Original Research Article

Prevalence of obesity in school children aged 11-15 years in western district of Tamil Nadu

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Abstract

Introduction: Obesity in children and adolescents is an important public health problem in India. This study was done to estimate the prevalence of obesity in 11-15 years urban school children using Body mass index. (BMI), waist circumference (wc), waist height ratio (WHtR)and to determine the screen viewing time – arisk factor for obesity. **Methods:** This was a descriptive cross-sectional study. It was conducted over 12 months in the year 2014 in 11- 15 years urban school children in Coimbatore district. About 859 children were selected for this study. A proforma was used to collect the details such as age, gender, type of school, screen viewing time. Weight, height, waist circumference of these children wasmeasuredand prevalence of obesity was estimated based on the 3 indices- BMI, WC,WHtR. The data were analyzed with a statistical software package. **Results:** Out of the 859 children, the sample strata was 170 for each age group from 11-15 years. About 5% were obese by BMI, 18 % by WC, 14% by WHtR. The prevalence in females was 7% (BMI), 22% (WC), 17% (WHtR) and in males it was 1% (BMI), 10% (WC), 7% (WHtR).The prevalence of obesity in private schools was 10%. (BMI), 21% (WC), 16% (WHtR) and in government schools, it was 3% (BMI), 9% (WC), 7% (WHtR). The prevalence in screen viewing time less than 2 hours was 3% (BMI), 9% (WC),12% (WHtR) and in more than 2 hours it was 10% (BMI), 20% (WC), 23% (WHtR). **Conclusion:** The prevalence of obesity in high school children according to BMI is 5%., WC 18% and WHtR 14%. It is more in females, children studying in private schools and in those with screen viewing time more than 2 hours.

Keywords: Childhood obesity, body mass index, waist circumference, waist height ratio.

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Introduction

Childhood obesity is a serious health problem of the 21st century as it is the precursor of adverse effects occurring in adulthood [1]. Obesity is a subclinical inflammation characterized by the secretion of cytokines that influence the formation of athero-sclerotic plaques and endothelial dysfunction. This inflammatory process begins in childhood [2]. The prevalence of obesity in a population is an indicator of health burden due to non- communicable diseases in developing countries[3]. There is a great need for studying obesity in India because there is an increase in type 2 Diabetes mellitus in Indian adults[4].

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In adolescents,central or abdominal fat increases the risk for metabolic and cardiovascular complications [5]. Indices predictive of adolescent central obesity include waist circumference (WC), waist to hip ratio (WHR), waist to height ratio (WHtR).

Only few studies could be traced in literature which estimated the prevalence of childhood obesity using all the three indices-BMI, WC, WHtR. Estimated prevalenceof obesity in school children would help in developing appropriate interventions to reduce obesity among this population.With this background we designed this cross–sectional study to estimate the prevalence of obesity using the 3 screening indices BMI,WC,WHtRamong school children11-15 years of age.

Materials and Methods

Type of study: This was a school based descriptive cross-sectional study.

Place of study: This was carried out in urban school children in Coimbatore district, Tamil Nadu for a period of one year. Ethical clearance was obtained from Institutional ethical committee and consent was obtained from Chief Educational Officer (Coimbatore Corporation).

Inclusion criteria: Urban school children, of age 11 to 15 years were included in the study.

Exclusion criteria: Students with major dysmorphology or signs ofphysical deformity were excluded.

Sample collection: The student was considered obese 1) if he or she was more than or equal to 27th adult equivalent of IAP BMI chart 2) WC was more than or equal to 75th percentile of Smoothed and Weighted Age and Sex Specific Waist Circumference Percentile Values (cm) for Indian children 3- 16 years of age 3) if he or she was more than or equal to 0.5 as per the Smoothed and Weighted Age and Sex Specific Waist Height (WHt) ratio percentile values for Indian children3-16 years of age.

A proforma was used and details were collected which included age, gender, type of school, and screen viewing time.

