

**Overweight, thinness and stunting among adolescent schoolgirls in Sri Lanka:  
prevalence and associated factors <sup>11</sup>**

Jayatissa R; Piyasena CL; Warnakulasuriya I; Mahamithawa AMSAB

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<sup>1</sup>Nutrition Department, Medical Research Institute, Department of Health, Colombo 08, Sri Lanka.

## **ABSTRACT**

**Background:** Few studies exist about the growth of adolescent girls in Sri Lanka. Overweight is an important risk factor for cardiovascular diseases, which is the leading cause of mortality and morbidity of Sri Lanka. The thinness of adolescent girls are also important as they will be future mothers.

**Objectives:** The objective was to assess the prevalence of stunting, thinness, overweight and associated factors in urban Sri Lankan schools, where densely populated.

**Design:** A cross sectional survey was conducted and anthropometric measurements were taken on 696 schoolgirls aged 10-16 years. Socio-economic and demographic factors were assessed. Thinness and overweight was defined as a body mass index <5<sup>th</sup> percentile value and >85<sup>th</sup> percentile value for age-and sex-specific reference data from the WHO/NHANES III, 1995 respectively. Stunting was defined as a height for age <-2SD value for sex specific NCHS reference. Multiple logistic regression was used to examine factors associated with overweight, with adjustment for age.

**Results:** Mean weight, BMI and height was 38.5 ( $\pm$ 8.6), 17.3 ( $\pm$ 2.9) and 148.41 ( $\pm$ 7.4) respectively. The overall prevalence of overweight, thinness and stunting in subjects was 4.0%, 22.1% and 18.1%. Mean BMI increased with age; there were notable increases after 13 years of age. There was overall positive and significant association between age and BMI ( $P=0.0000$ ) and age and weight ( $P=0.0000$ ). But the height has not shown positive association after the age of 13. The mean age of menarche was 12.2( $\pm$ 1.2) years. The proportion of girls attended menarche was 66.8%. The girls, not attended menarche was associated with a significantly higher risk of thinness and stunting than was attended menarche [odds ratio (OR) = 18.9; 95% CI: 2.58, 13.28]. Father's occupation and mother's education was not associated with risk of overweight.

**Conclusions:** This study indicates a low prevalence of overweight and high prevalence of thinness and stunting among Sri Lankan urban schoolgirls. Consideration should be given to assess the risk factors and the appropriate primary prevention programmes.

## **INTRODUCTION**

### **SUBJECTS AND METHODS**

This is a cross sectional study comprising 696 Sri Lankan girls aged 10-16 years. It was carried out from August to December 1997 in nine schools located within a educational zone of Colombo

District, which is one of the densely populated areas. There were 4 types of schools in the country. The largest schools which are comprised of schools with advanced level science classes (Type 1) and the schools with only primary classes (Type 4) were excluded from the study and nine schools were randomly selected from Type 2 and 3 school list. Three classes from each selected school were randomly selected from grade 6-11 classes. All the children in each selected class were studied. Thus, this was not a representative sample of all Sri Lankan girls aged 11-16 years. Information on the subject's birthday, socio-demographic and socio-economic characteristics were obtained from the parents, school records and by interviewing them.

Anthropometric measurements were taken by the trained field investigators who were trained and standardised before the study. All of them had previous experience of participating in nutritional surveys. Height was recorded to the nearest centimeter by using anthropometric rod. The girls were weighted with the use of an electronic balance to the nearest 0.5kg while removing shoes and socks. The observer variation was assessed by duplicating the measurement by the same observer and repeating the 10% by the best investigator.

Age was calculated from the subject's birthday to closest age points (11.0y, 12.0 etc). Body Mass Index (BMI-kg/m<sup>2</sup>), height-for-age z scores and weight-for-age z scores were calculated for each individual. The NCHS reference data for height and NHANES III reference data for BMI were used to estimate age-specific prevalence of stunting, thinness and overweight according to the recommendations made by WHO (1995).

