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Original Article

Overweight and obesity among adolescent school children in the Colombo education zone

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Abstract

Background

Sri Lanka has undergone rapid development during the past few decades, resulting in broad socioeconomic changes including rapid urbanization and industrialization. This has led to a nutrition transition with an increase in the prevalence of overweight and obesity. Adolescent obesity is a major problem as it leads to several adult life problems such as non-communicable diseases. This study aimed to estimate the prevalence of overweight and obesity among 14 to 15-year-old school children in the Colombo education zone.

Method

A school-based cross-sectional descriptive study was conducted among a sample of 1728 students representing all schools in the Colombo education zone selected using a multi stage cluster sampling method. Weight and height of all subjects were measured according to standard procedures using standard equipment. BMI for age was calculated using WHO charts.

Results

Prevalence of overweight and obesity among adolescents was revealed as 10.8% (CI 9.3-12.5) and 3.9% (CI 3.1-5.0) respectively, with no gender difference. Studying in semi-government or international schools was statistically significantly associated with adolescent overweight and obesity (p=0.000).

Conclusion

Overweight and obesity among adolescents in the Colombo education zone is a significant public health problem.

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Introduction

Adolescence begins with the onset of physiologically normal puberty and ends when an adult identity and behaviour are accepted. This period of development is considered to occur between 10 to 19 years of age [1]. The population of Sri Lanka consists of twenty million people and 19% of them are adolescents.

Government Schools are categorized as type1AB, type1C, type 2 and 3. According to the Ministry of Education, schools having the advanced level science stream are categorized as type 1AB while schools having the arts and/or commerce stream, but no science stream, are categorized as type 1C. Type 2 schools have classes only up to grade 11 and type 3 schools have classes only up to grade 5 [2]. Other than government schools, there are international and semi government schools in Sri Lanka and most of them are in the Colombo District.

Among adolescents, body mass index (BMI) for age is used to classify overweight and obesity. Obesity is defined as a BMI for age more than +2SD and overweight is defined as BMI for age between +1SD and +2SD [3].

Obesity is a complex condition which has serious social and psychological dimensions as well as being a risk factor for non-communicable diseases including diabetes mellitus, hypertension and cardiovascular disease [4].

In developing countries, a considerable nutrition transition has been observed as a result of broad socioeconomic changes, including rapid urbanization and industrialization, with a concomitant increase in the prevalence of overweight and obesity [5]. Sri Lanka is one such developing country which has shown rapid urbanization during the past few decades. Although undernutrition is a common problem in rural Sri Lanka, overweight and obesity are emerging problems in urban areas. Adolescents, during puberty, have the highest growth rate after infancy and childhood. Lack of attention to an adolescent's nutrition can lead to overweight and obesity resulting in non-communicable diseases in later adult life.

Although adolescent obesity results in several issues in adult life, policy makers and health planners of the country have not paid much attention to this problem due to the lack of direct mortality and morbidity. There are very few studies on adolescent overweight and obesity in Sri Lanka. Factors associated with overweight and obesity among adolescent school children may be different from those found in the general population. Sri Lanka is a country with rapid urbanization and industrialization. The Colombo city is the most urbanized city and is likely to have the highest prevalence of overweight and obesity [6]. Therefore, this study planned to determine the prevalence of overweight and obesity among 14 to 15-year-old adolescents in the Colombo education zone.

Methods

A school based, cross sectional, descriptive study was carried out to estimate the prevalence of overweight and obesity among 14 to 15-year-old school children in the Colombo education zone. Children between 14 and 15 years inclusive, studying in the Colombo education zone were included in the study. Children with pathological obesity with diagnosis cards were excluded from the study.

Sample size was calculated using the following formula [7]

$$n = z^2 p (100-p)/ d^2$$

Considering the feasibility and accuracy of the estimation, it was decided to have 2.5% as the desired precision level (d). Standard normal distribution corresponded to the 95% confidence (z). Expected prevalence of overweight and obesity in this study population was 15.2%, based on the reported prevalence of overweight among 11 to 16-year-old children from nine urban schools in Colombo zonal education in 1998 [8]. Thus, the required sample size was 792. Since the study used a multi stage cluster sampling technique, the sample size was multiplied by 2 to account for the design effect and a further 10% was added to account for non-response giving a final sample size of 1742. Thus, a sample of 1750 adolescent school children were selected.

