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Original Research Article

Prevalence of overweight and obesity among rural school children aged between 6 years to 16 years

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ABSTRACT

Background: The rise of childhood overweight and obesity in India is not only restricted to urban localities but fast spreading to rural areas due to lifestyle change and economic transition. Effective preventive measures will prevent the risk of developing chronic diseases like diabetes, hypertension etc., in adult life. This study aimed at assessing the prevalence of overweight and obesity and estimate the various factors influencing on it among school children in rural area.
Methods: A cross-sectional study was conducted among 542 school children of age 6-16 years from selected schools of B. G. Nagara. Research tool comprised of questions about demographic characteristics, type of physical activity, screen time, height and weight were measured on calibrated scales and BMI was assessed using IAP-growth charts. Statistical analysis was done using statistical package for social sciences (SPSS) 22 version statistical software.
Results: Overall, the prevalence of overweight and obesity was 12.9% and 7% respectively. The prevalence of overweight was more in girls (13.6%) than boys (11.3%), whereas the prevalence of obesity was more in boys (8.2%) than girls (5.6%). Association of overweight and obesity with socio-economic status, parental obesity, type of food consumption, screen time, daily physical activity in children revealed a strong statistically significant correlation ($p<0.001$).
Conclusions: The prevalence of overweight is higher than obesity with statistically significant correlation with various factors, revealing the need for public awareness and initiation of preventive measures for development of obesity and the complications related to it.

Keywords: Rural school children, Overweight, Obesity, Body mass index

INTRODUCTION

When we think about malnutrition, possibly the images that come to mind are the one associated with poverty and under nutrition. However today as standards of living continue to rise, weight gain and obesity are posing a growing threat to the world health.

There is an alarming increase in prevalence of obesity worldwide where these non-communicable diseases have behaved like communicable diseases and have hit developing countries along with developed countries in the last decade. Obesity can be seen as the first wave of a defined cluster of non-communicable diseases called new world syndrome creating an enormous socio-economic and public health burden in poorer countries.[1]

Overweight and obesity are a global pandemic according to WHO report; the global prevalence estimated that 41 million children under 5 years were overweight or obese in 2016, wherein the prevalence has risen dramatically from just 4% in 1975 to over 18% in 2016.[2] The International obesity task force (IOTF) has calculated the 10% global prevalence of obesity in children of 5-17

years. India is the third most obese country in world. According to National family health survey-5, 23% of females and 25% males are considered obese in India.[3]

Etiopathogenesis of childhood obesity is multifactorial and increase in prevalence of childhood obesity is associated with potential medical complications in adolescence and especially in adulthood like hypertension, coronary artery disease, cerebrovascular accidents, diabetes mellitus type 2, dyslipidaemia, gall stones, premature joint destruction and many others.[4]

Although many studies are conducted all over the country, which suggest that childhood obesity is quite alarming in India. Most of the studies till now are conducted in urban affluent schools and the trend in rural areas have not been studied in detail so far. Hence an attempt was made to study the prevalence of childhood overweight/obesity and its association with age, gender, socioeconomic status, diet, physical activity and screen time among school going children of B. G. Nagara, which is located in rural Mandya of Karnataka state.

This study formed a basic data which helped to design suitable school-based programme of physical activity and nutritional education. Early detection, preventive measures and modifying the risk factors can protect the children from developing complications, thereby reducing the morbidity and mortality.

METHODS

A cross-sectional study was conducted in school going children of age 6-16 years, studying in schools, affiliated to our Adichunchanagiri institute of medical college, B. G. Nagara, rural Mandya, Karnataka, India, during the period between February 2020 to September 2021 comprising of total 542 students. Four private unaided Schools affiliated to our medical college was selected by simple random sampling technique. Sample size was calculated using formula,

$$n=\frac{4pq}{d^2},$$

where,

p=prevalence of overweight/obesity in school going children based on recent study done by Premkumar et al and sample size obtained=540-545.[5]

Permission of the principal of the school was taken before starting the study and prior consent was taken from parents and students of the school for participation in our study. All healthy school children between age group of 6-16 years were included. Any children having chronic illness, endocrinal problems, physical and mental defects were excluded from study.