## RESULTS

The socio-demographic and socio-economic characteristics of the study sample are presented in Table 1;

**Table 1**  
**Socio-demographic and socio-economic characteristics of the study population**

Variable	Frequency (%)
Race	
Sinhalese	79.3
Moor	13.8
Tamil and others	6.9
Attain menarche	

Yes	66.8
No	33.2
Number of siblings	
None	8.8
1	32.5
2	31.9
3	16.5
4 >	
Mean age of menarchae year (SD)	12.2(1.2)
Education of mother	
None	
Upto O/L (11y of schooling)	
Upto A/L (13 y of schooling)	
Graduate and above	
Occupation of father	
Professional, managerial, professional	
Clerical, sales	
Manual worker and other	

**Table 2**  
**Anthropometric indices in adolescence girls aged 10-16 years**

Age <sup>1</sup> (year)	Weight (kg) <sup>2</sup>	Height (cm) <sup>3</sup>	BMI (kg/m <sup>2</sup> ) <sup>4</sup>
	Mean (SD)	Mean (SD)	Median (25 <sup>th</sup> -75 <sup>th</sup> percentiles)
10 (n = 19 )	29.75 (6.33)	138.29 (6.71)	15.50 (13.90 - 16.60)
11 (n = 91)	31.46 (6.49)	141.05 (6.22)	15.00 (14.10 - 17.30)
12 (n = 151)	35.41 (7.72)	145.79 (6.36)	16.00 (14.60 - 17.90)
13 (n = 161)	38.01 (7.33)	149.12 (6.54)	16.50 (15.40 - 18.10)
14 (n = 182)	43.48 (7.79)	152.44 (5.16)	18.10 (16.50 - 20.20)
15 (n = 87)	43.31 (7.07)	153.24 (5.95)	18.10 (16.80 - 19.90)
16 (n = 5)	44.44 (7.69)	150.34 (8.05)	20.00 (18.20 - 20.60)
<b>Total</b>	<b>38.50 (8.63)</b>	<b>148.44 (7.43)</b>	<b>16.86 (15.20 - 18.80)</b>

<sup>1</sup>Refers to single years of age, e.g., 10 =10.00-10.99.

