Original Research Article

A cross sectional study on association between overweight and obesity in adolescent population

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Received: 22 September 2016

Revised: 10 November 2016

Accepted: 15 November 2016

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ABSTRACT

Background: The rate of malnutrition in India remains high, increase in overweight and obesity have been observed in some areas undergoing rapid economic and epidemiologic transition. The aim was conducted to study association between obesity and overweight in adolescent population.

Methods: A total of 1258 students (males-644; females-614) with an age group 10-19 years were selected from the higher secondary schools and junior colleges in the urban area of Tirupati.

Results: The family history of obesity was reported by 54.7% of adolescents. The prevalence of overweight & obesity among males was found to be slightly higher in male adolescents 14.6% than in female adolescents 13.5%. Prevalence of overweight and obesity combined decreased with increase in the degree of physical activity from 12.7% in mild category to 10.0% in vigorous category and the differences are also found to be statistically significant in the present study.

Conclusions: The present study recommended that the health education destined to inculcate healthy life style practices should be provided at an early age group to reduce the incidence of overweight and obesity in adolescent population.

Keywords: Association, Morbidity, Obesity, Overweight

INTRODUCTION

Obesity can occur at any age, and generally increases with age. Infants with excessive weight gain have an increased incidence of obesity in later life. The composition of the diet, the periodicity with which it is eaten and the amount of energy derived from it are all relevant to the aetiology of obesity.¹ The prevalence of overweight and obesity among children and adolescents has increased significantly in the developed countries during the past two decades and similar trends are being

observed even in the developing world.^{2,3} Targeting adolescent age group for primary prevention can be justified for many reasons.⁴ Professionals need to stress the co-morbidities and the morbidities associated with obesity in youth. Obesity is not an individual problem but a population problem and effective preventive measures should be started during childhood itself. The adverse health consequences of overweight and obesity in India leads to higher prevalence of type 2 diabetes and cardiovascular diseases.⁵ Tirupati, with its rapidly growing population has a substantial share of adolescents

who are being exposed to the obesogenic environment.⁶ Hence this study was undertaken to study association between overweight and obesity in adolescent population.

METHODS

The present study was carried out in Tirupati urban areas among a total of 1258 adolescents (males – 644; females – 614) studying in 4 institutions (2 government and 2 private). The institutions were selected by random sampling method out of the total existing institutions (government and private schools and government and private junior colleges). The adolescents are studying 6th to Intermediate 2nd year. A standard questionnaire was used in collecting the required data regarding dietary patterns, physical activities, leisure activities including TV watching, computer games, visits to restaurant etc. The weight and height were recorded by using standardized instruments. Overweight and obesity association was assessed using International Obesity Task Force (IOTF) BMI standards for adult obesity in Asia and India. Ethical committee clearance for the study was obtained from the Institutional ethical committee, S. V. Medical College, Tirupati.

RESULTS

The gender distribution is similar with 51.2% males and 48.8% females. The distribution of subjects in school and college by government and private categories is similar. There are 33.8% government school adolescents and 34.0% private school adolescents. In the same way, there is equal proportion of 16.1% adolescents each in government and private junior colleges. By standard of education, it can be found that there are similar number of adolescents in each of the standards from 6th to 10th class with proportion between 13.2% to 13.8% while there is an equal proportion of 16.1% adolescents in Intermediate 1st year and 2nd year (Table 1).

The family history of obesity was reported by 54.7% of adolescents. As per the nutritional status classification based on BMI cut off levels recommended by International Obesity Task Force (IOTF), it was found that 88.5% are underweight/normal, 8.8% are overweight and 2.7% are obese. As per the classification recommended by Agarwal et al, it is found that 86% are underweight/normal, 9.9% are overweight and 4.1% are obese. Thus a higher prevalence of overweight and obesity is found with Agarwal et al classification compared to IOTF classification with 9.9% overweight and 4.1% obesity (Table 2).

As per the IOTF cut off levels, the prevalence of overweight and obesity was found to be 7.3% and 2.8% respectively in male adolescents. Among the female adolescents, a comparatively higher prevalence of overweight 10.4% is found while the prevalence of obesity is similar 2.6%. However the differences in the proportions of overweight and obesity between the two

groups is not found to be statistically significant. Based on the cut off levels recommended by Agarwal et al, the prevalence of overweight and obesity among males is found to be 9.8% and 4.8% respectively while among females, it was found to be 10.1% and 3.4% respectively. Thus the prevalence of overweight & obesity among males was found to be slightly higher in male adolescents 14.6% than in female adolescent's 13.5%. However the differences are not statistically significant (Table 3).

Table 1: Gender, institution and standard of education (N=1258).

Parameter	No. of subjects	Percentage
Gender		
Male	644	51.2
Female	614	48.8
Institution		
Government school	425	33.8
Private school	428	34.0
Government junior college	203	16.1
Private junior college	202	16.1
Standard of education		
6 th Standard	169	13.4
7 th Standard	174	13.8
8 th Standard	166	13.2
9 th Standard	173	13.8
10 th Standard	171	13.6
Intermediate first year	202	16.1
Intermediate second year	203	16.1

Table 2: Family history of obesity and nutritional status among adolescents (N=1258).