The students were given in pre-designed structured questionnaire which consisted of questions to be answered by the student. The questionnaire was explained to the students beforehand. It included demographic description, annual income, family history, dietary habits, activity pattern, screen time, weight and height measurement for BMI calculation. Socio-economic status was assessed by using modified B. G. Prasad classification.

Height was measured barefoot in Frankfurt to plane to the nearest of 0.1 cm using a standard calibrated bar. Weight was measured without any footwear with minimal clothing (school uniforms) to the nearest of 0.1 kg using a standard portable weighing machine and the scale will be zeroed before each session. Body mass index was calculated with formula,

$$\text{BMI}=\frac{weight\ (kg)}{height\ (m^2)},$$

and plotted on IAP percentile charts 2015.[6] A child was considered to be, obese: BMI ≥27th adult equivalent cut off, overweight: BMI ≥23rd adult equivalent cut off, normal: BMI 5-85th centile, underweight: BMI <5th centile with cut-off point which was specific to the age and sex of the child.

Data entry was done in Microsoft excel sheet. Statistical analysis was done using statistical package for social sciences (SPSS) 22 version statistical software. Student t test (two tailed, independent) had been used to find the significance of study parameters on continuous scale between two groups (inter group analysis) on metric parameters. Chi-square/Fisher exact test was used to find the significance of study parameters on categorical scale between two or more groups, non-parametric setting for qualitative data analysis. Fisher exact test used when cell samples are very small. P≤0.01 was strongly and statistically significant.

RESULTS

The overall prevalence of overweight in 542 study subjects of children aged 6-16year age group was 12.9%, followed by obesity of 7%. Males were more obese than females with prevalence of 8.2% and 5.6% whereas, females were more overweight than males with prevalence of 13.6% and 11.3% (Table 1).

The prevalence of overweight and obesity is higher in upper socio-economic status group (73.9% and 89.7%) than the lower socio-economic status group with significant correlation. Majority of children with parental obesity had increased prevalence of overweight and obesity (75.4% and 74.4%) with statistically significant (p<0.001). Children belonged to nuclear family had overweight (65.2%) when compared to joint family (34.8%) having an association with only suggestive statistically significance (p=0.053+) (Table 2).

In present study, 75.4% (52) and 84.6% (33) of children with overweight and obesity consumed mixed type of food whereas 24.6% and 15.4% of children with overweight and obesity consumed vegetarian type of food.[6,17] There was moderate statistical significance between the two variables with p=0.016* (Figure 1).

Table 1: Overall BMI interpretation of study population.

BMI interpretation	Gender		Total
	Female	Male	
	N (%)	N (%)	N (%)
Underweight	5 (2)	3 (1)	8 (1.5)
Normal	196 (78.4)	230 (78.8)	426 (78.6)
Overweight	36 (13.6)	34 (12)	70 (12.9)
Obese	14 (6)	24 (8.2)	38 (7)
Total	250 (100)	292 (100)	542 (100)

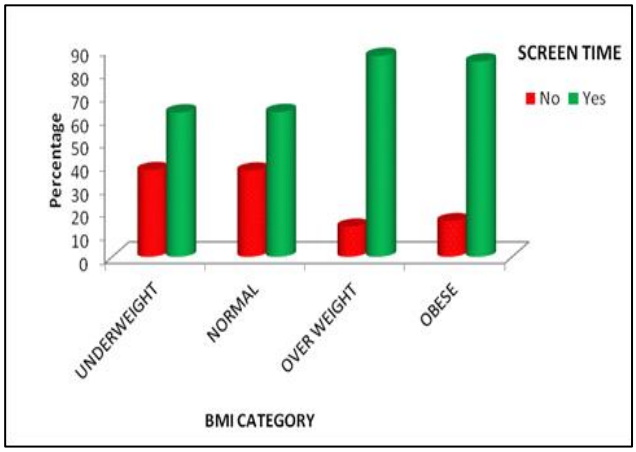

Figure 1: Association of type of food consumption in relation to overweight and obesity.

