A cross-sectional study to compare BMI and waist HIP ratio in adolescent children in Rewa, Madhya Pradesh

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Abstract

Background: Childhood obesity is increasingly being observed with changing lifestyles of families. The magnitude of overweight ranges from 9% to 27.5% and obesity ranges from 1% to 12.9% among Indian children

Objectives: The present study was conducted to compare the magnitude of overweight/obesity according to two scales of measurement i.e. BMI and waist hip ratio and its determinants among 11^{th} and 12^{th} class students in Rewa, MP.

Materials and Methods: A Study of Obesity in Adolescent Girls and Boys of Rewa; has been undertaken between June to September 2018 in Central Academy School Rewa, M. P. (North India). 250 school going children of 11^{th} and 12^{th}standard were selected as subject for the study in random basis.

Results: 3.75% children from joint families were overweight while none in the nuclear family were overweight. The study shows that only vegetarian were overweight (2.22%). 4.65% children at risk of being overweight and 1.4% come in over weight group are taking junk food. Children who were taking saturated fat in their diet, out of them 3.56% were at risk of overweight and 1.33% were overweight. Furthermore, 16% children was under weight also. Waist hip ratio was normal in 90% males &90% females. According to waist/hip ratio vegetarian children (12.59%) were more prone to central obesity group in comparison to non-vegetarian group (6.96%). In relation to waist/hip ratio children who were consuming saturated fat (11.11%) come in centrally obesity group. There is significant association of BMI and family

type, dietary pattern, while there is no significant association of waist hip ratio and family type and dietary pattern.

Keywords: BMI, overweight, obesity, waist hip ratio

Introduction

India is a vast country having different population groups. We are having significant proportion of malnourished children in our country, and at other end of this spectrum, number of obese children is also on increasing trend because of various factors. Lack of exercise rather than excessive diet perhaps is the major contributing factor. The major epidemiologic transition in the 21st century was the shift in mortality and morbidity from infectious diseases to chronic diseases, with cardiovascular diseases leading the list. This transition was primarily attributable to the social, economic, and public health changes that took place in the India. At the beginning of the new millennium, a new challenge has emerged-a marked increase in obesity prevalence with a parallel increase in obesity-associated chronic diseases and their clinical onset at even younger ages. Lack of physical activity is risk factor for overweight and obesity. Obesity is a challenging multi factorial problem. It is escalating at an alarming rate across the globe in all age groups, especially among the urban teens. Various studies have shown that there is up 5-10% increase in obesity per decade of late. Obesity in childhood is an important risk factor for obesity in adulthood and up to 80% of them become obese adults.[1-3]

Some of the health hazards that are linked to obesity are coronary artery disease, Cerebrovascular disease, hypertension, type II diabetes mellitus, hyperlipidemia, orthopaedic disorders, cholelithiasis, hyperuricaemia, early puberal changes, menstrual irregularities, respiratory infections, obstructive sleep apnoea (OSA) and psychosocial problems.[1] The prevalence of overweight and obesity in young people is increasing exponentially and is now of pandemic proportions. Childhood obesity is multi factorial, involving genetic, social, cultural, and environmental components. Obesity results from increased energy in excess of expenditure.[2-10]The present study has been undertaken to study physical activity, and obesity in adolescent boys and girls of Rewa city to probe the magnitude to problem and factors related to them.

Material and Methods

The present study has been undertaken between June to September 2018 in Central Academy School Rewa, M. P. (North India). 250 school going children of 11thand 12thstandard were selected as subject for the study in random basis. All the participants were subjected to sign the consent form and asked some specific questions for their food habits. Data collection was carried out by face to face interviews at the school campus. The information regarding demographic features, food habits, family history about and religion were recorded using a questionnaire.

Inclusion criteria: We studied all healthy children of middle and late adolescent age group.

Exclusion criteria: Children having any systemic disease or any chronic illness.

Methodology of anthropometric parameter: Different anthropometric measurements such as BMI, waist hip ratio, waist circumference and Hip circumference are used as the part of index for investigating cardiovascular risk factors[15]. Therefore, the reliability and validity of anthropometric measurements for the use of index of cardiovascular risk factors are well established [12& 15].

Observation &Result

The present study entitled "A crosssectional study to compare of BMI and Waist Hip Ratio in adolescent children in Rewa, Madhya Pradesh**"** conducted on 250 school going adolescent children, carried out in central academy school, Rewa (M.P.), during the period of June to September 2018.