Height was measured using a portablestadiometer, weightwas measured using electronic weighing-scale, and WC using a non stretchable elastic tape according to WHO standards.

Sample size calculation formula n= t^2*p (1-p)/m^2, wheren= required sample size, t= confidence level of 95% (standard value of 1.96), p=expected frequency of the factor under study 14.7%, m= margin of error of 2.5%, n= 1.962*0.147 (1-0.147) /0.0252 =770. The sample is increased by 10% to account contingencies like non-response and recording error. The sample size calculated was 850. About 50% of samples was chosen from Government schools and 50% from private schools.

Under the above-mentioned formula, previous studies and in consultation with the statistician, the sample size was calculated to be 850 and the sample strata was calculated to be 170 for each group from 11-15 years.

Sampling method- About 859 subjects from Coimbatore district were selected for this study. We adopted a multistage stratified random sampling procedure. Schools were selected basedon the list of schools in Coimbatore, which was obtained fromthe District Education Office. Both government and private schools were included, and the ratio was 1:1 in accordance with distribution of schools in Coimbatore. Students who did not submit the proforma or those who were not cooperative were considered as non-respondent.

Statistical analysis- A chi square test was used to assess the difference in categorical variables between groups. A p value of <0.05 using a two-tailed test was taken as being of significance for all statistical tests. Alldata wereanalysed with a statistical software package. (SPSS, version 16.0 for windows).

Results

About 859 children were enrolled.

Table-1: Age and Gender distribution.

Age	Males	Females	Total
11	68	106	174
12	75	96	171
13	85	86	171
14	50	122	172
15	61	110	171
Total	339	520	859

The male and female children were 339 and 520 respectively (Table-1).

Table-2: Prevalence of obesity

	BMI		WC		WHtR	
Obese	**n**	**%**	**n**	**%**	**n**	**%**
	43	5	154	18	120	14
Non -obese	816	95	705	82	739	86

n= frequency of children

According to BMI-43 Children (5%), WC-154 Children (18%), WHtR- 120 children (14%) were obese. (Table2).

Table-3: Association of gender with obesity (p<0.05)

	Males339		Females520	
	n	**%**	**n**	**%**
BMI	3	1	36	7
WC	33	10	114	22
WHtR	23	7	88	17

n= frequency of obese children

Out of 859 children, 339 were males and 520 were females. Using all 3 indices, obesity was more common in girls than boys and it was statistically significant (table-3).

Table-4: Association of type of school withobesity (p<.05).

	Private school– 459		Government school-400	
	n	**%**	**n**	**%**
BMI	45	10	12	3
WC	96	21	36	9
WHtR	73	16	28	7

n=frequency of obese children

Out of 859 enrolled children, 459 were from private schools and 400 from government schools. Obese children were more in private schools than in government schools and it was statistically significant(Table-4).

Table-5: Association of screen viewing time with obesity (p<0.05).

	Less than 2 hours (514)		More than 2 hours (345)	
	n	%	n	%
BMI	**15**	3	34	10
WC	**46**	9	69	20
WHtR	**88**	12	79	23

Among 859 children, 514 had screen viewing time less than 2 hours and 345 had screen viewing more than 2 hours. Obesity was more common in 2nd group and it was statistically significant (Table-5).

Discussion

In our study, 859 children were taken up according to inclusion and exclusion criteria. Among the study groups, the prevalence of obesity based on BMI was 5%, WC -18%, WHtR- 4%. Estimates of prevalence of obesity were studied by Midha T [6] by meta-analysis based on BMI was 3.31%. Nine studies

including 92,862 children were identified and analysed in the meta- analysis. Schroden H [7] did a study to determine the prevalence of abdominal obesitybased onWC & WHtR in Spanish children and adolescents aged 6 to 17 years.

