Original Research Article

Health status of adolescent school going children with special reference to waist hip ratio

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ABSTRACT

Background: A school is a key location for educating adolescents about health, hygiene and nutrition. Adolescence is period of critical development and transition. These changes have important implications for health. Aims and objectives of the stud was to study the role of WHR in nutritional assessment in adolescent school children and compare it with BMI as an assessment tool and to study nutritional status of municipal and private school.
Methods: It was a cross sectional study conducted in 10-17-year-old school children in Ahmedabad, Gujarat. There were 2 private and 2 municipal schools selected randomly by purposive sampling. Child absent or not well on the day of study were excluded.
Results: Incidence of obesity is 42.9% and 57.1% in municipal and private school respectively. Incidence of overweight is 47.2% and 52.8% in municipal and private schools respectively. (2.9%) adolescents had BMI range of 25-29.9 which is considered to be overweight. However, the percentage of overweight and obese was raised at 28% and 23.5% respectively when classified as per WHR.
Conclusions: The difference between incidence of overweight and obesity in private and municipal schools were not statistically significant. A combination of increase BMI with increase WHR is a stronger indicator of increase health risk.

Keywords: Adolescent, Nutrition, Obesity, Overweight, Waist hip ratio

INTRODUCTIONS

Adolescence is the stage between childhood and adulthood. It is not an age, but a stage. WHO defines the age group 10-19 year is considered as the period of adolescence and UNICEFF considered child up to the age of 18 years as adolescence.[1,2]

India is fighting a dual problem; on one hand malnutrition is still widely prevalent while on other hand childhood obesity is of more weight in urban locations particularly among the children of higher socio economic status.[3] Like a shepherd being followed by the herd of sheep, with obesity craps in a cluster of disease triggered by it. The WHO defines childhood obesity as one of the most serious public health challenges of the 21st century, due to its rapidly increasing prevalence and tracking seen till adulthood.

Childhood health behavior habits such as diet and physical activity are influenced by the school setting and often track into adulthood. The common morbidities found in school age children are nutritional deficiencies, dental, visual and hearing problems, respiratory infections, skin conditions, loco motor disabilities and congenital heart and other problems. The fact is that the most of these conditions are preventable or avoidable and curable especially in early stages by promotion of

hygienic practices among school children through proper health education by teachers, who are the first contacts.[3]

Simple anthropometrical measurements taken to determine nutritional status are more practical both in the clinical practice and for large scale epidemiological studies. This study is a humble effort to compare health status of school going adolescents of municipal and private school more precisely through obesity with special reference to WHR.

METHODS

Study type was cross sectional study. It was conducted at 4 schools from Sabarmati area in Ahmedabad, Gujarat. The schools were selected randomly by purposive sampling. Among them two were private Schools and two were Municipal Schools. Study period was September 2018 to February 2019. All School Children between 10- 17 year in municipal and private school.

Inclusion criteria

- All school children between 10-17yr present on the day of study in the selected schools.

Exclusion criteria

- Child absent or not well on the day of study.

Anthropometry measurement

Weight

It was measured according to UNICEFF recommendation by digital scale, with necessary clothing, without shoes, and recorded to the nearest 0.5 kg.[4]

Height

It was measured by using a non-elastic stadiometer, without shoes, to the nearest 0.5cm, while child look straight and heels, buttocks, shoulder and occiput touching to the wall , stand in a relaxed manner with the arms hanging by the sides with the both feet and knees close together with head in the Frankfurt plane.

Upper segment /Lower segment ratio

The length between the pubic symphysis and the heel was considered the lower segment. The upper segment was calculated by subtracting lower segments from the total length.

Waist-Hip ratio: *Measurement done following WHO STEP protocol.[5]*

Waist circumference was measured by the stretch resistance tape in standing position with arm at the sides, feet positioned together, and the tape was not constricting the body. The students were advised to relax, and take a few deep natural breaths, at the end of normal expiration measurements were done at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest.

The hip circumference was measured around the widest portion of the buttocks.

WHR: Waist circumference (cm)/Hip circumference (cm)

In this study WHR was interpreted as follows: - WHR 0.80-0.84 were considered as over-weight and >0.85 were considered as obese, <0.79 were normal.[6]

Body mass index: BMI= Weight (kilogram)/Height (meter)[2]

BMI below 18.5- Underweight, 18.5 - 24.9 Normal, 25.0-29.9 Overweight, 30.0 and Above Obese.