Parameter	No. of subjects	Percentage
Family history of obesity		
Yes	688	54.7
No	570	45.3
Nutritional status (based on BMI cut off levels recommended by IOTF)		
Underweight & Normal	1113	88.5
Overweight	111	8.8
Obese	34	2.7
Nutritional status (based on BMI cut off levels recommended by Agarwal et al)		
Underweight & Normal	1081	86.0
Overweight	125	9.9
Obese	52	4.1

As per the IOTF cut off levels, the prevalence of overweight is found to be highest in private school adolescents 16.4% and least in Government Junior College 2.5%. The prevalence of obesity also is found to be highest in private school 6.1% and least in

Government Junior College (0.0%). The differences in the proportion of overweight and obesity among the various institutions are also found to be statistically significant. As per the Agarwal et al cut off levels, the prevalence of overweight is found to be highest in private school adolescents 17.3% and least in Government Junior College 3.4%. The prevalence of obesity also is found to be highest in private school 9.8% and least in Government Junior College (0.0%). The differences in the proportion of overweight and obesity among the various institutions are also found to be statistically significant (Table 4).

The prevalence of overweight is found to be highest in 10th standard 13.5% followed by 9th standard 11.6% and least in Intermediate 1st year adolescents 2.5%. The prevalence of obesity is found to be highest in 9th standard 5.2% followed by 10th standard 4.1% and least in Intermediate 1st year adolescents (0.5%). The differences in the proportion of overweight and obesity among the various standards of education are also found to be statistically significant (Table 5).

The prevalence of overweight 9.0% as well as obesity 2.8% has been found to be higher in Adolescents of Hindu religion compared to other religions. However the differences in the proportions are not statistically significant (Table 6).

It is found that 11.0% and 7.5% are overweight and obese among those taking vegetarian diet compared to 8.5% and 1.9% respectively among those taking non-vegetarian diet and the differences are also found to be statistically significant (Table 7).

It is found that 8.0% and 4.7% are overweight and obese among those engaged in mild physical activity; 9.0% and 3.6% among those in moderate physical activity while 9.2% and 0.8% are overweight and obese respectively among those engaged in vigorous physical activity. Thus the overall prevalence of overweight and obesity combined decreased with increase in the degree of physical activity from 12.7% in mild category to 10.0% in vigorous category and the differences are also found to be statistically significant (Table 8).

Table 3: Nutritional status by gender.

Gender	Normal (%)	Overweight (%)	Obese (%)	Total (%)
Nutritional status based on IOTF cut off levels by gender				
Male	579 (89.9)	47 (7.3)	18 (2.8)	644 (100.0)
Female	534 (87.0)	64 (10.4)	16 (2.6)	614 (100.0)
Total	1113 (88.5)	111 (8.8)	34 (2.7)	1258 (100.0)
$\chi^2=3.82$;df=2; P=0.14; NS				
Nutritional status based on cut off levels recommended by Agarwal et al by gender				
Male	550 (85.4)	63 (9.8)	31 (4.8)	644 (100.0)
Female	531 (86.5)	62 (10.1)	21 (3.4)	614 (100.0)
Total	1081 (85.9)	125 (9.9)	52 (4.2)	1258 (100.0)
$\chi^2=1.55$; df=2;P=0.46;NS				

Table 4: Nutritional status by type of institution.

Institution	Normal (%)	Overweight (%)	Obese (%)	Total (%)
Nutritional status based on IOTF cut off levels by institution				
Government school	403 (94.8)	19 (4.5)	3 (0.7)	425 (100.0)
Private school	332 (77.5)	70 (16.4)	26 (6.1)	428 (100.0)
Government junior college	198 (97.5)	5 (2.5)	0 (0.0)	203 (100.0)
Private junior college	180 (89.1)	17 (8.4)	5 (2.5)	202 (100.0)
Total	1113 (88.5)	111 (8.8)	34 (2.7)	1258 (100.0)
$\chi^2=85.4$;df=2; P<0.001; S				
Nutritional status based on Agarwal et al cut off levels by institution				
Government school	396 (93.2)	25 (5.9)	4 (0.9)	425 (100.0)
Private school	312 (72.9)	74 (17.3)	42 (9.8)	428 (100.0)
Government junior college	196 (96.6)	7 (3.4)	0 (0.0)	203 (100.0)
Private junior college	177 (87.6)	19 (9.4)	6 (3.0)	202 (100.0)
Total	1081 (85.9)	125 (9.9)	52 (4.2)	1258 (100.0)
$\chi^2=105.7$;df=2; P<0.001; S				

Table 5: Nutritional status by standard of education.

