Prevalence of Obesity in mid adolescents in central India: a school based study

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Abstract

Introduction: 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. **Methods:** Mid adolescent boys and girls (14-16years) of three government and four private schools of Ujjain city were included with sample size of 1000. A pre designed questionnaire regarding nutritional and dietary history was prepared with measurement of anthropometry. **Results:** The overall prevalence of overweight and obese children in the present study was 6.8% and 3.7% respectively. The combined prevalence of overweight and obesity in the private and government schools was 12.2% and 8.4% respectively (p<0.05). Excess calorie intake was seen with 92.3 % of obese children in government compared to 50.8% in private school (p=0.00). It was also found in our study that less outdoor activity, and spending more time with computer and TV was more common in overweight and obese children. **Conclusion** The combined prevalence of overweight and obesity was much higher in private schools than government school. BMI underestimates the obesity while WHR is the better indicator for early detection of central obesity in the adolescent age group. Various factors which were found to have correlation with overweight and obesity included calorie intake, number of meals per day, lack of physical activity and overindulgence in indoor activity in the present study.

Key words: Adolescent obesity, Body Mass Index , Waist Hip Ratio, Waist to Height Ratio.

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Introduction

The World Health Organization (WHO) describes overweight and obesity as one of today's most important public health problems, which is escalating as a global epidemic [1]. It is also increasingly recognized as a significant problem in developing countries and countries undergoing economic transition [2]. The problem of overweight and obesity is confined not only to adults but also being reported among the children and adolescents of developed as well as developing countries. The prevalence of overweight and obesity among children and adolescents has increased significantly in the developed countries during the past two decades [3] and similar trends are being observed even in the developing world, though less rapidly [4-6].

This trend is of major concern, given the consequences that are associated with adolescent obesity both during

adolescence [7] and adult life which include increased incidence of coronary artery diseases & hypertension [8], diabetes, obstructive sleep apnea esophageal reflux & gastric emptying disturbances, osteoarthritis & flat feet, psychological dysfunction, self esteem & social isolation [8], dyslipidemia and overall increase in morbidity and mortality in later life [9]. The most significant long-term consequences of childhood and adolescent obesity is its persistence into adulthood, with all the attendant health risks. There are evidences that children and adolescents of affluent families are increasingly becoming over-weight/obese in recent times, possibly because of decreased physical activity & sedentary life styles [10] and change in dietary habits. Though several studies have been conducted from different parts of our country to evaluate the prevalence of obesity, very few studies have been done from central part of India. So we planned a school based

observational study to detect the prevalence of obesity and hypertension among adolescents of Ujjain city.

Materials and Methods

Study subjects: School going mid adolescent boys and girls of age group 14-16 yrs from government and private schools of Ujjain city were included in study.

1. Inclusion criteria.
a.   Age group 14-16 yrs.
b.   The students and the school administration should give written consent.

2. Exclusion criteria
a.   The students having systemic illnesses.
b.   The students having congenital malformations.

3. Sample Size: 1000 students [466 from private & 534 from government schools]

4. Material used
a. Weighing machine
b. Measuring tape (metallic)
c. Sphygmomanometer (Mercury)

5. Method

A pre designed questionnaire / proforma was prepared in order to adjust for the many of the possible confounders for the association with obesity among adolescents, all students of the study sample were subjected to a questionnaire and anthropometry was recorded.

6. Sampling

The current study was conducted in three government and four private schools of Ujjain city of Madhya Pradesh. School was used as the main sampling unit task. Of all the schools in the region, three government and four private schools were randomly selected.

Children's parents or guardians were fully informed about the objectives and methods of the study and signed a consent form. The study protocol was approved by the Ethical committee of R.D Gardi Medical College and the school management

7. Data collection

Study period extended from October 2009 to June 2011. The data was collected on a predesigned proforma which included information regarding socio-demographic profile, life style, health behavior, anthropometric measurements.

Anthropometrical measurements:
a)   **Weight** was measured using a spring balance with an accuracy of ± 50 g. Subjects were weighed without shoes.
b)   **Height** was also measured to the nearest 0.1cm with the use of measurement scale put against the wall . Height was measured without shoes and with children keeping their shoulders in a relaxed position, their arms hanging freely and their head aligned in Frankfurt plane.
c)   **BMI** was calculated by dividing weight (kg) by height squared (m^2).
Formula:-Weight (kg) ÷ height (m^2).

Participants were classified as 'underweight', 'normal', 'overweight' and 'obese', according to the WHO age- and sex-specific BMI cutoff points [11].

