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Original Research Article

Assessment of overweight and obesity among urban adolescents

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ABSTRACT

Background: Obesity is defined as the abnormal growth of adipose tissue due to enlargement of fat cell size or increase in their number or a combination of both. Adolescents are nutritionally vulnerable age group considering their increased nutritional needs, eating patterns, lifestyle and susceptibility to environmental influences. The present study was conducted with aims to access the prevalence of overweight and obesity among urban adolescents and to study various factors associated with overweight and obesity.
Methods: A community based cross sectional study of 872 adolescents of both sexes in urban population of Pune, Maharashtra, India was conducted to assess prevalence and various factors influencing overweight and obesity, especially type of diet, frequency of junk foods, physical activity and sleeping habits. The Body Mass Index (BMI) and Waist-Hip Ratio (WHR) were used to define overweight and obesity as per WHO growth standards.
Results: The prevalence of overweight and obesity in urban adolescents according to BMI were 17.4% and 6.9% respectively with overall prevalence being 24.3% but with Waist-Hip Ratio (WHR) it was 43.1%. Risk factors in urban areas were consumption of fast/junk food, carbonated drink, physical inactivity while afternoon sleep was not a significant factor.
Conclusions: This study showed an increased prevalence of overweight and obesity in urban adolescents especially in those who have more consumption of fast food, carbonated drink, those who were either inactive or engaged in physical activity for less than 30 min/day were strongly associated with overweight and obesity.

Keywords: Adolescents, Body Mass Index, Obesity, Overweight, Risk factors, Urban

INTRODUCTION

Adolescence is defined as the period of physical, social, psychological, behavioral and Sexual maturity, development of adult's mental process and adult identity, transition from total socio-economic dependence to relative independence. In chronological development it is period between (10-19 years).[1] WHO describes overweight and obesity as abnormal or excessive fat accumulation in adipose tissue to that extent that health may be impaired.[2] Adolescent are nutritionally vulnerable age group in considering their increased nutritional needs, eating patterns, lifestyle and susceptibility to environmental influences. The health problems and unhealthy habits acquired during this phase prove a lifelong hindrance in wellbeing. Nearly 35% of the global burden of disease has its root emergence in adolescence.[3]

Overweight and obesity is one of today's most important and most neglected public health problem which is escalating as a global epidemic. On one hand, highest rates of childhood obesity have been observed in the

developed countries and on the other hand its prevalence is increasing in the developing countries also. The children in developing countries presently suffer from double jeopardy of malnutrition - urban children are afflicted with problems of over nutrition while rural and slum children suffer from effects of under nutrition. Obesity is multifactorial condition influenced by many variables including genetic, demographic and lifestyle factors. Adolescent obesity is associated with increased morbidity and mortality related to a variety of chronic diseases later in life.[4]

The present study was conducted with aims:

- To assess overweight and obesity among urban adolescents.
- To study various factors influencing overweight and obesity.

METHODS

A community based cross sectional study was conducted from May 2018 to April 2019 in Department of Community Medicine at Bharati Vidyapeeth Medical College and Research Centre, Pune. In this study 872 adolescents of both sexes aged 10-19 years from urban population were included. The study was started with adolescents' interview for their diet and lifestyle related questions as according to a pre-tested proforma which included type of diet, frequency of junk food, physical activity in form of outdoor games and exercise and sleeping pattern. With appropriate standard technique of anthropometric measurement height, weight, BMI, waist and hip circumferences and waist-hip ratio were calculated. WHO growth standards (2007) were used in defining overweight and obesity and for calculating BMI for age. Statistical Data's were analyzed using Pearson's Chi-square test and all the statistical significances were evaluated as 95% confidence interval level.

Inclusion criteria

Adolescents aged 10-19 years of both sexes who gave consent and willing to participate in the study were included in the study.

Exclusion criteria

Adolescents with chronic systemic illness, those on long term medicine and those who showed hostile behaviour during study were excluded.

RESULTS

The results of the study on different parameters are as follows

Overweight, obesity, BMI and Waist-Hip Ratio

Out of total 872 adolescents 53.0% were males and 47.0% were females. Mean age was 14.43 years±2.82 SD. The mean BMI of adolescents was 20.19 kg/m2±10.71 with 19.3% adolescents being underweight (BM1 <3rd percentile), 56.4% normal (b/w 3rd-85th percentile), 17.4% overweight (>85th percentile) and 6.9% obese (>97th percentile). Overall prevalence of overweight and obesity (BMI >85th percentile) was 24.3% as shown in (Table 1).

Table 1: Distribution of study population by Body Mass Index (BMI).