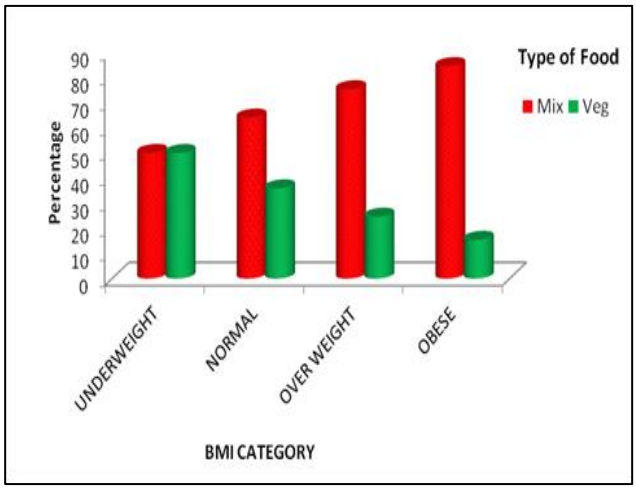

Figure 2: Association of screen time in relation to overweight and obesity.

Children who viewed TV, played computer more than two hour in a day showed higher potential of developing overweight/obesity (87%, 84.6%) than children viewed TV/played computer less than two hour in a day with strong statistical significance with p<0.001 (Figure 2).

According to the Table 3, 71% and 61.5% children were overweight and obese with decreased outdoor physical activity signifying that decreased outdoor physical activity, increases the prevalence of overweight and obesity in children with strong statistical significance with two variables. Also, children with increased sedentary activity had more prevalence of overweight and obesity with 84.1% and 69.2% compared to 15.9% overweight and 30.8% obese children with no sedentary activity with strong statistical significance (p<0.001). Whereas when comparing the association of indoor games in relation to overweight and obesity there was no statistical significance.

DISCUSSION

India is undergoing a rapid epidemiological transition. The burden of noncommunicable diseases is overtaking the burden of infectious diseases. Life style transition and economic improvement have contributed to childhood obesity. There had been a dramatic increase in the past 30 years in adiposity and excess body weight relative to height in young children and adolescents.

The use of dual X-ray absorptiometry and other imaging techniques for mass screening and identifying children at risk for obesity-related problems is not possible. Anthropometric indices were extremely useful, cost-effective and time-saving tools for determining a child's nutritional status.

In our study, we found that out of the total 542 children aging from 6 to 16 years, the overall prevalence of overweight and obesity was 12.9% and 7% according to the IAP classification using BMI centiles which was similar to study conducted in rural schools of Neelambur village, Coimbatore by Shanmugam et al where the overall prevalence of overweight and obesity was 8.32% and 4.72% but they used WHO standard charts.[7] The study conducted by Kumar et al in schools of Devanahalli, Bengaluru revealed that the overall prevalence of overweight and obesity was 3.19% and 2.04% signifying the prevalence of overweight more than obesity.[8]

In our study population, males were more obese than females with prevalence of 8.2% and 5.6% whereas, females were overweight than males with prevalence of 13.6% and 11.3%. similar studies done by Mudur et al in three major Indian cities found that more girls were overweight than boys.[9] On the contrary studies by Kapil et al indicated that the prevalence of obesity was lower in girls (6%) as compared to boys (8%).[10] All these studies therefore indicated that the sex of the child had an influence on the prevalence of overweight and obesity.

Table 2: Comparison of age in years, gender and SES according to BMI category of students studied.