Table1: Demographic Distribution of Cases

Sex	**Case**	**Percentage**	
Male	170	68.00%	
Female	80	32.00%	
Total	**250**	**100.00%**	
Age group	**Male**	**Female**	**Total**
15-16 year (Middle Adolescent)	93 (54.71%)	55 (68.75%)	148 (59.2%)
17-18 year (Late Adolescent)	77 (45.29%)	25 (31.25%)	102 (40.8%)
Total	**170 (100%)**	**80 (100%)**	**250 (100%)**
Habitat	**Male**	**Female**	**Total**
Rural	33 (19.41%)	20 (25%)	53 (21.2%)
Urban	137 (80.59%)	60 (75%)	197 (78.8%)
Total	**170 (100%)**	**80 (100%)**	**250 (100%)**
Type of Family	**Number**	**Percentage**	
Hindu	242	97%	
Muslim	8	3.00%	
Total	**250**	**100.00%**	
Type of family	**Number**	**Percentage**	
Nuclear	173	69.2%	
Joint	77	30.8%	
Total	**250**	**100.00%**	
Diet	**Number**	**Percentage**	
Veg	135	54.00%	
Non-veg	115	46.00%	
Total	**250**	**100.00%**	

In this table total of 250 children belonging to Adolescent age group were evaluated. Out of 250 children 68% were male & 32% were female. As per the established criteria, children were segregated into two groups, middle (15-16 years) & late adolescent (17-18 years).59.2% children were of middle adolescent age group & remaining 40.8% were of late adolescent age group. In this study group 21.2% children belonged to rural area where as 78.8% were from urban area. The difference in habitat may be because the school chosen for the study was located in the city.

Table2: Distribution of Cases According to Dietary Preferences

Diet	**Number**	**Percentage**
Veg	135	54.00%
Non-veg	115	46.00%
Total	**250**	**100.00%**
Dietary Habits	**Number**	**Percentage**
Taking Junk food	215	86.00%
Not taking junk food	35	14.00%
Total	**250**	**100.00%**
Saturated Fat	**Number**	**Percentage**
Yes	225	90.00%
No	25	10.00%
Total	**250**	**100.00%**

Though 54% children were vegetarian, the percentage of non-vegetarian children was also high i.e. 46.0%. Ost of the children were taking junk food in their diet (86%). Majority (90%) of families were using saturated fat in their diet.

Table3: Relation between Dietary Preferences & BMI

BMI (kg/m^2)	**Food**		**Total**	
	Veg	**Non-Veg**		
Under weight	15 (39.47%) (11.11%)	23 (60.53%) (20%)	38 (15.2%)	χ^2=6.12 p =0.019, Significant
Normal weight	109 (55.9%) (80.74%)	86 (44.1%) (74.78%)	195 (78%)	
At risk of Over weight	8 (57.14%) (5.93%)	6 (42.86%) (5.22%)	14 (5.6%)	
Over weight	3 (100%) (2.22%)	0 (0%) (0%)	3 (1.2%)	
Total	**135 (54%)**	**115 (46%)**	**250 (100%)**	
BMI (kg/m^2)	**Junk Food**		**Total**	
	Yes	**No**		
Under weight	29 (76.32%) (13.49%)	9 (23.68%) (25.71%)	38 (15.2%)	χ^2=7.11 p=0.06, Significant
Normal weight	173 (88.72%) (80.47%)	22 (11.28%) (62.86%)	195 (78%)	
At risk of Over weight	10 (71.43%) (4.65%)	4 (28.57%) (11.43%)	14 (5.6%)	
Over weight	3 (100%) (1.4%)	0 (0%) (0%)	3 (1.2%)	
Total	**215 (86%)**	**35 (14%)**	**250 (100%)**	
BMI (kg/m^2)	**Saturated Fat**		**Total**	χ^2=18.43 p=0.0004, Significant
	Yes	**No**		
Under weight	36 (94.74%)	2 (5.26%)	38	

	(16%)	(8%)	(15.2%)	
Normal weight	178 (91.28%) (79.11%)	17 (8.72%) (68%)	195 (78%)	
At risk of Over weight	8 (57.14%) (3.56%)	6 (42.86%) (24%)	14 (5.6%)	
Over weight	3 (100%) (1.33%)	0 (0%) (0%)	3 (1.2%)	
Total	**225 (90%)**	**25 (10%)**	**250 (100%)**	

3.75% children from joint families were overweight while none in the nuclear family were overweight. The study shows that only vegetarian were overweight (2.22%).4.65% children at risk of being overweight and 1.4% come in over weight group are taking junk food. Children who were taking saturated fat in their diet, out of them 3.56% were at risk of overweight and 1.33% was overweight. Furthermore, 16% children were under weight also.

Table 4: Waist/Hip ratio in relation to Gender, Dietary preference And Junk food intake

Waist/Hip ratio	**Sex**		**Total**	**Significance**
	Male	**Female**		
Normal	153 (68%) (90%)	72 (32%) (90%)	225 (90%)	χ^2= 0.051 p=0.82, Not Significant
Central Obesity	17 (68%) (10%)	8(32%) (10%)	25 (10%)	
Total	**170 (68%)**	**80 (32%)**	**250 (100%)**	
Waist/Hip ratio	**Food**		**Total**	
	Veg	**Non-Veg**		
Normal	118 (52.44%) (87.41%)	107 (47.56%) (93.04%)	225 (90%)	χ^2=1.61 p=0.204, Not Significant
Obesity	17 (68%) (12.59%)	8 (32%) (6.96%)	25 (10%)	
Total	**135 (54%)**	**115 (46%)**	**250 (100%)**	
Waist/Hip ratio	**Saturated Fat**		**Total**	
	Yes	**No**		
Normal	200 (88.89%) (88.89%)	25 (11.11%) (100%)	225 (90%)	χ^2=0.369 p=0.543, Not Significant
Central Obesity	25 (100%) (11.11%)	0 (0%) (0%)	25 (10%)	
Total	**225 (90%)**	**25 (10%)**	**250 (100%)**	