BMI	Underweight (<3rd percentile) No. (%)	Normal (3rd -85th percentile) No. (%)	Overweight (>85th percentile) No. (%)	Obese (>97th percentile) No. (%)	Total No. (%)
Study population	168(19.3)	492(56.4)	152(17.4)	60(6.9)	872(100.0)

Table 2: Distribution of study population by WHR.

WHR	Male		Female		Study population	
	No.	%	No.	%	No.	%
High	144	38.3	232	61.7	376	43.1
Normal	318	64.1	178	35.9	496	56.9
Total	462	53.0	410	47.0	872	100.0

The prevalence of abdominal obesity (High WHR) came out to be 43.1% being significantly more in females (61.7%) than males (38.3%) as shown in (Table 2).

Prevalence of abdominal obesity increased with the increasing BMI being maximum (83.3%) in adolescents who had BMI >97th percentile followed by 77.6%, 37.4% and 14.3% in adolescents who had BMI >85th percentile, 3rd - 85th percentile and <3rd percentile respectively (P < 0.001). The prevalence of overweight and obesity was higher (P<0.001) by WHR (43.1%) than by BMI (24.3%) as shown in (Table 3).

Dietary habits

The prevalence of overweight and obesity was 25.9% in Flexitarians as compared to 21.8% in vegetarians (P

>0.05) as shown in (Table 4). The prevalence of overweight and obesity was significantly high (P <0.001) among those who consumed carbonated drinks either daily (56.8%) or 2-3 times per week (38.2%) as compared to those consumed them occasionally (10.7%) or did not consume at all (3.5%) as shown in (Table 5).

Table 3: Distribution of high WHR (abdominal obesity) in relation to BMI.

BMI	Study population (N=872)		Total		
			High WHR (N=376)		Prevalence of overweight and obesity BMI Vs WHR (%)
	No.	%	No.	%	
Obese (>97th percentile)	60	6.9	50	13.3	83.3
Overweight (>85th percentile)	152	17.4	118	31.4	77.6
Normal (3rd -85th percentile)	492	56.4	184	48.9	37.4
Underweight (<3rd percentile)	168	19.3	24	6.4	14.3
Total	872	872	376	100.0	43.1

Table 4: Overweight and obesity in relation to type of diet.

Dietary habit	Study population		BMI > 85th Percentile					
			Overweight		Obese		Total	
	No.	%	No.	%	No.	%	No.	%
Vegetarian	348	39.9	54	15.5	22	6.3	76	21.8
Flexitarians	524	60.1	98	18.7	38	7.2	136	25.9
Total	872	100.0	152	17.4	60	6.9	212	24.3

Table 5: Overweight and obesity in relation to frequency of intake of carbonated drinks.

Intake of carbonated drinks	Study population		BMI > 85th Percentile					
			Overweight		Obese		Total	
	No.	%	No.	%	No.	%	No.	%
Daily	88	10.1	36	40.9	14	15.9	50	56.8
2-3times/Week	314	36.0	82	26.1	38	12.1	120	38.2
Occasionally	356	40.8	32	9.0	6	1.7	38	10.7
None	114	13.1	2	1.7	2	1.7	4	3.5
Total	872	100.0	152	17.4	60	6.9	212	24.3

Table 6: Overweight and obesity in relation to frequency of intake of fast food.

Intake of fast food	Study population		BMI > 85th Percentile					
			Overweight		Obese		Total	
	No.	%	No.	%	No.	%	No.	%
Daily	96	11.0	30	31.2	14	14.6	44	45.8
2-3times/Week	430	49.3	98	22.8	40	9.3	138	32.1
Occasionally	320	36.7	24	7.5	6	1.9	30	9.4
None	26	3.0	0	0.0	0	0.0	0	0.0
Total	872	100.0	152	17.4	60	6.9	212	24.3

Table 7: Overweight and obesity in relation to regularity of exercise/sports activity.

Regularity of exercise/ sports activity	Study population		BMI > 85th Percentile					
			Overweight		Obese		Total	
	No.	%	No.	%	No.	%	No.	%
Regular (<5days/Week)	330	63.2	26	7.9	18	5.4	44	13.3
Irregular (>5days/Week)	192	36.8	32	16.7	8	4.2	40	20.8
Total	522	100.0	58	11.1	26	5.0	84	16.1

Table 6 shows that the prevalence of overweight and obesity was also significantly high (P < 0.001) among those who consumed fast food items either daily (45.8%) or 2-3 times per week (32.1%) as compared to those who consumed these products occasionally (9.4%), Adolescents who did not consume fast food items were not found to be overweight and obese.

Table 8: Overweight and obesity in relation to duration of exercise/sports activity.