RESULTS

A total of 446 Students in age range of 10-16 years were studied. Out of these, 206 (46.1) belonged to municipal school and 240 (53.9) belonged to private school. The number of students per class in private schools was more than municipal schools. This may be because of higher degree of absenteeism in municipal schools, rather than more number of school enrolments per class in private school.

Out of total 446 adolescents in the study 265 (59.5%) students were underweight according to BMI while 168 (37.6%) had normal BMI and 13 (2.9%) were overweight, among them 9 (69.2%) were from private school, however, it is difficult to interpret this as total number of overweight students is less. No student fell in obesity range based on BMI. This suggests that undernutrition still remains the challenging form of malnutrition in Indian setup, be it private or municipal and needs to be addressed (Table 1).

In this study according to BMI 56.4% (122) male were underweight, 40.2% (87) were normal and 3.2% (7) were overweight. In females, 62.1% (143) were underweight, 35.2% (81) were normal and 2.6% (6) were overweight (Table 2).

Out of 446 students; 216 (48.4%) were male amongst them 101 (46.7%) were of municipal school and 115 (53.2%) were from private school. There were 230 (51.5%) female, amongst them 105 (45.6%) were municipal and 125 (54.3%) were private. Females slightly outnumber males in both private and municipal schools, more so in private schools. This might reflect either more presence or less school absenteeism on their part or rising female literacy (Table 3).

Table 1: Age specific Co-relation of BMI in study population (n = 446).

Age (yr)	Underweight (BMI - <18.5)		Normal (BMI -18.5-24.9)		Overweight (BMI -25-29.9)	
	Municipal	Private	Municipal	Private	Municipal	Private
10	24	35	1	2		
11	24	30	3	4		2
12	25	18	14	14	1	4
13	14	23	20	11	1	2
14	13	22	17	17	1	
15	14	3	11	21	1	1
16	12	8	13	20		
Total	126	139	79	89	4	9
Grand total	265 (59.5%)		168 (37.6%)		13 (2.9%)	

Table 2: Gender specific Co-relation of BMI in study population.

BMI	Male	Female
Underweight (BMI - <18.5)	122 (56.4)	143 (62.1)
Normal (BMI -18.5-24.9)	87 (40.2)	81 (35.2)
Overweight (BMI -25-29.9)	7 (3.2)	6 (2.6)
Total	216	230

Table 3: Gender wise distribution.

Gender	Male	Female
Municipal	101 (46.7%)	105 (45.6 %)
Private	115 (53.2 %)	125 (54.3%)
Total	216 (48.4 %)	230 (51.5 %)

In this study according to WHR 28% adolescents were overweight, and 23.9% were obese, 47.9% were normal. Adolescents with WHR <0.79 were considered as normal. There were no significant influences of age on WHR reflected in the present study (Table 4).

Thirteen (2.9%) adolescents had BMI range of 25-29.9 which is considered to be overweight. However, the percentage of overweight and obese was raised at 28% (125) and 23.7% (106) respectively when classified as per WHR.

This disparity between BMI and WHR may be attributed to the fact that in the present study, WHR either tends to overestimate overweight and obesity or it diagnoses overweight and obesity at the earlier stage.

Increase WHR with normal BMI indicates more of central fat distribution (central obesity) in Indian adolescents, which causes increase risk of metabolic syndromes (Table 5).

In this study incidence of obesity and overweight is 42.9% (46) and 57.1% (61) 47.2% (59) and 52.8 (66) in municipal and private school respectively according to WHR.

The difference between incidence of overweight and obesity in private and municipal schools were not statistically significant (chi square 0.41, p=0.52).This might be because of unhealthy eating and lifestyle habits among municipal school children, which are very much prevalent, though they may be different from those of private school (Table 6).

Major Co-morbidities were Anaemia (44.1), Skin disease (42.3) and Dental problems (33.8).

Among all incidence of Worm infestation, Anaemia, Skin disease and Ear disease were higher in municipal school, While Upper respiratory tract infection and Refractory error incidence were found more in private school. Single handicapped female was found in private school.

Hence, Iron rich diet, Iron supplements, Deworming, and Dental hygiene need to be emphasized amongst adolescents in India (Table 7).

Sedentary lifestyle due to emergence of Mobile phone and Television is considered to be one of the major reason for obesity, hence the habits were enquired.

The usage of Mobile-phone and Television was found in all respondents (100%) among the sample but the duration is varied. There was no significant difference in usage of mobile phones in municipal and private schools. This may be due to the easy availability of low-cost gadgets.