<sup>2</sup>F=43.27, P=0.000000

<sup>3</sup>F=58.94, P=0.000000

<sup>4</sup>F=19.83, P=0.000000

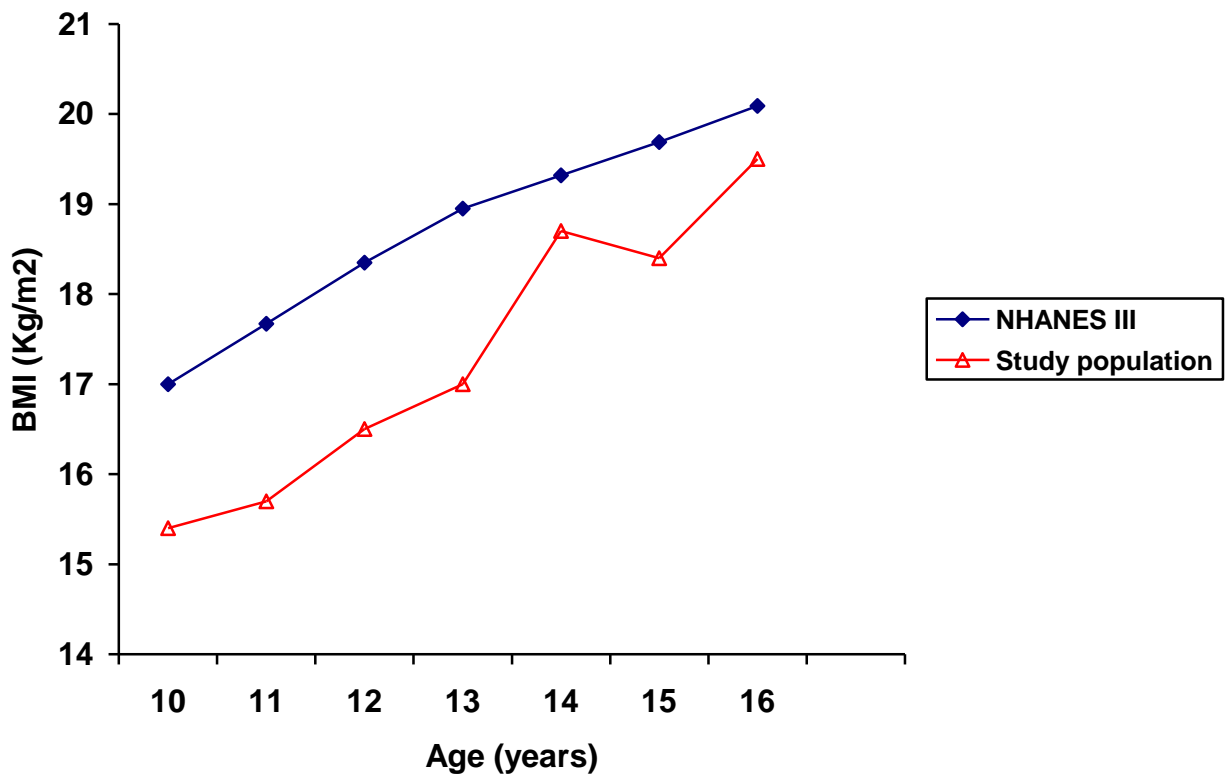
Median BMI by age is shown in Table 2. BMI increased with age; there were notable increases after 13 years of aged. There was a overall positive and significant association between age and BMI and age and weight. But the Height has not shown positive association after the age of 13.

The percentages of subjects with values  $\geq 85^{\text{th}}$  percentiles for the NHANES III reference population, by age group are shown in Table 3. Data were grouped into 6 age categories to mitigate statistical instability due to small cell sizes. The overall prevalence of overweight in subjects aged 10-18 year was 15.5% in girls. The prevalence of overweight was higher in the younger age categories than in the older ones for boys and girls; this trend in the prevalence of overweight across age categories was significant.

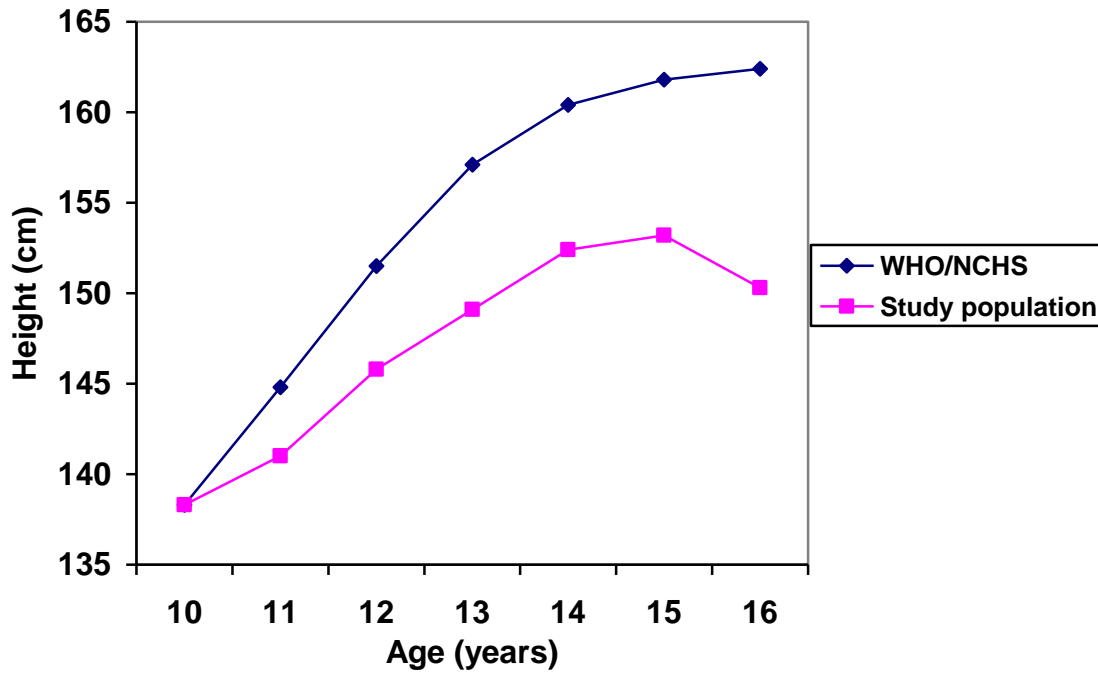
Median BMIs by age for the adolescents are shown in figure 1. The median BMI was lower in the study population than in the NHANES III reference population; the difference was more for those aged 11, 13 and 15 years. The difference was lowest for those aged 14 years.