Duration of exercise/ sports activity	Study population		BMI > 85th Percentile					
			Overweight		Obese		Total	
	No.	%	No.	%	No.	%	No.	%
< 30 Min	188	36.0	34	18.1	16	8.5	50	26.6
30-60 Min	218	41.8	22	10.1	10	4.6	32	14.7
>60 Min	116	22.2	2	1.7	0	0.0	2	1.7
Total	522	100.0	58	11.1	26	5.0	84	16.1

Table 9: Overweight and obesity in relation to duration of sleeping in afternoon.

Sleeping in afternoon	Study population		BMI > 85th Percentile					
			Overweight		Obese		Total	
	No.	%	No.	%	No.	%	No.	%
< 2 Hrs	316	65.3	58	18.3	20	6.3	78	24.6
>2hrs	168	34.7	32	19.0	12	7.1	44	26.2
Total	484	100.0	90	18.6	32	6.6	122	25.2

Physical activity

Adolescents who were physically active prevalence of overweight and obesity was significantly lower (P < 0.05) among those who practiced any kind of exercise/sport regularly (13.3%) as compared to those who practiced them irregularly (20.8%) as shown in (Table 7).

When effect of various physical activities was observed it was seen that overweight and obesity was higher among those who were performing exercise/sports activity for less than 30 min. (26.6%) as compared to those who were performing these activities for a duration of 30-60 min. (14.7%). Only 1.7% were overweight and obese among these who were doing exercise for more than 60 min. This difference in prevalence of overweight and obesity in relation to duration of physical activity was found to be statistically significant (p <0.001) as shown in (Table 8).

Sleeping habits

The prevalence of overweight and obesity was 25.2% in adolescents who had habit of sleeping in afternoon as compared to 23.2% in those who did not sleep in afternoon (P >0.05). Among those who had habit of sleeping in afternoon prevalence of overweight and obesity was 24.6% among those who slept for less than equal to 2 hrs/day as compared to 26.2% in those who slept for more than 2 hrs/day (P >0.05) as shown in (Table 9). On univariate analysis factors like more consumption of fast food, carbonated drinks, those who were either inactive or engaged in physical activity for less than 30 min/day were strongly associated with overweight and obesity.

DISCUSSION

In the present study a total of 872 adolescents were surveyed out of which 53.0% were males and 47.0% were females. Maximum number of adolescents (37.8%) belonged to late adolescence age group 16-19 years followed by early adolescence age group 10-12 years (31.7%) and middle adolescence age group 13-15 years (30.5%).

Similarly Tiwari et al, conducted study among 940 adolescents out of which 53.7% were males and 46.3% were females, 53.9% of adolescents belonged to middle adolescence age group, 35.8% belonged to late adolescence age group and only 10.3% belonged to early adolescence age group. Kar et al, in their study, also showed that out of total 979 adolescents studied 38.41% were males and 62.82% were females. Maximum no of adolescents belonged to age group 16-19 years (62.82%) as compared to age group 10-15 years (37.18%).[5]

Prevalence of overweight and obesity by BMI and WHR

The present study shows Out of total 872 adolescents surveyed 17.4% were overweight and 6.9% were obese

constituting total of 24.3%. Similarly study done by Brahmbhatt et al, reported prevalence of overweight and obesity being 13.3% and 5.4% respectively.[6] The prevalence observed in present study is also comparable to that of the range indicated by a review in India in 2007 as overweight (8.5%-29%) and obesity (1.5%-7.4%). The overall prevalence (24.3%) observed in present study was comparable to 23.9% reported by Khadilkar et al.[7] In the present study there was higher prevalence of High WHR among those who were obese (83.3%) and overweight (77.6%) as compared to those who were having normal BMI (37.4%) and underweight (14.3%). This may be due to the reason that with increase in BMI, WHR also increases. Some adolescent's despite of having normal BMI and being underweight were also having High WHR. According to latest studies the central obesity measured by WHR is the major predictor risk factor for NCDs.

In the present study overweight and obesity according to BMI came out to be 24.3% and by WHR 43.1%. Similarly study done by Senbanjo et al, reported 5% children had general obesity and 24.5% had central obesity.[8] Similarly Sabageh et al, also reported that prevalence of obesity was 4.2% using BMI and 37.2% by WHR which is in conformity to present study.[9] This shows that normal or underweight by BMI were also centrally obese.

Relation of overweight and obesity with dietary factors

Dietary pattern established in childhood and adolescence often persists into adulthood and therefore faulty dietary behaviour has implications for risk of developing chronic diseases in future.