When using the multi stage cluster sampling technique, a list of schools in each category of schools with grade 9 and 10 classes in the Colombo education zone was prepared as the sampling frame. A grade 9 or 10 class was recognized as a cluster. It was observed that an average class size was 30 students. The required number of clusters were 58 (1750/30= 58). The number of clusters was divided among four categories of schools (type 1AB, type 1C, type 2 and international and semi government school category) proportionate to the total student population in grade 9 and 10 in each category of schools. Sample interval for each category was calculated. A random number, less than the respective sampling interval for each category, was generated using a random number table. A class in the school whose cumulative population included the respective random number was identified as the 1st cluster for each category. The next cluster was identified by adding the sampling interval to the random number in each category. Fifty-one schools were included for the study and sometimes more than one cluster selected from one school.

The age and sex of each student were recorded. The weight and height were measured according to standard procedures using standard equipment by two independent investigators. Duplicate measurements were taken by the principal investigator in 10% of the sample to ensure validity. A stadiometer was used for measuring height to the nearest centimeter. Weight was measured to the nearest 0.1kg using an electronic digital weighing scale (Seca ©, France). Weighing scales were calibrated with a known weight prior to each day's weighing session. Weight measurements were done when participants were in school uniform without foot wear or heavy items in their pockets. BMI for age was calculated using WHO charts [3].

Permission for the study was obtained from the Ministry of Education and informed written consent was obtained from each child's parents. Parents were requested to send their children's medical records on the date of data collection if they were known to have medical problems. Informed verbal assent was obtained from the study participants. Ethics clearance for the study was obtained from the Ethical Committee of the Medical Research Institute.

Data analysis was done using the SPSS statistical package. Descriptive analysis of the socio-demographic profile of the participant and putative risk factors were done. The prevalence of overweight and obesity was calculated. The relationship between each putative risk factor and the presence of obesity/overweight was analyzed using standard statistical tests such as the Chi square test. Appropriate multivariate analysis was done to identify associated factors. Chosen P value was 0.05.

Results

One thousand seven hundred and fifty subjects were selected for the study and 1728 agreed to participate. Therefore, the response rate of this study population was 98.7%.

Socio-demographic characteristics

Table 1 shows the distribution of the study population according to age, sex, ethnicity, and religion. More than half of the study population were females (53.6%). Majority were Sinhalese (72.8%) and the most common religion was Buddhism (69.6%)

Table 1: Distribution of study population according to age, sex, ethnicity & religion

Characteristics	N(%)
Age	
14 years	914(52.9)
15 years	814(47.1)
Sex	
Male	801(46.4)
Female	927(53.6)
Ethnicity	
Sinhalese	1258(72.8)
Tamil	196(11.3)
Moor	265(15.3)
Others	9(0.5)
Religion	
Buddhist	1203(69.6)
Hindu	120(6.9)
Islam	258(14.9)
Catholic	147(8.5)
Total	1728(100)

Distribution of the study population according to the type of school and grade is shown in Table 2. The majority of the study population consisted of students in type 1AB schools (52.3%) and most were studying in grade nine (52.9%).

Table 2: Distribution of study population according to type of school and grade

Characteristics	N(%)
Type of School	
Type 1Ab	904(52.3)
Type 1C	345(20.0)
Type 2	217(12.5)
Semi government and international	262(15.2)
Grade	
Grade 9	912(52.8)
Grade 10	816(47.2)
Total	1728(100)

Table 3 shows the anthropometric measurements of the study population. The mean BMI of the adolescents in the study group was 19.04 (SD 4.01). Mean weight (p=0.5), height (p=0.737) and BMI (p=0.09) did not differ significantly between males and females.

Table 3: Anthropometric measurements of the study population

	Males (n=801)		Females (n= 927)		Total (n=1728)	
	Mean	SD	Mean	SD	Mean	SD
Height (m)	1.56	0.09	1.55	0.84	1.56	0.88
Weight (Kg)	45.91	10.87	46.25	10.10	46.09	10.45
BMI	18.87	4.03	19.19	3.99	19.04	4.01

The study population was categorized according to the nutritional status (Table 4). More than half the adolescents belonged to the normal weight category (n=1093 (63.3%).