Variables	BMI category				P value
	Underweight	Normal	Over weight	Obese	
	N (%)	N (%)	N (%)	N (%)	
Age in years					
6	1 (12.5)	36 (8.5)	0 (0)	0 (0)	0.017*
7	0 (0)	41 (9.6)	3 (4.3)	2 (5.1)	0.315
8	0 (0)	38 (8.9)	3 (4.3)	2 (5.1)	0.408
9	0 (0)	40 (9.4)	8 (11.6)	2 (5.1)	0.558
10	0 (0)	48 (11.3)	7 (10.1)	3 (7.7)	0.684
11	1 (12.5)	48 (11.3)	9 (13)	8 (20.5)	0.405
12	2 (25)	44 (10.3)	10 (14.5)	1 (2.6)	0.133
13	3 (37.5)	46 (10.8)	8 (11.6)	6 (15.4)	0.110
14	0 (0)	37 (8.7)	9 (13)	4 (10.3)	0.530
15	1 (12.5)	27 (6.3)	8 (11.6)	7 (17.9)	0.039
16	0 (0)	21 (4.9)	4 (5.8)	4 (10.3)	0.478
Gender					
Female	5 (2)	196 (78.4)	36 (13.6)	14 (6)	0.560
Male	3 (1)	230 (78.8)	34 (12)	24 (8.2)	
Social economic status					
Lower class	2 (25)	42 (9.9)	2 (2.9)	0 (0)	<0.001**
Lower middle class	5 (62.5)	231 (54.2)	16 (23.2)	4 (10.3)	
Upper middle class	1 (12.5)	153 (35.9)	51 (73.9)	35 (89.7)	
Type family					
Nuclear family	2 (25)	221 (51.9)	45 (65.2)	18 (46.2)	0.053+
Joint family	6 (75)	205 (48.1)	24 (34.8)	21 (53.8)	
Family history					
No	8 (100)	331 (77.7)	17 (24.6)	10 (25.6)	<0.001**
Yes	0 (0)	95 (22.3)	52 (75.4)	29 (74.4)	

Table 3: Association of indoor/outdoor game and sedentary activity in relation to overweight and obesity.

Variables	BMI category				Total	P value
	Under weight	Normal	Over weight	Obese		
	N (%)	N (%)	N (%)	N (%)	N (%)	
Indoor games						
No	3 (37.5)	203 (47.7)	34 (49.3)	20 (51.3)	260 (48)	0.898
Yes	5 (62.5)	223 (52.3)	35 (50.7)	19 (48.7)	282 (52)	
Outdoor games						
No	2 (25)	174 (40.8)	49 (71)	24 (61.5)	249 (45.9)	<0.00
Yes	6 (75)	252 (59.2)	20 (29)	15 (38.5)	293 (54.1)	01**
Sedentary activity						
No	3 (37.5)	195 (45.8)	11 (15.9)	12 (30.8)	221 (40.8)	<0.00
Yes	5 (62.5)	231 (54.2)	58 (84.1)	27 (69.2)	321 (59.2)	1**
Total	8 (100)	426 (100)	69 (100)	39 (100)	542 (100)	

All Chi-square test.

The prevalence of overweight and obesity was higher in upper socio-economic status group (73.9% and 89.7%) than the lower socio-economic status group with significant correlation. Our findings were similar to studies done by Kavitha at Mysore observed higher prevalence and at Shimla by Mahajan et al showing higher prevalence of overweight/obesity in the high socio-economic group.[11,12] Children with parental obesity had increased prevalence of overweight and obesity (75.4% and 74.4%) with statistically significant (p<0.001) similar studies done by Monga et al and Singh et al showed family history as an important factor for development of obesity in children.[13,14] Also, our study revealed that children belonging to nuclear family had overweight (65.2%) when compared to joint family (34.8%) having an association with only suggestive statistically significance (p=0.053+) similar to study done

by Kumar et al at Dakshina-Kannada and Udupi districts by found the prevalence of overweight/obesity was (7%) in nuclear and (4%) in joint family.[15]

In our study, the prevalence of overweight and obesity (75.4%, 84.6%) was more common in children consuming mixed diet similar to a study by Ramachandran et al in Kerala, however the difference was statistically insignificant.[16] The association between increased screen time up to more than two hour per day, in relation to BMI category of study population revealed a strong statistical significance with prevalence of 87% and 84.6% in overweight and obese children. Similar study done by Fang et al but by meta-analysis of about 16 studies showed a positive correlation.[17] A study by Anderson et al among 16 to 18 years old children in USA showed positive correlation.[18]

Though many studies were done in urban affluent children and adolescents showing an increase in prevalence of overweight and obesity, our study was done in rural school children revealing an increase in prevalence of overweight and obesity. The cause could be due to the increasing urbanization, life style changes and economic growth creating an obesogenic environment even in rural areas.

