International Journal of Contemporary Pediatrics
Varghese AD et al. Int J Contemp Pediatr. 2019 Mar;6(2):473-476
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291
DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20190527

Original Research Article

Are adolescents studying in private schools more obese? a comparative study among adolescents from different types of schools in Kerala, India

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Received: 06 February 2019
Accepted: 11 February 2019

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ABSTRACT

Background: Adolescent obesity is a serious public health challenge of this century. It is associated with many factors including sleep patterns among adolescents.
Methods: This cross-sectional study was conducted in Pathanamthitta district, Kerala. Adolescents studying in high school and higher secondary classes were included using stratified random sampling. Study tools included a structured questionnaire and anthropometric measurements.
Results: 657 students were enrolled from Government, Government-aided and Private schools. The mean age of the participants was 15.09±1.33 years. The overall prevalence of overweight and obesity was 13.8% and 6.5% respectively. Students in private schools were found to have higher prevalence of overweight (17.8%) and obesity (9.8%) compared to Government-aided (15.3% and 5.4%) and Government schools (8% and 4.5%). Students with lesser sleep duration had higher BMI values. Factors such as higher age, family income, parental education, lack of regular physical activity were associated with obesity. Students with more siblings and family members had low BMI compared to others.
Conclusions: High prevalence of overweight and obesity was observed among adolescents especially among private school students. Inadequate sleep duration was also found to be associated with obesity. Primary prevention approach aimed at spreading adequate awareness among students, parents and teachers should be practiced.

Keywords: Adolescents, Obesity, School-going, Sleep duration

INTRODUCTION

The World Health Organization considers obesity as one of the serious public health challenges of this century.[1] Obesity is usually determined by various social, environmental and behavioural factors. Paediatric obesity is considered an epidemic with 32% of U.S. children and adolescents 2-19 years old considered overweight or obese in 2007-2008.[2] India is undergoing a nutritional and demographic transition as it progresses with its development. Though there are well known associations for obesity such as diet and lack of physical exercise, many factors still remain unexplored. A study done on the prevalence of adolescent obesity among high school students of Kerala, South India, found 8.75% to be overweight and 4.82% obese.[3] It is known that sleep, diet and physical activity play a crucial role in obesity. Insufficient sleep as a possible cause of weight gain and obesity has been studied over the past decade.[4] Studies of the association between sleep duration and obesity during adolescence have yielded mixed results, perhaps in part because of the methodological differences.[5] The association of various factors leading to obesity has been described in different age groups but there are few studies

done in India on the association between sleep and obesity in school going adolescents.[6,7] Schools and colleges in Kerala belong to either government, government aided or private category. The general education department of Kerala government mentions that in 2018, 36% of total schools were run by the government, 56% were aided by the government and 8% were privately run schools. The government schools usually cater to lower economic strata of the population. To the best of our knowledge there are no studies in Kerala comparing the nutritional status among students studying in different types of schools. The objectives were to compare the nutritional status of children studying in different types of schools in an urban area of Kerala and to find out the correlation between Body Mass Index and sleep duration.

METHODS

This cross sectional study was conducted among school going adolescents in Pathanamthitta district, Kerala from January to December 2017. Institutional Ethical and Review Board approval was obtained prior to the study. Considering the prevalence of overweight among adolescents as 13%, with 5% precision and 95% confidence interval, and allowing for 10% non-response rate, present sample size was calculated to be 192. So, a minimum of 192 participants each were taken from Government, aided and private schools. Stratified random sampling, with the strata based on the type of school (Government/ Aided/ Private school). From the list of schools in urban areas of Pathnamthitta district, one school was selected randomly from each category/stratum. Permission for conducting the study was obtained from the principal/management of the schools.

Inclusion criteria

- All adolescents studying in high school and higher secondary classes in the selected schools were included.

Exclusion criteria

- Students whom authors were not able to contact even after 3 visits were excluded.

Data was collected after obtaining written informed consent. The study tool used was a structured questionnaire (Part 1) and included basic anthropometric measurements (Part 2).

Part 1

Socio-demographic variables, history of regular exercise and sleep duration

Age, gender, class, parents' education, occupation, family income, religion, type of family, number of family members, distance and mode of travel to school, time taken for travel, regular exercise (≥5 days/week) and sleep duration of the students were included.