As shown in the study prevalence of overweight and obesity was more among flexitarians (25.9%) as compared to vegetarians (21.8%). Among flexitarians prevalence was maximum among those who were daily eaters (34.6%) followed by those who ate 2-3 times per week (30.2%) and least among occasional eaters (23.4%). Similarly Aggarwal et al, reported that prevalence of overweight and obesity was more among those who were non-vegetarians (15.8%) as compared to vegetarians (8.3%).[10] This observation clearly indicates that non-vegetarian diet is associated with increased prevalence of overweight and obesity.

In the present study prevalence of overweight and obesity was higher among those who consumed carbonated drinks either daily (56.8%) or 2-3 times per week (38.2%) as compared to those who consumed them occasionally (10.7%) or did not consume them at all (3.5%). Similarly prevalence was higher among those who consumed sweets/chocolates/ice creams either daily (29.6%) or 2-3 times per week (27.1%) as compared to those who consumed these products either occasionally (18.7%) or did not consumed them at all (16.7%).

Katkuri et al, also reported that prevalence of overweight and obesity was higher among those who consume soft drinks/sweets/chocolates/ice-creams daily (60%) and 2-3 times/week (31.1%) than those who consume it occasionally (3%) or not consuming (6.4%).[11] This is due to consumption of these things increases weight as they add more calories and satiety is not addressed.

In the present study prevalence was higher among those who consumed fast food items either daily (45.8%) or 2-3 times per week (32.1%) as compared to those who consumed these products occasionally (9.4%). Those who did not consume fast (18.7%) or did not consumed them at all (16.7% Thakre et al, also reported that food items were not found to be overweight and obese. Similarly study done by Thakre et al, reported that overweight and obesity was significantly higher among those who consumed junk food regularly and frequently (25.71%) as compared to those consuming junk food never/occasionally (11.98%).[12] This may be due to fast food items are rich in fat, sugar, salt and oil. Fast food is easily available, yummy in taste and cheap at cost so most of children are attracted towards these food fads.

Relation of overweight and obesity with physical activity

As observed in the present study overweight and obesity have inverse relationship with level of physical activity. Prevalence of overweight and obesity was higher among those who were not physically active (36.6%) as compared to those who were involved in some sort of physical activity (15.1%). Patnaik et al, also reported a higher prevalence of overweight and obesity among those who did not do regular exercises (such as walking, jogging, gyming, yoga) (33.9%) as compared to those doing regular exercise daily (9.8%).[13]

Present study shows that among those who were physically active, prevalence of overweight and obesity was lower among those who practiced any kind of exercise/sport regularly (13.3%) as compared to those who practiced them irregularly (20.8%). Similarly Tomar et al, reported that prevalence of overweight and obesity was significantly lower among those who did regular exercises (>5 times/week) (7.5%) as compared to those who did not do regular exercises (<5 times/week) (19.9%).[14] The results clearly revealed that regular physical activity was an important factor in reducing prevalence of overweight and obesity.

In the present study those who were performing exercise/sports activity for less than 30 min (26.6%) were more overweight and obese as compared to those who were performing these activities for a duration of 30-60 min (14.7%) and more than 60 min (1.7%). Vohra et al, from their study at Lucknow also reported that prevalence of overweight and obesity was more among those who were playing outdoor games <30 min/day (7.85%) as compared to those who were playing outdoor games >30 min/day (0.60%).[15] So doing some sort of exercise is

found to be a protective factor against overweight and obesity and its effect increases with increased duration and regularity of exercise.

Relation of overweight and obesity with sleeping habits

In the present study higher prevalence of overweight and obesity was not found to be statistically associated with habit of sleeping in afternoon (25.2%) as compared to those who were not in habit of sleeping in afternoon (23.2%) nor duration of sleep in the afternoon as the prevalence of overweight and obesity was 24.6% among those who slept for less than equal to 2 hrs/day as compared to 26.2% in those who slept for more than 2 hrs/day. Watharkar et al, showed that those who were regularly sleeping (31.2%) in afternoon were more overweight and obese than those who were not regularly sleeping (28.7%).[16] The reason for this may be physical inactivity and less interest in playing outdoor games and exercises makes children sleep during daytime which leads to development of overweight and obesity.

CONCLUSION

The prevalence of overweight and obesity is higher in urban areas. Prevention of overweight and obesity should begin in early childhood. This is due to the fact that obesity is harder to control once it is established in adolescent. This persists into adulthood making them more prone to non-communicable diseases. Children should be encouraged to be physically active by doing regular exercise at least 5 days per week and more than half an hour per day, play outdoor games/sports etc. There should be regular classes on healthy food habits providing knowledge about nutritive values of different food items, lifestyle and behavioural modifications in schools. Large scale nationwide campaigns targeted at more specific groups are required to check the growing epidemic of childhood obesity in developing countries.

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