Limitations

It was a cross sectional study, done in smaller size sample group in and around B.G. Nagara. This did not represent the whole rural population. Comparison between rural and urban population would have been more accurate to interpret the increased prevalence, but the present study was restricted to rural population only.

CONCLUSION

This study concluded that the overall prevalence of overweight was higher than obesity with 12.9% and 7% respectively. It also revealed that there is strong correlation of overweight and obesity with socio-economic status, parental obesity, mixed type of food, increased screen time, decreased physical activity in children.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. World Health Organization. The Asia - Pacific perspective: Redefining obesity and its treatment. 2000.
2. World Obesity. Prevalence of Obesity. 2021. Available at: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. Accessed on 9 June 2021.
3. National Family Health Survey [NHFS-5] 2019-20. International Institute for Population Sciences (IIPS). Maharashtra, Mumbai: India. 2021. Available at: URL: http://rchiips.org/nfhs/NFHS-5Report_MH.shtml. Accessed on 21 December 2021.
4. Hill JO, Trowbridge FL. Symposium on the causes and health consequence of obesity in children and adolescents. Pediatrics. 1998.
5. Premkumar S, Ramanan PV, Lakshmi JD. Rural childhood obesity – An emerging health concern. Indian J Endocr Metab. 2019;23:289-92.
6. Khadilkar V, Khadilkar A. Revised Indian Academy of Pediatrics 2015 growth charts for height, weight and body mass index for 5-18-year-old Indian children. Indian J Endocrinol Metab. 2015;19(4):470.
7. Shanmugam K, Ravishankar SL, Kannappan S, Chacko TV. Prevalence of overweight and obesity among children aged 5–15 years in a rural school in Coimbatore. Int J Med Sci Public Health. 2016;5:2186-89.
8. Kumar DR, Rohith M, Philip G. A study on prevalence of overweight and obesity amongst school children of Bangalore. Int J Community Med Public Health. 2019;6:159-63.
9. Mudur G. Asia grapples with obesity epidemics, World Health Organization. Obesity: preventing and managing the global epidemic. Geneva. BMJ. 2003;326(7388):515.
10. Kapil U, Singh P, Pathak P, Dwivedi SN, Bhasin S. Prevalence of obesity among affluent adolescent school children in Delhi. Indian Paediatric. 2002;14(210):415-20.
11. Kavita HS, Ashok NC. Prevalence of Obesity among Primary school children and its Association with Parental obesity and Socio-economic status. Medica Innovatica. 2013;2(1):26.
12. Mahajan A, Nagi PV. Prevalence of overweight and obesity in urban school going adolescents in Shimla city. International Journal of Nutrition, Pharmacology, Neurological Diseases. 2014;4(1):23-8.
13. Monga S. Prevalence of obesity among school children (7-9 years old) and related factors; public health and the environment: the 132nd annual meeting of APHA. India. 2004;6-10.
14. Singh M, Sharma M. Risk Factors for obesity in Children. Indian Peadiatr. 2005;42:183-5.
15. Kumar KM. Prevalance of overweight among high school children in Dakshina kannada and Udupi Districts. Nitte University, Mangalore. 2011;2249-711.
16. Ramachandran Y. Prevalence of overweight and obesity among school & college going adolescents in rural and urban Thirvananthapuram districts, Kerala. India. 2004;07.
17. Fang K, Mu M, Liu K, He Y. Screen time and childhood overweight/obesity: A systematic review

and meta-analysis. Child Care Health Dev. 2019;45(5):744-53.
18. Andersen RE. Relationship of Physical activity & Television watching with body weight and level of fitness among children. JAMA. 1998;12:2179-291.

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