The prevalence of WHtR >=0.5 was 14.3%, WC>= 90th percentile was 9.6% in adolescents. In a study by Mustaq MU [8] age and gender specific smoothed percentiles for WC, WHtR were developed for a sample of 1860 children, aged 5 to 12 years. In that study 12% children had a WC of =>90th centile, 16.5% children had a WHtR =>0.5 while 11% had both. WC provided a better estimate of visceral adipose tissue and WHtR was age independent. In the cross-sectional study by Taheri F [9] conducted on 2458Iranian students, aged 11-18 years, the prevalence of WC >90th centile was 16.3%.

A systematic review was done by de Moraes A C [10] on the prevalence of abdominal obesity in adolescents (10-19) years old, theprevalence of abdominal obesity varied from 8.7% to 33.2%. This wide range is partly due to actual population disturbances and partly due to the cut offpoints used to define abdominal obesity.

Among 859 children, 339 were males and 520 were females. The prevalence of obesity based on the 3 indices (BMI,WC,WHtR) were more common in girls.This was in part due to the sedentary lifestyle. Kumar S [11] estimated the prevalence of obesity in 1496 students aged 10- 15years. The prevalence based on BMI was more common in girls (8.82%) than boys (4.1%). The difference was statistically significant. Bamoshmoosh M [12] estimated central obesity in a sample of 3114 Yemeni children aged 6-19 years. The prevalence based on WC and WHtR was 1.22 times more common in girls. In Yemen central obesity is more common in adult women than in men and according to this study, this difference originates at early adolescence.

Out of 859 enrolled children, 459 were private school and 400 from government schools. Obese children were more common in private schools than government schools. The prevalence was more in private schools than government schools and it was statistically significant. Children in private school were more affluent. Preetam B Mahajan[13] did a study on obesity in children between 6-12 years from government and private schools in Puducherry. Prevalence of obesity according to BMI was 1.82% in government schools and 2.48% in private schools. In a study done by Jagadesan S [14] on 18955 children aged 6-17 years across 51 schools of Chennai, the prevalence of obesity was significantly higher in private (21.4%) compared to government schools.

Among 859 children, 514 had screen viewing time less than 2 hours and 345 had more than 2 hours. Obesity was significantly higher in second group. The American Academy of Pediatrics recommends no more than 2 hours/day of screen viewing time (watching television, videos, playing video games and using computer for purposes other than school work [15].

A meta-analysis by Zhang G [16] included 14 cross sectional studies containing 1,06,169 subjects to evaluate the association between obesity and television watching. A linear dose response relationship was found for television watching and obesity and the risk increased by 13% for each 1 hour/day increment in TV watching. There are limitations and strengths in this study.

A first limitation is the unequal number of boys and girls in the stratified age groups. Secondly the pubertal development status was not assessed.

The strengths of our study are - 1. The novelty of comparing the 3 anthropometric indices as screening tools for obesity. 2. The sample being obtained from both government and private schools.

Conclusion

WC and WHtR are better than BMI in detecting obesity. The prevalence of obesity is higher among girls, in children studying in private schools in Coimbatore. Screen viewing time more than 2 hours /day is associated with a higher risk of obesity. Body Mass Index is the most traditional anthropometric index used for diagnosing obesity.

This study reinforces the importance of including the WC, WHtR measurements in routine anthropometric evaluation. National programs should be aimed at periodic obesity screening of school children and sensitizing about healthy foods, outdoor activities and screen viewing hazards.

What is already known: BMI is the most common anthropometric index used for diagnosing obesity.

What this study adds: WC and WHtR are better than BMI in detecting childhood obesity.

Abbreviations used: BMI – Body Mass Index, WC – Waist Circumference, WHtR – Waist Height Ratio

Authors' contribution

[1]Dr. Suganthi V, [2]Dr. Arunthathi A, [3]Dr. Nayana T

1. Concept, Design of the work, data analysis, drafting the work, editing, revising it and final approval of the article

2. Concept, Design of the work, Data acquisition, data analysis

3. Data acquisition, data analysis

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