Majority of the adolescents 75.7% (338) were using phones of their own or family member for 1-3 hr/day. Duration Usage of phone for more than 3hr/day was more among private school adolescents 3.7% (9) than municipal adolescents. Television watching was the most preferred activity among the adolescents. Majority of them 85.6% (382) were watching TV for 1-3hr while 3.8% (17) were watching TV >3 hr/day. Hence, parents need to keep a close watch on the daily screen time of adolescents before it becomes a dangerous habit (Table 8).

Table 4: Age and gender specific comparison of WHR between municipal and private school.

			WHR		
			>0.85CM	0.80-0.84CM	≤0.79CM
10 yr	Municipal	Male	1	3	8
		Female	-	4	10
	Private	Male	2	7	8
		Female	1	2	19
11 yr	Municipal	Male	3	6	3
		Female	4	3	6
	Private	Male	6	2	8
		Female	9	5	6
12 yr	Municipal	Male	5	9	5
		Female	3	6	12
	Private	Male	2	6	8
		Female	5	6	7
13 yr	Municipal	Male	5	2	10
		Female	1	5	12
	Private	Male	5	4	10
		Female	4	12	4
14 yr	Municipal	Male	1	3	13
		Female	5	3	5
	Private	Male	3	5	13
		Female	4	4	10
15 yr	Municipal	Male	6	1	8
		Female	2	6	3
	Private	Male	3	4	7
		Female	4	3	4
16 yr	Municipal	Male	5	4	1
		Female	5	4	6
	Private	Male	4	3	6
		Female	9	3	3
Total			107 (23.9%)	125 (28%)	214 (47.9%)

Table 5: Prevalence of obesity according to WHR and BMI.

	BMI	WHR
Over-weight	13(2.9%)	125 (28%)
Obese	-	106 (23.7%)

Table 6: Comparison of incidence of overweight and obesity according to WHR in municipal and private school going adolescent.

Incidence	Municipal	Private
Obesity	42.9% (46)	57.1% (61)
Overweight	47.2% (59)	52.8% (66)

Majority of the students of private schools 59% (137) were using bicycle as a mode of transport and municipal school 73.2% (107) were came to school walking. Walking and cycling both are supposed to be good exercise, this could be the reason for no major difference

of WHR pattern observed among the municipal and private school adolescents.

Table 7: Common-morbidity patterns in school going adolescents

Co-morbidities	Municipal school	Private school
Upper respiratory infections (8.5%)	44.7	55.3
Worm infestations (9.4%)	54.7	45.3
Anemia (44%)	64.9	35.1
Dental problems (33.8 %)	46.3	53.7
Skin disease (42.3%)	58.7	41.3
Ear problems (21.5%)	56.2	43.8
Refractory errors (24.4%)	40.4	59.6
Conjunctivitis and squint (2.6%)	33.3	66.7
Handicap		1

Table 8: Screen time: Mobile and television viewing habits of school going adolescents.

		Total	<1 hr	1-3 hr	>3 hr	X^2
Mobile/day (446)	Municipal	206 (46.2)	48 (23.3)	157 (76.2)	1 (0.4)	5.58 (0.06)
	Private	240 (53.8)	50 (20.8)	181 (75.4)	9 (3.7)	
Television/day (446)	Municipal	206 (46.2)	24 (11.6)	174 (84.4)	8 (3.8)	0.51 (0.77)
	Private	240 (53.8)	23 (9.6)	208 (86.6)	9 (3.8)	

Table 9: Correlation of mode of transport and WHR.

Mode of transport	N (%)		Total (n%)	Male (%)	Female (%)
Bicycle	232 (52)	Municipal	95 (41)	53 (55.7)	42 (44.3)
		Private	137 (59)	85 (62.1)	52 (37.9)
Walking	146 (32.7)	Municipal	107 (73.2)	63 (58.8)	44 (41.2)
		Private	39 (26.8)	17 (43.6)	22 (56.4)
Own two-wheeler	21 (4.7)	Municipal	1 (4.7)	1 (4.7)	-
		Private	20 (95.3)	14 (70)	6 (30)
With guardian	47 (10.5)	Municipal	8 (17)	2 (25)	6 (75)
		Private	39 (83)	19 (48.7)	20 (51.3)

Table 10: Indoor and outdoor activity with WHR.

Type of activity		Total (%)	≤1 hr	1-3 hr	≥3 hr
Indoor games N =356 (79.8)	Municipal	139 (39)	79 (38.1)s	53 (42.1)	7 (30.4)
	Private	217 (61)	128 (61.9)	73 (57.9)	16 (69.6)
Total (%)			207 (58.1)	126 (35.4)	23 (6.5)
Outdoor games N =278 (62.3)	Municipal	145 (52.1)	103 (47.4)	4 (19)	38 (95)
	Private	133 (47.9)	114 (52.6)	17 (81)	2 (5)
Total (%)			217 (78)	21 (7.5)	40 (14.5)

Only 4.7% (21) students have their own two-wheeler. Most of them were of private school, only single municipal school child had own two-wheeler. 10.5% (47) students came to the school with their parents (Table 9).

