

PREVALENCE OF OVERWEIGHT AND OBESITY AMONG ADOLESCENT SCHOOL CHILDREN IN AN URBAN AREA IN CENTRAL KERALA- A CROSS-SECTIONAL STUDY

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ABSTRACT

BACKGROUND

Childhood obesity is emerging as a serious public health problem among low and middle-income countries. Overweight and obese children are likely to stay obese into adulthood. They are more likely to develop non-communicable diseases like diabetes and cardiovascular diseases at a younger age. So early intervention is very important.

MATERIALS AND METHODS

The study was conducted in an urban area of Kottayam district in Kerala. The schools were stratified as Government, Aided and Unaided Schools. Cluster sampling technique was adopted and data was collected after informed consent using pre-tested semi-structured questionnaire and analysed in SPSS vs 16.

RESULTS

The prevalence of obesity as per the present study was 5.1% and the prevalence of overweight was 10.8%. The Demographic and Social factors associated with Childhood obesity were Age, Birth order, Socioeconomic status and Family history of diabetes mellitus.

CONCLUSION

This study concludes that the prevalence of obesity and overweight are increasing in urban area. Lifestyle transition and economic improvement have contributed to the problem of adolescent obesity.

KEYWORDS

Obesity, Overweight, Urban Area, Adolescent.

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BACKGROUND

Obesity is perhaps the most prevalent form of malnutrition and it is a global nutritional concern. The increasing prevalence of overweight, obesity and its consequences prompted the World Health Organisation to designate obesity as a global epidemic.¹

Kerala has made remarkable achievement on par with the developed countries in the field of women and children's health during the last few decades. Though India is a country still combating the communicable diseases, Kerala on the other hand has an admirable health status comparable to the West and is now going through an epidemiological transition where non-communicable diseases are more prevalent. The 'nutritional transition' and

the lifestyle changes are also becoming relevant among the adolescents. There is paucity of data on prevalence of overweight and obesity among the adolescent in Kerala. The present study is therefore carried out in an urban area of Central Kerala to estimate the prevalence of overweight and obesity among adolescent children and to find out its association with various socio-demographic factors.

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional study.

Study Setting

The study was conducted in High schools in urban area of Kottayam district.

Sampling

The list of schools in the Municipal area was taken from DEO, Kottayam. There are 15 High schools in the Municipal area. The schools were stratified as Government Aided and Unaided Schools. This includes 2 Government Schools, 11 Aided Schools and 2 Unaided Schools. Population of 8th, 9th and 10th standard of each school was ascertained and the total population was estimated, which was found to be 5840 students. One school was taken as one cluster and a total of

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6 clusters were covered. Since there were only 2 schools, each in the Government and Unaided category, 1 Government School and 1 Unaided School were selected randomly. In the Government school, only 29 high school students were there. All these students were selected for the study. The selected school in the unaided category had 204 students and all these students were also included. The cumulative population of High school students in the Aided School category was 5212. Four clusters were identified from this population. The cumulative population was divided by the number of clusters (4) and the sampling interval was estimated. This was found to be 1303. A number less than this number was identified using a random number table (1097). The cluster which contained this number was taken as the first cluster. Then sampling interval of 1303 was added to this number to find out the next cluster. (1097+1303 = 2400). The cumulative population equal to 2400 was taken as 2nd cluster and this process was continued until 4 clusters are obtained. All the high school students in the selected cluster (school) were covered. By this way, 759 high school students were selected from the aided schools. So the final sample size came to be 992 high school students, (29 from Government schools, 204 from Unaided schools and 759 from Aided schools).

Sample Size

The sample size was calculated using the formula

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 (N-1) + z^2 \cdot p \cdot q} = 423$$

(N= 5840, Z= 1.96, Prevalence (p)= 5%, q= 1-p and acceptable error of 2% at 95% confidence limits). According to a study conducted by Ambily G. Unnithan et al among school going children in Thiruvananthapuram district, the prevalence of obesity was found to be 4.99%.² So 'p' was taken as 5%. By applying the design effect of 2, the sample size is estimated to be 846 high school children.

Data Collection and Analysis

After getting informed consent from the Head of the Institution, the data was collected using semi-structured interview schedule.

- 1. Weight-** The weight of the student was measured using a weighing machine with a precision of 0.5 kg. The initial reading in the weighing machine was set to zero prior to each measurement. The students were asked to remove their footwear before weighing. The reading was taken after ensuring that the student is not in contact with any other object and in erect posture.
- 2. Height-** For measuring the height, the student was made to stand on a level surface without shoes. Students were asked to stand upright against a wall with the heels touching the wall and the chin held horizontally, so that the tragus of the ear and the eye are in a straight line (Frankfurt plane), then the height in cm was read.

To estimate the prevalence of overweight and obesity among the study population, BMI for age Z scores were used (WHO Reference 2007).