One fourth of the adolescents (26.0% CI 23.9- 28.1) were underweight or severely underweight with 7.2% (CI 6.0-8.4) being severely underweight. About one tenth (10.7% CI 9.3-12.5) were overweight. Prevalence of obesity was 3.9% (CI 3.1-5.0).

Table 4: Distribution of study population according to nutritional status

Nutritional status	Males N(%)	Females N(%)	Total N(%)
Obese	32(4.0)	36(3.9)	68(3.9)
Over weight	55(6.9)	63(6.8)	118(6.8)
Normal weight	482(60.1)	611(65.9)	1093(63.3)
Underweight	166(20.7)	159(17.1)	325(18.8)
Severe underweight	66(8.2)	58(6.30	124(7.2)
Total	801(100.0)	927(100.0)	1728(100.0)

Presence of adolescent overweight and obesity was significantly associated with studying in semi-government and international schools (p=0.000) whereas, age (p=0.599) and sex (p=0.903) were not significantly associated with overweight and obesity (Table 5).

Table 5: Association between adolescent overweight and obesity and some demographic characteristics

	Overweight & obesity				
	Present N(%)	**Absent N(%)**	**OR**	**95% CI of OR**	**Significance**
Type of School					
Government Semi-government & international	132 (9.0) 54(20.6)	1334 (99.0) 208 (79.4)	1 2.62	1.82-3.77	$\chi^2 = 31.7$ df = 1 p=0.000
Age					
14 yrs 15 yrs	95(10.4) 91(11.2)	819(89.6) 723(88.8)	1 1.09	0.79-1.49	$\chi^2 = 0.277$ df = 1 p=0.599
Sex					
Male Female	87(10.9) 99(10.7)	714(89.1) 828(89.3)	1 0.98	0.72-1.35	$\chi^2 = 0.015$ df = 1 p=0.903
Total	186(10.8)	1542(89.2)			

Discussion

The present study revealed that the prevalence of overweight and obesity in 14-15-year old children in the Colombo education zone is 10.8%, indicating that overweight and obesity among adolescents is a public health problem in urban school children. A previous study done in the same study setting in 1988 with 690 adolescent school children of 11 to 16 years of age from nine urban schools showed the prevalence of overweight as 15.2% [8]. The difference in prevalence in the above two studies may be due to the different age range of the study populations or differences in the definition of overweight and obesity.

A nationwide study done in Sri Lanka in 2001 showed the prevalence of overweight as 4.9% while obesity was 1.1% [9]. A nationally representative cross-sectional study, conducted in Sri Lanka in 2006 among 6,264 adolescents, 10 to 15 years of age, using the International Obesity Task Force age and sex-specific reference for body-mass, revealed the prevalence of overweight as 2.2% [10]. The higher prevalence of obesity found in the present study can be attributed to Colombo being the highest urbanized city in Sri Lanka with the highest prevalence of overweight and the fact that the present study is more recent, being conducted in 2013.

When considering the global situation, developed countries show a higher prevalence of overweight and obesity than other parts of the world. Studies done in Malta and the USA in 2003 showed that one fourth of children aged 10 to 16 years are overweight [2]. A study done among 1548 primary school children in 2006 in Glasgow to determine the prevalence of overweight and obesity showed that 31·4 % were overweight, 19·1 % were obese and 12·4 % were severely obese [11]. However, according to the Bhave, Indian national data mostly from school based or comorbidity-oriented surveys, showed a prevalence of overweight and obesity that ranged from 6 to 8% [12]. This indicates that countries with higher development show a higher prevalence of overweight and obesity

Therefore, a higher prevalence of overweight and obesity can be expected in urban schools when compared to other parts of the country.

Conclusion

The prevalence of overweight and obesity among 14 to 15-year-old adolescent school children in the Colombo education zone was 10.8% with no gender difference**.** Overweight and obesity among adolescents in the Colombo education zone is a significant public health problem.

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