Part 2

Basic anthropometric measurements

Weight and height measurements were taken by trained nurses and doctors. Body weight was measured to the nearest 100 grams using calibrated electronic portable scales. Height was measured to the nearest centimeter with the subject in full standing position, using a calibrated measuring rod. All measurements were taken with minimal clothing and without shoes. Authors calculated the body mass index (BMI) (kg/m^2) and defined adolescent obesity as a sex-specific BMI-for-age using the International (IOTF) body mass index cut-offs for thinness, overweight and obesity in children (Asian cut off).[8]

RESULTS

Socio-demographic details

A total of 657 students studying in different schools were included in the study. The mean age of the students was 15.09±1.33 years. Majority of the students were males and belonged to nuclear family. Table 1 shows the socio-demographic details of the students.

Table 1: Distribution of the respondents based on socio-demographic characteristics.

Variables		Number
Class	High school (8^{th}, 9^{th}, 10^{th})	355 (54%)
	Higher secondary (11^{th},12^{th})	302 (46%)
Gender	Males	367 (55.9%)
	Females	290 (44.1%)
Type of school	Government school	201 (30.6%)
	Government aided school	242 (36.8%)
	Private school	214 (32.6%)
Religion	Hindu	260 (39.6%)
	Christian	379 (57.7%)
	Muslim	18 (2.7%)
Type of family	Nuclear	397 (60.4%)
	Three generation	210 (32%)
	Joint	50 (7.6%)
Monthly family income (Rs)	<10,000	337 (51.3%)
	10,000-30,000	186 (28.3%)
	>30,000	134 (20.4%)
Educational status (mother)	Up to 10^{th} std	52 (7.9%)
	10^{th}-12^{th} std	355 (54%)
	>12^{th} std	194 (29.5%)
	Don't know	56 (8.5%)
Educational status (Father)	Up to 10^{th} std	95 (14.5%)
	10^{th}-12^{th} std	301 (45.8%)
	>12^{th} std	189 (28.8%)
	Don't know	86 (13.08%)

Nutritional status and sleep duration among students

The mean weight of the students was 49.75 ±12.59 kg. The mean height of the students was 160.82±9.75 centimeters. The mean BMI of the participants was 19.09±3.86kg/m^2. The prevalence of overweight was 13. 8% and obesity was 6.5% among students according to sex-specific BMI-for-age using the International (IOTF) Body Mass Index Cut-offs for thinness, overweight and obesity in children (Table 2). The mean duration of sleep among the students was 7.2±1.26 hrs.

Present analysis revealed a negative correlation between sleep duration and BMI. Lower the sleep duration higher was the BMI (r=-0.116, p=0.003). Interestingly, authors also found that variables such as number of siblings (r=-0.089, p=0.022) and number of family members (r=-0.106, p=0.006) was negatively correlated with BMI.

Factors like age (r=0.133, p=0.001), education of father (r=0.189, p p<0.0001) and education of mother (r=0.157, p<0.0001) were positively correlated with BMI. There was a significant difference in the prevalence rates of obesity among students from private, aided and Government schools. Nearly 10% of students in private school were obese, whereas the prevalence of obesity among students in Government school was only 4.5%. Similarly, students from a high socio-economic status and students who were not exercising regularly had higher prevalence of overweight/obesity compared to others. present study revealed no association between overweight and factors like gender, religion and type of family.

Table 2: Distribution of participants based on nutritional status.

Variables	Nutritional status			
	Underweight	**Normal**	**Overweight**	**Obese**
All students	228 (34.7%)	295 (44.9%)	91 (13.8%)	43 (6.5%)
Class wise distribution of nutritional status				
Class 8	28 (41.2%)	28 (41.2%)	8 (11.8%)	4 (5.9%)
Class 9	55 (30.1%)	87 (47.5%)	30 (16.4%)	11 (6%)
Class 10	33 (31.7%)	44 (42.3%)	18 (17.3%)	9 (8.7%)
Class 11	81 (35.4%)	108 (47.2%)	26 (11.4%)	14 (6.1%)
Class 12	31 (42.5%)	28 (38.4%)	9 (12.3%)	5 (6.8%)

Table 3: Factors associated with nutritional status.