Standard of education	Normal (%)	Overweight (%)	Obese (%)	Total (%)
6 th standard	153 (90.5)	13 (7.7)	3 (1.8)	169 (100.0)
7 th standard	156 (89.7)	14 (8.0)	4 (2.3)	174 (100.0)
8 th standard	141 (85.0)	19 (11.4)	6 (3.6)	166 (100.0)
9 th standard	144 (83.2)	20 (11.6)	9 (5.2)	173 (100.0)
10 th standard	141 (82.4)	23 (13.5)	7 (4.1)	171 (100.0)
Intermediate first year	196 (97.0)	5 (2.5)	1 (0.5)	202 (100.0)
Intermediate second year	182 (89.6)	17 (8.4)	4 (2.0)	203 (100.0)
Total	1113 (88.5)	111 (8.8)	34 (2.7)	1258 (100.0)

P=0.0026; S.

Table 6: Nutritional status by Religion.

Religion	Normal (%)	Overweight (%)	Obese (%)	Total (%)
Hindu	1055 (88.2)	108 (9.0)	34 (2.8)	1197 (100.0)
Muslim	32 (94.1)	2 (5.9)	0 (0.0)	34 (100.0)
Christian& Others	26 (96.3)	1 (3.7)	0 (0.0)	27 (100.0)
Total	1113 (88.5)	111 (8.8)	34 (2.7)	1258 (100.0)

Table 7: Nutritional status by type of diet.

Type of diet	Normal (%)	Overweight (%)	Obese (%)	Total (%)
Non-Vegetarian	972 (89.6)	92 (8.5)	21 (1.9)	1085 (100.0)
Vegetarian	141 (81.5)	19 (11.0)	13 (7.5)	173 (100.0)
Total	1113 (88.5)	111 (8.8)	34 (2.7)	1258 (100.0)

P<0.001; S.

Table 8: Nutritional status by degree of physical activity.

Degree of physical activity	Normal (%)	Overweight (%)	Obese (%)	Total (%)
Mild	295 (87.3)	27 (8.0)	16 (4.7)	338 (100.0)
Moderate	338 (87.4)	35 (9.0)	14 (3.6)	387 (100.0)
Vigorous	480 (90.0)	49 (9.2)	4 (0.8)	533 (100.0)
Total	1113 (88.5)	111 (8.8)	34 (2.7)	1258 (100.0)

P<0.001; S.

DISCUSSION

The present study was carried out among 1258 adolescents studying in 6th standard to Intermediate 2nd year. It was found that the proportion of males 51.2% is similar to that of females 48.8%. A similar study carried out among 8613 adolescents among Hispanic immigrants to the US had also found similar gender distribution of male 50.5% and females 49.5%.⁷ The Ahmadabad study had also found a similar gender distribution with 51.2% males and 48.8% females.⁸ A study in Surat City however found a preponderance of females 70.4% than males 29.6% reportedly because one exclusive girls' school was included in the study.⁹ In the present study, the proportion of government and private school distribution is also similar 33.8% and 34.0%. Similarly the distribution of government and private college is similar 16.1%. The educational standard distribution from 6th to 10th is similar varying within narrow limits of 13.2% to 13.8%. Similarly the proportion of first year intermediate and

second year intermediate is similar. The main reason for this similarity in distribution is that the subjects have been matched for gender, type of institution (government & private) and level of education (within school and college level). Similar age adjustment was done in another Indian study for assessment of overweight and obesity.¹⁰ A study in Guntur has found higher proportion of private school children 69.1% than government school children 32.9%.¹¹ The prevalence of overweight 9.0% as well as obesity 2.8% has been found to be higher in Adolescents of Hindu religion in our study. The Lucknow study in contrast, showed lower prevalence in Hindu religion 4.7% compared to others 6.1%.¹² It is found that 11.0% and 7.5% are overweight and obese among those taking vegetarian diet compared to 8.5% and 1.9%. Nagpur study had shown a significantly higher prevalence among non-vegetarians 17.0% compared to vegetarians 11.8%.¹³ The Vizianagaram study also showed higher prevalence in non-vegetarians (20.2%) compared to vegetarians 13.8%.¹⁴ It is found that 8.0%

and 4.7% are overweight and obese among those engaged in mild physical activity; 9.0% and 3.6% among those in moderate physical activity while 9.2% and 0.8% are overweight and obese respectively. The study in South Karnataka had showed decreasing levels of overweight and obesity with increased duration of exercise.¹⁵ The Guntur study also showed that low levels of physical activity are associated with higher prevalence of overweight and obesity.¹¹ Significantly higher prevalence of overweight/obesity was found in adolescents of private institutions, day scholars and in those with positive family history of obesity in the present study.

CONCLUSION

Overweight and Obesity were found to be significantly higher in school adolescents than the college going adolescents which reiterates the fact that the health education destined to inculcate healthy life style practices should be provided at an early age group.

ACKNOWLEDGEMENTS

Authors acknowledge Faculty of Department of Community Medicine, S.V. Medical College, Tirupathi for their valuable suggestions during this work.

Funding: No funding sources

Conflict of interest: None declared

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

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Cite this article as: Gorantla AK, Kumar MP. A cross sectional study on association between overweight and obesity in adolescent population. *Int J Community Med Public Health* 2017;4:115-9.