Results

Table 1: Age and gender wise distribution of study subjects in government and private schools

Age (years)	Government				Private			
	BOYS(n)	(%)	GIRLS(n)	(%)	BOYS(n)	(%)	GIRLS(n)	(%)
14	103	37.87	57	29.38	97	33.00	85	35.42
15	101	37.13	70	36.08	114	38.78	70	29.17
16	68	25.00	67	34.54	83	28.23	85	35.42
Total	272	100	194	100	294	100	240	100

Table 1 shows distribution of boys and girls in government and private school.

Table 2(a): Weight, Height & BMI of 14yrs Group

	Gov/ Pri	N	Mean	Std. Deviation	P value
Weight	Government	160	41.8344	10.33552	0.001
	Private	182	45.3940	9.55415	
Height	Government	160	154.5231	9.44154	0.001
	Private	182	157.6687	7.14677	
BMI	Government	160	17.5410	3.16831	0.020
	Private	182	18.2797	2.85306	

Above table shows that mean weight, height and BMI is higher in 14 yr age group in private school than in government school with a significant p value according to independent t test.

Table 2(b): Weight, Height & BMI of 15 yrs Group

	Gove /Private	N	Mean	Std. Deviation	P value
Weight	Government	101	46.8525	9.52597	
	Private	114	47.9912	9.54928	0.383
Height	Government	101	164.7277	8.69756	0.000
	Private	114	159.8509	8.90732	
BMI	Government	101	17.2865	2.77587	0.000
	Private	114	18.9336	3.36827	

Above table shows that mean weight and BMI is higher in private schools, whereas mean height is higher in government students in 15 yr age group.

Table 2(c): Weight, Height & BMI of 16yrs Group

	Gov/ Pri	n	Mean	Std. Deviation	P value.
Weight	Government	135	48.7556	11.62631	
	Private	168	46.9631	9.80547	0.14
Height	Government	135	160.6074	8.49064	0.002
	Private	168	157.1220	11.65362	
BMI	government	135	18.7517	3.74807	0.82
	Private	168	18.8386	3.10792	

Above table shows that in this group mean height and weight is higher in students of government school than in private schools. P value is only significant for height.

Table 3: Prevalence of underweight, healthy, overweight and obese in the study group

Classification of BMI (Percentile)	Government				Private			
	BOYS n	(%)	GIRLS n	(%)	BOYS n	(%)	GIRLS n	(%)
Underweight(<5)	125	45.95	38	19.59	75	25.51	49	20.42
Normal(5-84th)	130	47.78	134	69.07	184	62.59	161	67.08
Overweight(85-94)	4	1.47	18	9.28	25	8.50	21	8.75
Obese(≥95)	13	4.78	4	2.06	10	3.40	9	3.75
Total	272	100	194	100	294	100	240	100

Above table shows the higher number of overweight and obese children in private schools than in government school. (Significant p value <0.05 in chi square test)

Table 4: Distribution of obesity among students according to body composition

		Government				Private				P value
		BOYS n	(%)	GIRLS n	(%)	BOYS n	(%)	GIRLS n	(%)	
WHR	Non obese	259	95.22	176	90.72	276	93.88	221	92.08	0.04
	Obese	13	4.78	18	9.28	18	6.12	19	7.92	
	Total	272	100	194	100	294	100	240	100	
WHtR	Non obese	259	95.20	180	92.80	276	93.90	226	94.20	0.2
	Obese	13	4.80	14	7.20	18	6.10	14	5.80	
	Total	272	100.0	194	100.0	294	100.0	240	100.0	

The above table shows prevalence of obesity is higher in girls of government school on the basis of WHR while it is more in boys in private schools.

Table 5: Prevalence of obesity in the study group in relation to health behavior

Health Behavior		Government				P value	OR	Private				P value.	OR
		NO n	(%)	OB n	(%)			NO n	(%)	OB N	(%)		
1. Calorie Intake	Normal Or ≤ Normal	184	43.1	3	7.7	0.00	0.06	106	22.6	32	49.2	0.00	0.28
	Excess Calorie	243	56.9	36	92.3			363	77.4	33	50.8		
	Total	427	100	39	100			469	100	65	100		
2. Number Of Meals Per Day	≤4 TIMES /DAY	410	96.0	38	97.4	0.66	0.63	459	97.9	60	92.3	0.01	3.82
	>4TIMES /DAY	17	4.0	1	2.6			10	2.1	5	7.7		
	TOTAL	427	100.0	39	100			469	100	65	100		
3. Smoking	Yes	1	0.2	0	0			2	0.4	0	0		
	No	426	99.8	39	100			467	99.6	65	100		
	Total	427	100.0	39	100			469	100	65	100		
4. Diet	Veg	306	71.7	14	35.9	0.00	4.51	333	71.0	29	44.6	0.00	3.04
	Non Veg	121	28.3	25	64.1			136	29.0	36	55.4		
	Total	427	100	39	100			469	100	65	100		
5. Physical Activity	≤1 Hr/Day	222	52.0	21	53.8	0.82	0.48	166	35.4	37	56.9	0.00	0.5
	>1 Hr / Day	205	48.0	18	46.2			303	64.6	28	43.1		
	Total	427	100	39	100			469	100	65	100		
6. TV /Comp	≤2 Hr /Day	93	21.8	13	33.3	0.09	1.79	83	17.7	18	27.7	0.03	1.80
	>2 Hr /Day	334	78.2	26	66.7			386	82.3	47	72.3		
	Total	427	100	39	100			469	100	65	100		

