [9].

A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight. Overweight and obesity are major risk factors for several chronic diseases, including diabetes, cardiovascular diseases and cancer. Once considered a problem only in high-income countries, overweight and obesity are now dramatically on the rise in low and middle-income countries, particularly in urban settings. India has >135 million obese individuals at present. Body mass index (BMI) has been used to assess obesity until recent times. By the year 2020, there would be 158 million obese children in the world, 206 million by 2025 and the figure would reach 254 million by 2030. In fact, after China, India will have the most number of obese children at 27,481,141 or 27 million, far ahead of the US at 17 million [10].

Although the growing prevalence of overweight and obesity among secondary school children has received much attention in recent years there is not much data available, so the above study to evaluate risk factors of overweight and obesity among higher secondary school children in Muzaffarpur, Bihar. This evaluation was done to assess the risk factors associated with overweight and obesity among secondary school children.

Materials & Methods

A cross-sectional study was conducted for during May, 2020 to May, 2021. The present study was conducted in randomly selected six higher secondary schools belonging to the Government sector situated in Muzaffarpur. Muzaffarpur is a city located in the Muzaffarpur district in the Tirhut region of the Indian state of Bihar. Children studying in classes XI and XII between the ages of 14 to 18years were included in the study. Informed consent was obtained from the Principal and Parents. Ethical committee approval was obtained. A sample size of 492 students from the government sector schools was included in the study. Baseline parameters like age, sex, and socio-economic status (SES) using Modified Kuppusamy Scale were noted. Height and weight were also recorded in all of them. The height was measured as a distance between the ground and a scale pressed firmly on the child's head and placed horizontally to the ground. Weight was recorded on a digital weighing scale after removing the footwear.

Body mass index (BMI) was calculated using the formula weight in Kg/height in m^2. Over-weight was defined as BMI between 85th and 95th centile according to age and gender specific charts by CDC (Child Development Centre). Obesity was defined as BMI more than 95th centile and under nutrition as BMI less than 5th centile according to the same charts. This value was used as a cut off for statistical analysis. [11] Students were also grouped according to Agarwal charts.[12]

A questionnaire prepared for finding out the 'prevalence and determinants of obesity in higher secondary school children' developed by CDC was given to these students. The questionnaire was filled by the students after a brief introduction by the investigator about how to fill the proforma. The

questionnaire is a structured one on the determinants of obesity. Socio economic status was assessed using Modified Kuppusamy scale. Physical activity was ascertained by asking about daily physical activity during a typical month in a proforma designed by Bharathy et al.[13] Any hobbies at home and house hold chores were also assessed. Secondary activities like reading, TV watching, hobbies were recorded.

Appropriate statistical tests (chi square) and logistic regression were carried out to find the association of variables. Univariate and multivariate analyses were conducted to determine the association between dependent (overweight) and independent (risk factors) variables. Initially, in univariate analysis, a single variable at a time was entered; unadjusted OR and 95% CI were computed for all independent variables. Multivariate analysis with all independent variables entered at the same time was completed to adjust for the effect of confounding, and adjusted OR and 95% CI were computed.

Results

Four ninety two school adolescent studying in the classes XI and XII from six higher secondary schools of the government sector were examined. Out of this 51.82% (255) were girls and 48.17% (237) were boys. Age group ranged from 14 to 18 years in the study population. In boys, height ranged from 157.5cm to 181cm, weight from 40.5 to 82 kg and BMI from 15.35 to 30.09. In girl's height ranged from 151.69 to157.5cm, weight from 48.15 to 50 kg and BMI from 19.33 to 20.79.

Table 1: Gender distribution of overweight andobesity

Sex	Over weight	Obese	%
Male	23	7	30/237 (12.65)
Female	13	10	23/255 (7.84%)
%	36/492 (7.31%)	17/492 (3.45%)	53/492

Out of 237 boys 72% were having normal nutritional status based on BMI, 18% were undernourished, 9.7% were overweight and 3% obese. Out of 255 female students 73% were having normal BMI, 18% were undernourished, 5% were overweight and 4% obese. Out of 17 obese students 59 % were girls. This gender difference was statistically significant (3.2%).

Table 2: NCHS and Agarwal classification of obesity

Category	NCHS	Agarwal
Underweight	84 (17 %)	54 (10.47 %)
Normal	358 (72 %)	391 (79.47 %)
Overweight	34 (7 %)	35 (7.11 %)
Obese	16 (4 %)	12 (2.43 %)

Fifty obese/overweight students were selected and physical activity questionnaire was given to them. Two students were not willing to fill the proforma and 4 proformas were incomplete and thus excluded.

So, a total of 44 obese or overweight children were compared with 52 randomly selected normal children with BMI less than 85th centile.

Table 3: Risk factors for obesity

Risk factors	Significance 95 % CI P value	Odds ratio	95 % CI	
House hold chores	0.02	3.71	1.23	11.2
Sedentary (TV watching)	0.013	5.33	1.43	19.89

The data statistically significant with a p value of 0.02, oddsratio (OR) of 3.71 and 95% confidence interval (CI) of 1.23 to 11.2. Physical activities in the form of games and sports (less than 4 hours in a week) were observed in 75% of cases. Physical activities of more than 4 hours in a week were observed in 25% of cases. But this was not found to be statistically significant. Logistic regression and univariate analysis were also done.Multivariate analysis was done to rule out confounding factors which can affect the result. House hold factors and sedentary activities were found to be significant.