To calculate the individual Z scores, WHO AnthroPlus software version 1.0.2 was used. Further analysis was done using statistical software 16.0 version. Chi-Square test was used for evaluating the level of significance.

Definition of Keywords

- 1. Z Score³-** The Z score system expresses the anthropometric value (e.g. BMI for age) as a number of standard deviations or Z scores below or above the reference mean or median value.

Age Group	Sex		Total
	Male	Female	
12 - 14 yrs.	100 (22.40%)	149 (27.30%)	249 (25.10%)
14 - 16 yrs.	300 (67.10%)	357 (65.50%)	657 (66.20%)
16 - 18 yrs.	47 (10.50%)	39 (7.20%)	86 (8.70%)
Total	447 (100.00%)	545 (100.00%)	992 (100.00%)

Table 1. Distribution of Study Population according to Age and Sex

- 2. Overweight⁴-** A child whose Z BMI for age between +1 and +2 standard deviations from the reference population was defined as overweight.
- 3. Obesity⁴-** A child whose Z BMI for age more than +2 standard deviations from the reference population was defined as obese.

Ethical Considerations

Ethical clearance for the study was obtained from the Institutional Ethics Committee. Consent for participation was obtained from school authorities in an informed and written consent form.

RESULTS

A cross-sectional study was conducted to find out the prevalence and associated risk factors of obesity and overweight among adolescent school students in an urban area of Kottayam district. The study population consisted of adolescent students belonging to 8th, 9th and 10th standard. The observations are as follows-

The age distribution of the study population varied from 12 years to 18 years. The total number of males in the present study was 447 and the number of females was 545. Majority of the study population (66.2%) were belonging to the 14 - 16 years' age group.

Z-BMI for Age	N	Prevalence
Obesity	51	5.10%
Overweight	107	10.80%
Normal	691	69.70%
Thinness	110	11.10%
Severe Thinness	33	3.30%
Total	992	100.00%

Table 2. Prevalence of Obesity and Overweight

The age distribution of the study population varied from 12 years to 18 years. The total number of males in the present study was 447 and the number of females was 545.

Majority of the study population (66.2%) were belonging to the 14 - 16 years' age group.

	Z-BMI for Age					P-value
	Obesity	Overweight	Normal	Thinness	Severe Thinness	
Age Group						
12 – 14 yrs.	18 (7.20%)	36 (14.50%)	164 (65.90%)	20 (8.00%)	11 (4.40%)	0.016*
14 – 16 yrs.	31 (4.70%)	61 (9.30%)	467 (71.10%)	81 (12.30%)	17 (2.60%)	
16 – 18 yrs.	2 (2.30%)	10 (11.60%)	60 (69.80%)	9 (10.50%)	5 (5.80%)	
Sex						
Male	26 (5.80%)	40 (8.90%)	306 (68.50%)	60 (13.40%)	15 (3.40%)	0.365
Female	25 (4.60%)	67 (12.30%)	385 (70.60%)	50 (9.20%)	18 (3.30%)	
Birth Order						
1	33 (6.70%)	59 (12.00%)	341 (69.50%)	45 (9.20%)	13 (2.60%)	0.017*
2	18 (3.60%)	48 (9.60%)	350 (69.90%)	65 (13.00%)	20 (4.00%)	

Table 3. Demographic Factors

Age was recorded in completed years of life and rounded to the nearest year. In the present study, 7.2% of the children in the 12 - 14 years' age group were obese and 14.5% were overweight. In the 14 - 16 years' age group, the percentage of obesity was 4.7% and in the 16 - 18 years' age group it was 2.3%.

In the present study, total proportion of overweight and obesity among males (14.7%) is lower than females (16.9%).

It can be seen from the table that the proportion of children with obesity decreases as the birth order increases. Proportion of children with obesity in the birth order 1 was 6.7%, whereas in the birth order 2 group it was only 3.6%. In the overweight group, the proportion of children with birth order 1 was 12% and with birth order 2 was 9.6%. It is also found to be statistically significant.

	Z-BMI for Age		P-value
	Obesity and Overweight	Not Overweight	
Type of Family			
Nuclear	91 (14.40%)	542 (85.60%)	0.076
Joint	67 (18.70%)	292 (81.30%)	
Socio-Economic Status			
Upper and Upper middle	106 (24.70%)	324 (75.30%)	0.000 *
Lower middle	38 (11.00%)	307 (89.00%)	
Upper lower and lower	14 (6.50%)	203 (93.50%)	
Family History of Diabetes Mellitus			
Yes	61 (21.30%)	226 (78.70%)	0.003*
No	97 (13.80%)	608 (86.20%)	

Table 4. Socioeconomic Factors and Family History

In the present study, the proportion of children with overweight and obesity living in nuclear families were 14.4% and those living in joint families were 18.7%. There was an apparent difference between proportion of overweight and obese children in nuclear and joint families. But this difference was not found to be statistically significant.

