

Predisposing factors associated with obesity among adolescents-A case control study.

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Abstract

Background: The risk factors of obesity changes around the world. Adolescence is identified as a critical period for the development of obesity related metabolic derangements. This study evaluated the predisposing factors of obesity among adolescent students in kancheepuram district, South India.

Methods: This case control study was conducted in Kancheepuram district between July 2017 to September 2017. A total of 1656 adolescent boys and girls between the age group of 12 to 15 years were randomly selected from 12 schools (4 public schools, 4 matriculation schools and 4 government schools). The cases were obese adolescents and the controls were non obese adolescents. Univariate and Multivariate logistic regression analysis was conducted, and odds ratios (ORs) and 95% confidence intervals (CIs) were calculated.

Results: Various lifestyle factors including behavioral, dietary and family factors were identified as predisposing factors also for obesity.

Conclusion: There is an urgent need to educate adolescents on the aspects of healthy food habits and desired lifestyles to prevent overweight/obesity and its associated ill effects.

Keywords: Metabolic problem, Pre disposing, Factors, Obesity, Adolescents, South India.

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Introduction

The prevalence of obesity is increasing around the world. World Health Organization defined overweight and obesity as abnormal or excessive accumulation of fat that may impair health [1]. At present the potential public health issue that is emerging, is the increasing incidence of childhood obesity in developing countries, and the resulting socioeconomic and public health burden that will be faced by these countries in the near future. Childhood and adolescence obesity is related to an increased adult morbidity and mortality by leading to a variety of conditions such as diabetes mellitus, hypertension, psychological disorders and social problems [2]. The pandemic of obesity has engulfed children and adolescents. It is estimated that 200 million school-aged children worldwide are overweight, of which 40-50 million are obese [3]. In India, the magnitude of overweight ranges from 9% to 27.5% and obesity ranges from 1% to 12.9% [4,5].

Obesity is a multi-factorial disorder. The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and expended. The epidemic of obesity and overweight has been fuelled by an increase intake of energy dense food that are high in fats, coupled with an increase in

physical inactivity due to the increasing sedentary work, changing modes of transportation and decrease in outdoor recreational activities [6]. Although studies have identified adverse consequences of obesity [7], research done to identify specific risk factors associated with obesity is limited in adolescent age group. Establishment of associated factors will be potentially useful in the holistic approach to the prevention of the rising prevalence of obesity and other non-communicable cardiovascular diseases. Various studies conducted in India have revealed a rising trend in prevalence of overweight and obesity among children and adolescents. Thus, this study aimed to identify the predisposing factors of obesity among school going adolescents in Kancheepuram district, South India.

Materials and Methods

Study design and participants

This was a case control study conducted among adolescent students between 12 to 15 years to examine a broad range of possible determinants of obesity. The cases and controls were

recruited from 12 schools (4 public schools, 4 matriculation schools and 4 government schools) in Kancheepuram district.

Sample size

The sample size was based on the prevalence of 5% and allowable error as 1%, for 95% significance level. A total of 1656 students were randomly selected and the level of obesity was assessed based on Revised Indian Academy of Pediatrics

BMI-for-Age and Sex growth charts [8]. Controls (here after referred 'non-obese') included 1500 adolescents with healthy weight and BMI Cut-off between adult equivalent of 23 and 19 (here after referred 'non-obese'). Cases included 156 obese adolescents with BMI of Adult equivalent 27 cut-off (here after referred 'obese'). Exclusion criteria included underweight adolescents (Table 1).

Table 1. Identification of influencing demographic factors for more level of obese using univariate analysis.