Waist hip ratio was normal in 90% males & 90% females. According to waist/hip ratio vegetarian children (12.59%) were more prone to central obesity group in comparison to non-vegetarian group (6.96%). In relation to waist/hip ratio children who were consuming saturated fat (11.11%) come in centrally obesity group.

Discussion

The study shows that only vegetarian were overweight (2.22%).4.65% children at risk of being overweight and 1.4% come in over weight group are taking junk food. Children who were taking saturated fat in their diet, out of them 3.56% were at risk of overweight and 1.33% was overweight. Furthermore, 16% children were under weight also.

Thus prevalence of obesity is same as in present study but that of underweight is less. According to V. R. Parmar, S. Basu*et al*., 40% of adolescent boys were under weight (BMI <5th percentile for age). In a similar study conducted by K. Anand, prevalence of obesity (BMI<27.5) in urban children (2.19%) has 1.37 times higher than the obesity in rural children (1.6%) Also highest prevalence of obesity was observed in age group of 14 year (3.14%).

Studies have shown that height, weight and BMI values are significantly lower in those from poor socioeconomic status than those from well to do group.

In middle and late adolescents girls tend to be overweight and boys tend to be under weight, this was statistically significant the observations may be result of early pubertal changes in girls. Gorden*et al*., [13] from New Zealand have conducted a cross sectional community based survey and reported that estimates for obesity must be interpreted cautiously because estimated percentage of obese children was higher when indices were based on weight and height than based on measure of body fat (SFT and percentage of body fat). Caramina N G *et al*., reported that 33% children were overweight and 38% obese in her study on children between 9-12 years in Canada.

Another study from Manitoba found that 64% of girls and 60 % of boys exceeded 85th percentile of reference of BMI and 40% girls and 40% boys exceeded 90th percentile of BMI. In Canadian community health survey it was reported that aboriginal children have an obesity prevalence of 20%, another study. Berkley *et al*., found that for boys and girls a 1 year increase in BMI was larger in those who reported more time in TV/video gaming during the year between the 2 BMI measurements and in those who reported that there caloric intake increased from 1year to next. Larger year to year increases in BMI were also seen among girls who reported higher caloric intake and less physical activity during the year between the 2 BMI measurements. Although the magnitudes of these estimated effects were small, their cumulative effects, year after year during adolescence, would produce substantial gains in body weight. Strategies to prevent excessive caloric intakes, to decrease time with TV/videos/games, and to increase physical activity would be promising as a means to prevent obesity. Down *et al*., have reported no difference in EI: B M Rest in different age groups and gender.

In our study more children who were not consuming junk food were under weight as compared to those consuming junk food. Obesity was exclusively present in children consuming junk food and saturated fats. Although larger numbers of the children were at the risk of overweight who were not eating junk food and saturated food. Dietary habits in it may not be the only deciding factor for obesity. An interplay of multiple factors is responsible for development of obesity. Food choice availability had been

associated with increased BMI. The availability of high fat fast foods and the decreased number of family meals results in less fruit and vegetable consumption and higher fat food consumption.

In present study 10% of girls and 10% boys have abnormal WHR indicating obesity, abnormal WHR was associated with consumption of Saturated Fat. No statistical difference is observed in relation to non-vegetarian and junk food consumption. M. Neoviou*set al*., have reported that WHR is less useful diagnostic test for detection of obesity whereas R W Taile*et al*., from New Zealand concluded waist circumference, WHR, Conicity Index provide a simple yet effective measure to truncaladiposity in children and adolescents. Another study from Punjab, India, Baddrudoza reports that there is a good correlation of WHR with systolic and diastolic blood pressure and obesity. Hence this can be combined with parameters like SFT and BMI to predict disease like hypertension, obesity and diabetes regardless of ethnic and generic background specially in women.

Conclusion

3.75% children from joint families were overweight while none in the nuclear family were overweight. The study shows that only vegetarian were overweight (2.22%). 4.65% children at risk of being overweight and 1.4% come in over weight group are taking junk food. Children who were taking saturated fat in their diet, out of them 3.56% were at risk of overweight and 1.33% was overweight. Furthermore, 16% children were under weight also. Waist hip ratio was normal in 90% males &90% females. According to waist/hip ratio vegetarian children (12.59%) were more prone to central obesity group in comparison to non-vegetarian group (6.96%). In relation to waist/hip ratio children who were consuming saturated fat (11.11%) come in centrally obesity group. There is significant association of BMI and family type, dietary pattern, while there is no significant association of waist hip ratio and family type and dietary pattern.

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