Discussion

According to the findings of this study the prevalence of overweight and obesity was 7.31 % and 3.45 %, respectively, resulting in the prevalence of overweight and obesity together, 10.76 %. This was found to be statistically significant. The difference may be due to the fact that the students mainly belong to affluent classes belonging to upper and middle SES. In India, there is a tremendous urban/rural and rich/poor divide. Prevalence among urban rich being much higher than rural and poor communities.Overweight and obesity among children is progressing towards epidemic level. Even relatively small increase in body weight, has its influence on cardio cerebral

morbidity and mortality. Till now in India the priority of pediatrics studies were focused on prevalence of Malnutrition.[14] Data from National Health survey has shown that approximately 30% children from US were overweight and obese which is greater than the prevalence in India (10%) as shown by IOTF (Indian Obesity Task Force). A similar study was showing the prevalence of overweight as 7.5% and obesity as 3% almost comparable to our study.[15] The prevalence of overweight (24.4%) and obesity (8.9%) was reported at age 15.[16]

In present study this difference was not apparent probably due to socio economic condition in Bihar where there is no much drastic difference between different SES groups unlike other states. In a review article SES has shown to have inverse relationship with obesity in developed countries, which is not consistent with men and children of the same society, but in developing countries it is showing a strong direct relationship which is well reflected in our study.

Conclusion

Obesity is increasing among school children and demands preventive strategies. This study is one of the few conducted in Muzaffarpur, Bihar that have analyzed risk factors associated with overweight and obesity among adolescent students and it also

compares the association of these risk factors with prevalence of obesity and overweight. Therefore, the government, the schools, and the families need to collaborate to improve the health of the students.

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References

1. H. Ranjani, T. Mehreen, R. Pradeepa et al., "Epidemiology of childhood overweight & obesity in India: a systematic review," Indian Journal of Medical Research, 2016; 143(2):160–174.

2. A. H. Bereket, M. Beyero, A. R. Fikadu, and T. Bosha, "Risk factors for overweight and obesity in private high school adolescents in Hawassa city, Southern Ethiopia: a case-control study," Food Public Health.2017; 7(2): 29-34.

3. J. Sun, Y. Wang, X. Zhang, and H. He, "effects of met-formin on insulin resistance in overweight or obese children and adolescents: a PRISMA-compliant systematic review and meta-analysis of randomized controlled trials," Medicine.2019; 98(4):142-49

4. WHO, Global Action Plan on Physical Activity 2018-2030: More Active People for a Healthier World, World Health Organization, Geneva, Switzerland, 2019.

5. L. B. Sardinha, R. Santos, S. Vale et al., "Prevalence of overweight and obesity among Portuguese youth: a study in a representative sample of 10–18-year-old children and adolescents," International Journal of Pediatric Obesity, 2011 ;(6): e124–e128.

6. E. Alemu, A. Atnafu, M. Yitayal, and K. Yimam, "Prevalence of overweight and/or obesity and associated factors among high school adolescents in Arada Sub city, Addis Ababa, Ethiopia," Journal of Nutrition & Food Sciences;2014 (4): 21.

7. Y. Wang and T. Lobstein, "Worldwide trends in childhood overweight and obesity," International Journal of Pediatric Obesity.2006; (1):11–25.

8. M. D. Schmidt, T. Dwyer, C. G. Magnussen, and A. J. Venn, "Predictive associations between alternative measures of childhood adiposity and adult cardio-metabolic health," International Journal of Obesity.2011 ;(35) 1:38-45.

9. K. Sahoo, B. Sahoo, A. K. Choudhury, N. Y. Sofi, R. Kumar, and A. S. Bhadoria, "Childhood obesity: causes and consequences," Journal of Family Medicine and Primary Care.2015;(4) 2: 187-192.

10. NCD Risk Factor Collaboration. Worldwide trends 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):2627-2642.

11. Laitinen J, Power C, Järvelin M-R Family social class, maternal body mass index, childhood body mass index, and age at menarche as predictors of adult obesity. Am J ClinNutr 2001;74:287–94.

12. Agarwal KN, Saxena A, Bansal AK, Agarwal DK. Physical growth assessment in adolescence. Indian Pediatr. 2001; 38(11):1217-35.

13. Bharathi AV, Sandhya N, Vaz M. The development and characteristics of a physical activity questionnaire for epidemiological studies in urban middle class Indians. Indian J Med Res. 2000; 111:95-102.

14. Stigler MH, Arora M, Dhavan P, Tripathy V, Shrivastav R, Reddy KS et al. Measuring obesity among school-aged youth in India: A comparison of three growth references. Indian Pediatr. 2011; 48:105-10.

15. S. K. Muthuri, L.-J. M. Wachira, V. O. Onywera, and M. S. Tremblay, "Correlates of objectively measured overweight/obesity and physical activity in Kenyan school children: results from ISCOLE-Kenya," BMC Public Health.2014 ;(14)1: article 436.

16. G. B. Gebregergs, M. E. Yesuf, and T. K. Beyen, "Overweight and obesity, and associated factors among high school students in gondar town, North West Ethiopia," Journal of Obesity & Weight Loss Therapy.2013; (3):165.