Demographic variables		BMI				Chi square test	Odds Ratio (95%CI)
		Normal (n=1500)		Obese (n=156)			
		n	%	n	%		
Age	12-13 years	913	60.9%	74	47.4%	$\chi^2=10.58$ P=0.001	1.7 (1.2-2.4)
	14-15 years	587	39.1%	82	52.6%		
Gender	Male	1017	67.8%	75	48.1%	$\chi^2=24.47$ P=0.001	2.3 (1.6-3.2)
	Female	483	32.2%	81	51.9%		
Level of education	6-7 th std	834	55.6%	70	44.9%	$\chi^2=6.56$ P=0.01	1.5 (1.1-2.1)
	8-9 th std	666	44.4%	86	55.1%		
Type of school	Govt. school	540	36.0%	32	20.5%	$\chi^2=14.99$ P=0.001	2.2 (1.5-3.3)
	Private School	960	64.0%	124	79.5%		
Occupation of mother	Housewife	782	52.1%	55	35.2%	$\chi^2=16.10$ P=0.001	2.0 (1.4-2.8)
	Employed	718	47.9%	101	64.8%		
Income	<Rs 21,438	849	56.6%	73	46.8%	$\chi^2=5.50$ P=0.02	1.5 (1.1-2.1)
	>Rs 21,438	651	43.4%	83	53.2%		

Table 2. Identification of influencing life style factors for more level of obese using univariate analysis.

Demographic variables		BMI				Chi square test	Odds Ratio (95%CI)
		Normal (n=1500)		Obese (n=156)			
		n	%	n	%		
Daily intake of breakfast	Regular	898	59.9%	58	37.2%	$\chi^2=28.80$ P=0.001	2.5 (1.8-3.5)
	Irregular	602	40.1%	98	62.8%		
Frequency of intake of high fiber diet per day	more times	1029	68.6%	70	44.9%	$\chi^2=35.61$ P=0.001	2.7 (1.9-3.7)
	None	471	31.4%	86	55.1%		
Frequency of snacking on 'junk' food per day	None	340	22.7%	22	14.1%	$\chi^2=6.06$ P=0.01	1.8 (1.1-2.8)
	more times	1160	77.3%	134	85.9%		
Frequency of drinking sweetened beverages per day	None	829	55.3%	23	14.7%	$\chi^2=92.89$ P=0.001	7.1 (4.5-11.3)
	One to two times	671	44.7%	133	85.3%		
Frequency of eating fast food items per day	None	848	56.5%	32	20.5%	$\chi^2=73.62$ P=0.001	5.0 (3.4-7.5)
	more times	652	43.5%	124	79.5%		

Frequency of eating snacks & meals while watching TV	Sometimes/often	1115	74.3%	68	43.6%	$\chi^2=65.45$ P=0.001	3.8 (2.7-5.3)
	Always	385	25.7%	88	56.4%		
Physical activity done per day (hrs /day)	Yes	1383	92.2%	129	82.7%	$\chi^2=16.08$ P=0.001	2.4 (1.6-3.9)
	No	117	7.8%	27	17.3%		
Total hours of sleep per day	>8 h	953	63.5%	73	46.8%	$\chi^2=16.79$ P=0.001	1.9 (1.4-2.8)
	<8 h	547	36.5%	83	53.2%		
Personnel health problem	No	1427	95.1%	140	89.7%	$\chi^2=8.07$ P=0.01	2.2 (1.3-3.9)
	Yes	73	4.9%	16	10.3%		
Attained puberty	No	1215	81.0%	94	60.3%	$\chi^2=36.70$ P=0.001	2.8 (2.0-3.9)
	Yes	285	19.0%	62	39.7%		

Anthropometry

Body weight and height were measured within the school premises, in an isolated area which did not affected the routing daily activity of the school and secured the privacy of the participants, by the investigator. Subjects were asked to remove shoes and empty their pockets, before body weight was measured using calibrated electronic scale placed on an even concrete floor accurate to the nearest 0.1 kg. Height was measured to the nearest 0.1 cm with an upright plastic portable stadiometer. BMI was calculated as weight in kilograms divided by height squared in meters (kg/m²).

Data collection

The interviewer administered questionnaire to collect the information from the subjects. The questionnaire was designed to capture the dietary, behavioural and socioeconomic factors associated with obesity, from the individuals. The validity and reliability of the questionnaire were assessed. This study was also approved by the Institutional Ethical committee. Informed consent was obtained from the parents and assent from children before the data was collected.