Socioeconomic status of the study population was assessed using Modified Kuppaswamy's Classification. In the present study, it was found that the proportion of children with obesity and overweight increases as the socioeconomic scale goes up. The proportion of obesity and overweight increases from 6.5% in the Class 4 and below to 11% in the Class 3 and 24.7% in the Class 2 and above group. The apparent difference was also found to be statistically significant.

Among children with family history of diabetes mellitus 21.3% were obese and overweight, whereas it was 13.8% among children with no family history of diabetes. This apparent difference was also found to be statistically significant.

DISCUSSION

Prevalence

Lifestyle transition and economic improvement have contributed to the problem of adolescent obesity. Published data regarding this aspect from India is scarce.

In a study conducted by A. G. Unnithan and S. Syamakumari² among school going children in Rural and Urban areas of Thiruvananthapuram Educational District, Kerala State, it was found that 4.99 percent were obese,

17.73 percent were overweight, 58.67 percent were normal weight, 16.16 percent were under-weight with a BMI less than 15 and 2.44 percent were severely underweight with a BMI less than 13.

In another study conducted by Ms. Little Flower Augustine, Mrs. Rashmi H. Poojara among urban college going girls in Ernakulam has put the prevalence of obesity at 10.5% and overweight at 14%.⁵

Other studies conducted in India shows that the prevalence of overweight and obesity is high among adolescent age group. The one conducted by S Kaur, SN Dwivedi, R Lakshmy and U Kapil amongst school children in Delhi, showed that the prevalence of obesity and overweight among children belonging to high income group was 9.3 and 13.1 percent respectively.⁶

In a study conducted by Jugesh Chhatwal et al in Punjab showed that the prevalence of obesity was 11.1%, while 14.2% of the children were overweight.⁷

Majority of the studies conducted in India shows that the prevalence of obesity and overweight is higher when compared to the present study. It could be due to the fact that the study area is not yet a city and is not exposed to big city culture. However, still a lurking danger is evident.

Age Group

It is evident from the present study that among the adolescents as age increases the prevalence of obesity decreases. This difference was also found to be statistically significant.

The maximum prevalence was observed during the pubertal period. This may be associated with the increase in adipose tissue and overall weight gain during the pubertal growth spurt. The present study has highlighted that obesity is an emerging health problem in younger age group of adolescent children.

A similar pattern was found in a study conducted by Umesh Kapil et al. In that study, the maximum prevalence of obesity was found during the pubertal period between 10 - 12 years.⁸

Another study conducted by Jugesh Chhatwal, Manorama Verma and Sandeep Kaur Riar showed the similar trend. Prevalence of obesity decreased significantly with age from 18.5% at 9 years to 7.6% at 14 years.⁹

Sex

In a study conducted by Umesh Kapil et al, the overall prevalence of obesity was higher in male than female children.⁸ No such difference were seen in the present study. The reason may be the fact that there is no gender difference in the availability of food in Kerala.

Birth Order

Negative correlation between obesity and birth order was found in studies conducted by Mohamed A. A et al in Kuwaiti children. In another study conducted by Koziel S et al showed that the first-born girls were 1.5 times at higher risk of obesity in comparison to later-born girls.¹⁰

Type of Family

Typical joint family system with senior most member heading the family is not seen in Kerala. It is true that children will get more care and support in a joint family system. But when children grow up in families with bad eating habits and lifestyle, the risk of overweight and obesity will be high.

Socioeconomic Status

Socioeconomic status of the family has got a direct relation with nutritional status of the child. In families with high socioeconomic status, the purchasing power and food availability will be more when compared to low socioeconomic group. The frequency of eating out may be more in high socioeconomic group of people.

The relation between obesity and high socioeconomic status has been demonstrated in several studies. In a study by Y Kaneria et al in Udaipur city in Rajasthan reported a high prevalence of obesity and overweight among affluent group children in the age group of 12 - 17 years.¹¹

Family History of Diabetes Mellitus

It is well established that traits and components of the metabolic syndrome tend to cluster in families, whereas the heritability of the syndrome itself has been reported to be in the range of 25%, heritability of some of its individual components may be as high as 60%.¹² Positive family history of type 2 diabetes has been associated with early alterations in glucose metabolism- mainly reduced insulin sensitivity.¹³

CONCLUSION

The prevalence of obesity as per the present study was 5.1% and the prevalence of overweight was 10.8%.

The following demographic and social factors were found to have a statistically significant association with obesity and overweight.

1. Age- The maximum prevalence was observed during the pubertal period.
2. Birth order- Obesity was more in birth order 1.
3. Socioeconomic status- It was that the proportion of children with obesity and overweight increases as the socioeconomic scale goes up.
4. Family history of diabetes mellitus- Obesity and overweight were more among students with family history of diabetes.

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