Variables	Nutritional status				Chi square, p value
	Underweight	**Normal**	**Overweight**	**Obese**	
Male	120(32.7%)	173(47.1%)	51(13.9%)	23(6.3%)	χ^2=1.990, P=0.574
Female	108(37.2%)	122(42.1%)	40(13.8%)	20(6.9%)	
Government school	98 (48.8%)	78(38.8%)	16(8%)	9(4.5%)	χ^2=32.92, P<0.0001
Aided school	75(31%)	117(48.3%)	37(15.3%)	13(5.4%)	
Private school	55(25.7%)	100(46.7%)	38(17.8%)	21(9.8%)	
High school	116(32.7%)	159(44.8%)	56(15.8%)	24(6.8%)	χ^2=3.05, P=0.386
Higher secondary	112(37.1%)	136(45%)	35(11.6%)	19(6.3%)	
Income- <Rs.10,000	138(40.9%)	150(44.5%)	34(10.1%)	15(4.5%)	χ^2=23.21, P=0.001
Rs. 10,000-Rs. 30,000	53(28.5%)	90(48.4%)	28(15.1%)	15(8.1%)	
>Rs. 30,000	37(27.6%)	55(41%)	29(21.6%)	13(9.7%)	
Regular exercise	59 (43.1%)	54 (39.4%)	21 (15.3%)	3 (2.2%)	χ^2=9.93, P=0.019
No regular exercise	169(32.5%)	241(46.3%)	70(13.5%)	40 (7.7%)	

DISCUSSION

This study was designed to compare the nutritional status of children studying in different types of schools in an urban area of Kerala and factors associated with it. In this study the prevalence of overweight students was 13.8% and obesity was 6.5% among students according to sex-specific BMI-for-age which was higher than that found in a study done by Remesh A et al.[3] In present study authors found that prevalence of obesity (9.8%) and overweight (17.8%) was more in children studying in private school compared to government school. This was similar to a study done by Stigler MH et al that showed combined prevalence of overweight and obesity in was 16.6% and the combined prevalence of overweight and obesity was more than six times higher in Private schools than Government schools.[9] This finding in present study can be explained by factors such as higher academic load,

stress, economic class and higher academic pressure limiting physical activity and further studies are needed to understand this association better. Authors found no gender difference in children with higher BMI. Similar to study done by Ochiai H et al authors also found that the children who had more number of siblings were found to be less obese. The causes for the negative correlation can probably be attributed to factors like socio-economic status, child to child interaction and reduced amount of food per child but needs to be investigated further. In present study authors noted higher percentage of students of Class-10 were overweight (17.3%) or obese (8.7%).[10] This can be due to limited physical activity and predominately sedentary life due to an increased academic pressure in Class-10. Results of educational status of father and mother were found to be positively correlated with obesity and this finding was in agreement with previous studies.[11] Authors found that children with sleep disturbances had higher BMI, suggesting that probably sleep duration is an important adolescent obesity risk factor, and this finding was similar to that of Mitchell JA et al.[12] Present data also showed children from higher income category to have higher BMI. This may be due to various lifestyle choices followed in higher economic families. Obese children were also found to be physically less active. To the best of our knowledge, this study is the first and only one of its kind in Kerala on school-going adolescents from different types of schools. As a follow-up to present study, health and nutrition education classes were undertaken for students and teachers by the investigating team.

CONCLUSION

The prevalence of obesity in school-going adolescents in Pathanamthitta district of Kerala was found to higher than that found elsewhere in Kerala. Students in private schools had a higher prevalence of obesity as compared to those in Government schools. Factors such as parental education, income, physical activity and duration of sleep were found to be significant factors leading to obesity. As childhood obesity is on the rise in India various factors that could lead to obesity need to be studied and appropriate interventions for prevention and control initiated so as to have a healthy and fruitful future generation.

ACKNOWLEDGEMENTS

Authors would like to acknowledge respective Departments and Institution for the help given. Authors thank Dr. Pramod Thomas, Associate Professor, Department of Biostatistics for the help in data analysis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethical and Review Board

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Cite this article as: Varghese AD, Mathew G, Benjamin AI. Are adolescents studying in private schools more obese? a comparative study among adolescents from different types of schools in Kerala, India. Int J Contemp Pediatr 2019;6:473-6.