Data analysis

The logistic regression analysis was conducted to control the effect of various risk factors on obesity. Adjusted odd ratios (ORS) were calculated to determine the association between obesity and predisposing factors by applying a significance level of 0.05 using the SPSS Statistics Software.

Results

Univariate analysis identified aged adolescents, Female gender, Private school adolescents, Employed mothers adolescents and high income family adolescents obese than non-obese. Unadjusted odds ratio was given with 95% confidence interval. The table also shows statistically significant association between obesity and age of adolescents (p<0.001), female gender (p<0.001, private school students (p<0.001), employment status of mother (p<0.001), and monthly family income (p<0.02).

Table 2 shows statistically significant association between dietary factors and obesity. The dietary factors include skipping breakfast (p<0.001), lack of intake of high fiber diet (P<0.001), intake of sweetened beverages (P<0.001), ‘junk’ foods (P<0.01), fast food items (P<0.001) and snacking while watching TV (P<0.001). This study also shows significant association between behavioral factors and obesity. The behavioral factors include lack of physical activity (P<0.001) and lack of sleep (P<0.001). Health problems of adolescents (P<0.01) and puberty (P<0.001) also showed statistically significant association (Table 3).

Table 3. Identification of influencing life style factors for more level of obese using Multivariate logistic regression.

	Univariate analysis		Multivariate analysis	
	p-value	Unadjusted OR (95%CI)	p-value	Adjusted OR (95%CI)
Daily intake of breakfast (Irregular vs. Regular)	0.001	2.5 (1.8-3.5)	0.001	2.5 (1.7-3.7)
Intake of high fiber diet per day (None vs. more times)	0.001	2.7 (1.9-3.7)	0.02	1.6 (1.1-2.3)
snacking on ‘junk’ food per day (None vs. more times)	0.01	1.8 (1.1-2.8)	0.18	1.5 (0.8-2.5)
drinking sweetened beverages per day (None vs. ≤ More times)	0.001	7.1 (4.5-11.3)	0.001	5.8 (3.4-9.9)
eating fast food items per day (None vs. more times)	0.001	5.0 (3.4-7.5)	0.01	1.8 (1.1-2.9)
eating snacks & meals while watching TV (>Always vs. sometimes)	0.001	3.8 (2.7-5.3)	0.001	2.0 (1.3-3.1)
Physical activity done per day (No vs. Yes)	0.001	2.4 (1.6-3.9)	0.001	4.0 (2.2-7.1)
Total hours of sleep per day (<8 h vs.>8 h)	0.001	1.9 (1.4-2.8)	0.55	0.9 (0.6-1.3)
Personnel health problem (Yes vs. No)	0.01	2.2 (1.3-3.9)	0.23	1.5 (0.8-3.0)

Attained puberty(Yes vs. No)	0.001	2.8 (2.0-3.9)	0.001	2.6 (1.8-3.9)
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Univariate analysis identifies irregular daily intake of breakfast of high fiber diet, Frequent snacking on 'junk' food, drinking sweetened beverages, frequent eating of fast food items, more times of eating snacks & meals while watching TV, No physical activity, <8 h sleeping per day, Personnel health problems, and puberty among obese adolescents than non-obese. Unadjusted odds ratio was given with 95% confidence interval. Multivariate analysis logistic regression identifies increased number of obesity among adolescents with Irregular intake of breakfast, lack of intake of high fiber diet, drinking sweetened beverages per day, more times of eating fast food items per day, more times of eating snacks & meals while watching TV, physical activity and puberty. Adjusted odds ratio was given with 95% confidence interval.