Overall indoor activities were observed more (61%) in private school and outdoor activity were more (52.1%) in municipal schools.

Majority of the adolescents 58.1% and 78% spent less than 1 hr/day in indoor and outdoor activities respectively.

Only 6.5% and 14.5% adolescents reported that they were involved in indoor and outdoor activities for more than 3 hr/day.

The rest of them were not in the habit of engaging regularly in playing activities.

Duration of activity and WHR has significant correlation. For outdoor activities, chi square value was 40.5 and p-value <0.001, which suggests significant correlation between duration of activity and WHR.

However other factors like sedentary lifestyle, food habits, etc. need to be correlated. Satine that mankind moved away from the vigorous work to win over bread, and obesity has put mans hard earned money to engage them in exercise (Table 10).

DISCUSSION

Comparison of the nutritional status between municipal and private school going adolescents.

A Cross sectional study among 446 adolescents was conducted between September 2018 to February 2019.

There is no significant influence of gender on BMI. On the contrary, study conducted by Unnithan and Syamakumari also showed a higher incidence of overweight (18.80%) and obesity (5.99%) among boys than girls (overweight-16.39% and obesity-3.79%) (Table 2).[7]

To study the role of WHR (Waist-Hip Ratio) in nutritional assessment in adolescent school children and compare it with BMI as an assessment tool.

Thirteen (2.9%) adolescents had BMI range of 25-29.9 which is considered to be overweight. However, the percentage of overweight and obese was raised at 28% (125) and 23.7% (106) respectively when classified as per WHR (Table 1).

The chi-square statistic is 0.76. The p value is 0.68, the result is not significant. Hence, for Over-weight adolescent statistically there is no correlation between WHR and BMI (Table 5).

The results were similar to by those in the study conducted by Sukhpal kaur et al, carried out on 189 nursing students aged 17-23 years, which shows 67.7% had normal BMI, 11 (5.82%) participants had BMI in obesity range. Only 4 (2.12%) were obese with BMI >30 kg/m^2. The percentage of overweight and obese raised to almost four times i.e. 23.28% and 7.94% respectively when classified as per waist hip ratio.[8]

WHR either tends to overestimate overweight and obesity or it diagnoses overweight and obesity earlier stage. Increase WHR with normal BMI may indicates more of central fat distribution (central obesity) in Indian adolescents, which causes increase risk of metabolic syndromes, for conclusion other parameters need to correlate like serum lipid profile.

It is important to avoid going by BMI alone, as it can under/overestimate obesity. A combination of increase BMI with increase WHR is a stronger indicator of increase health risk.

The overweight and obesity incidence is similar to study done by Patel et al, in-school health setup with a large sample size, which showed 30.8% undernutrition, 69.2% with normal BMI, only 0.7% as overweight and only 0.05% obesity.[9]

This suggests that undernutrition still remains the challenging form of malnutrition in Indian setup, be it private or municipal and needs to be addressed.

There were no significant influences of age on WHR reflected in the present study. This is in contrast to study conducted by Ridder et al which concluded that with advancing age especially in the girls WHR decreases.[10]

The study correlates with the study done in Kenya in nursery schools between public and private schools, results suggesting 84.6% and 18.7% children of public and private school respectively walked to school.[11]

CONCLUSION

In India, under-nutrition is still a major burden and though the trend of obesity is rising as per WHO, schools are still relatively spared and obesity is still not as prevalent in adolescent school going children as expected. But for final conclusion large sample study should be needed. The difference between incidence of overweight and obesity in private and municipal schools was not significant.

WHR doesn't have good correlation with BMI. However, large sample size studies are needed to further study obesity in school going adolescents. As compared to BMI, WHR is a more sensitive parameter in picking up central obesity, which is known to be a potential risk factor for metabolic syndrome in adults.

No significant difference was observed for involvement of physical activities, mode of transport to the school, usage of mobile phone and television watching habits. Thus, health status does not differ significantly between private and municipal schools in the same locality, though minor differences may be found in morbidity patterns and habits and behaviour.

School can be a key area of intervention as regards health, nutrition, habits, attitude and behaviour of adolescents and it should be utilized to the fullest with continuing health education and care.

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