Above table shows correlation of obesity in relation to health behavior in government and private schools.

Discussion

Our study was conducted in Ujjain city to compare prevalence of obesity as well hypertension among adolescent children aged 14-16 years (Mid.

Adolescents) of 8th to 10th class of 3 government and 4 private schools. Various factors were taken into account to understand their effect on obesity and hypertension in adolescent children.

The various factors which were studied in the present study were - calorie intake, number of meals, type of food whether vegetarian or non vegetarian, duration of outdoor physical activity, time spent in watching TV or playing computer games. Other factors like family history of obesity among one or both parents were also taken into consideration. There were total 272 boys and 194 girls in the age group of 14-16 years in government school as opposed to 294 boys and 240 girls in private school. Over all distribution of over-weight and obesity in government schools is 4.7% and 3.6%. Over all prevalence of over-weight and obesity in private school is 8.6% and 3.8%. The prevalence of obesity is higher in private as compared to government 3.78%> 3.50% which was similar to study of M Premnath et al [12] (3.1%>2.6%). Present study reveals 86.2% of males , 53.8% females of private schools were overweight v/s 13.8 % males and 46.2 % females of government schools which was statistically highly significant (p=0.00) similar observations were found by M Premnath et al [12]. The prevalence of obesity in girls is higher than boys (3.75% >3.40%) in our study. Reason behind this high number of obese and overweight children was abnormal dietary pattern, non vegetarian diet, high number of meals, less outdoor activities, high number of hours of viewing TV. These differences were more in children of private schools as compared to government schools.

When WHR was studied in the study group boys of private schools were found to be more obese as compared to government boys (6.12%>4.78%) and prevalence of obese girls of government were more as compared to private schools (9.28% >7.92%), which was statistically significant p=0.04 according to χ^2 test. Hence the overall girls of both government and private schools are showing significantly higher prevalence of central obesity than boys (3.7% >3.1%) similar to the findings of Moustafa et al [13] where 31.9% girls and 0.3% boys were obese.

According to waist height ratio 4.80 % boys and 7.20 % of girls (p<0.05) were obese in government schools while 6.10% boys and 5.80 % girls were obese in private school which was more or less same. It was not found to be statistically significant. Similar findings were observed by Moustafa et al [13] (18.5%>14.8%) but the prevalence was higher in his study. The

prevalence is higher in this study as the number of cases was higher (n=1500) and the age group was between 11-19 years.

Among 39 obese children in government school 21(53.8%) were having outdoor physical activity ≤ 1hr/day where as in private school it was 37(56.9%) students (p=0.00). Similar observations were found by J prajapati et al [14], WHO [15] .So sedentary habits and not playing outdoor games or cycling is closely related to obesity. Similarly out of 39 obese children of government school 66.7% students were watching TV /computer for >2 hours/day as opposed to 72.3 % students among private schools (p=0.00 statistically highly significant by χ^2 test). Our study findings are similar to the findings of Joyce et al [6]. Indoor activities like watching TV and computer is closely associated with obesity (Table 5).

125 boys and 38 girls from government schools were found to be underweight comparable to 75 boys and 49 girls from private schools.

Conclusion

1. This study concludes with overall prevalence of overweight and obese children in our study is 6.8% and 3.7% respectively with overall prevalence of over-weight was higher in girls than boys (3.9%>2.9%).

2. The prevalence of obesity in boys was higher in government as compared to private (4.78%>3.40%). Whereas girls were more obese in private as compared to government (3.75%>2.06) and is statistically significant.

3. Combined prevalence of overweight and obesity in the private and government schools was 12.2% and 8.4% respectively

4. BMI underestimates the obesity. WHR is the better indicator for early detection of central obesity in the adolescent age group.

5. The various factors which were studied had correlation with prevalence of obesity and hypertension were:
   a. Taking more calories per day.
   b. Consuming more fatty diet (non vegetarian).
   c. Less outdoor physical activity.
   d. Spending >2 hours per day in front of TV and computers were more at risk of getting overweight and obese.

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