Discussion

The objective of the study was to identify the predisposing factors associated with obesity. Present study identified demographic factors such as children above 13 years (AOR: 1.7; 95% CI=1.2-2.4) and female gender (AOR:2.3; 95% CI=1.6-3.2) as predisposing factors of obesity. These results were supported by Misra et al. [9]. This data was also supported by Katulanda et al. [10]. Our study results highlighted that adolescents from high family income were at a higher risk (AOR: 1.5; 95% CI=1.1-2.1) of being obese than those from low income [11]. This is the normal trend seen in economies transition as people of affluent strata have more purchasing power to buy refined, calorie dense food in contrast to developed nations where fruits and vegetables are more expensive and high sugar and fat containing foods are available at a lower price. Private school students and employment status of mother were also identified as predisposing factor of obesity.

Present study identified dietary factors, family factors, behavioral factors, health problems and puberty as predisposing factors of obesity. Identified dietary factors in our study were, skipping breakfast (AOR 2.5, 95% CI=1.7-3.7), less intake of high fiber diet (AOR:1.6, 95% CI=1.1-2.3), frequent intake of junk foods (AOR 1.5, 95% CI=0.8-2.5) and sweetened beverages (AOR: 5.8, 95% CI=3.4-9.9). Always snacking while watching TV also increased the risk of obesity 2 times higher (AOR:2.0, 95% CI=1.3-3.1). A nationally representative cross-sectional study [12] identified physical inactivity, skipping breakfast, inadequate consumption of green leafy vegetables and fruits and increased television viewing as potential challenges faced by adolescents. This information was consistent with our study.

In our study, 129 (82.7%) adolescents did not participate in any physical activities; only 27(17.3%) of the obese adolescents reported performing some regular activities. These results were supported by Agazzi et al. [13]. Their study emphasized that, non-obese adolescents reported regular physical activity compared to their obese counterparts. Our study findings showed that, less hours of sleep (AOR:0.9, 95% CI=0.6-1.3)

per day leads to obesity. This data was similar to the study by George et al. [14]. According to their study findings, among the influencing factors of obesity, sleeping time was found to be significant ($p=0.01$). Adolescents with health problems (AOR:1.5, 95% CI=0.8-3.0) were also considered as predisposing factors of obesity. Our study showed an influence of birth order on obesity. Although, it was not statistically associated with obesity in our study, similar study results showed significant association between first-born status of the child and obesity [15].

Obesity and sedentary life style are closely related. In this study, 34 (21.8%) obese adolescents reported, screen time more than 4 day and 78 (49%) obese adolescents reported screen time >2 day. Similar to a published study [16] computer use was more prevalent among obese children. A study conducted among adolescent school children in India revealed that the risk of overweight was seven times higher among those who had screen time ≥ 4 h/day [17]. Puberty was also considered as a predisposing factor of obesity. Present study shows that obesity was marginally higher among the pubertal age group, i.e., 13 to 15 years of age, as observed in similar studies conducted in Hyderabad [18]. Puberty increases the chance of obesity 2.6 times higher (AOR:2.6, 95% CI=1.8-3.9) because of increased adipose tissue and overall body weight in children during puberty. It has been reported earlier that the number of fat cells increases during periods of rapid growth up to 16 years of age, after which increased fat ordinarily accumulates by increasing size of the cells already present.

Conclusion

The major conclusion drawn from this study is that low levels of physical activity, watching television, intake of junk foods and fewer intakes of fruits and vegetables were associated with a higher prevalence of obesity. Thus, participation in household activities and regular physical exercise could help in lowering the prevalence of overweight. Therefore, the role of physical activity, games, and sports should be emphasized, and facilities should be provided for outdoor games in schools, with compulsory hours of sports and games. There is an urgent need to educate adolescents on the aspects of healthy food habits and desired lifestyles to prevent overweight/obesity and its associated ill effects.

Implications

- Health care members play a vital role in health promotion by increasing public awareness on identification of obesity and by training the teachers regarding early recognition of issues in management of obesity.
- Health care administrators can place recommendations to the authorities regarding initiation in creating policies and plans in providing education to the children, parents and teachers for improving their lifestyle behaviors to prevent obesity.
- Researchers are also motivated to develop more reliable approaches to generate data that can be used in policy making and organization of services.

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