**Figure 1**

**Mean body mass index (BMI) for girls aged 10 - 16 years and third National Health and Nutrition Examination Survey (NHANES III) reference population.**

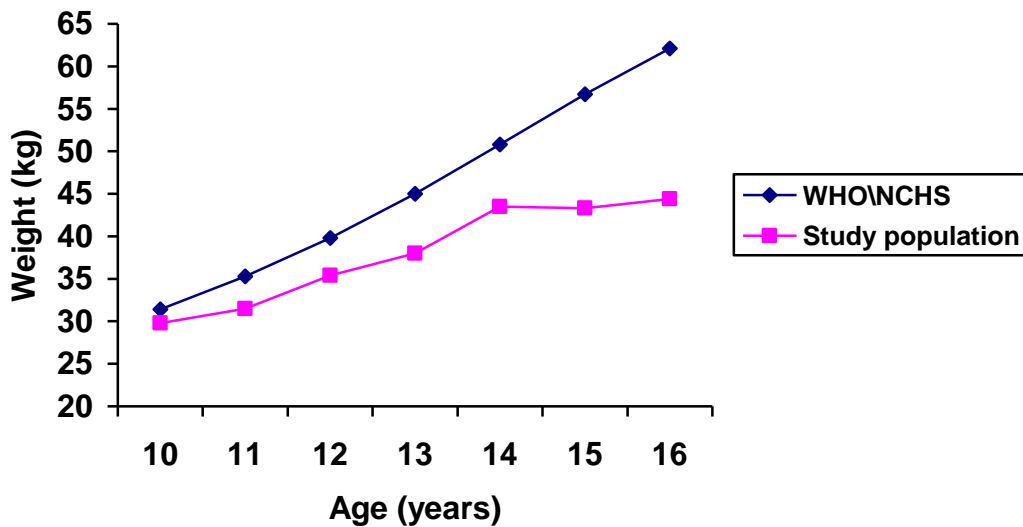


**Figure 3**  
**Mean height by age of adolescence girls**



The age-specific mean values for height is plotted in relation to the median of the NCHS reference data, is shown in Figure 1. The age-specific mean values for height of the Sri Lankan girls were 5-10cm below the NCHS median. The difference is less in the younger age categories than in the older ones; higher difference initiates from the age of 13 years.

**Figure 2**  
**Mean weight by age of girls aged 10-16 years**



**Table 4**

**Prevalence of thinness and overweight in girls aged 10-16 years**

Age <sup>1</sup> (year)	BMI <sup>4</sup>	Thinness (BMI-for-age)	Overweight (BMI-for-age)
	Mean ( $\pm$ SD) (kg/m <sup>2</sup> )	<5 <sup>th</sup> percentile %	> 85 <sup>th</sup> percentile %
10 (n = 19)	15.4 (2.2)	31.6	5.3
11 (n = 91)	15.7 (2.5)	40.7	3.3
12 (n = 151)	16.5 (2.8)	31.8	4.6
13 (n = 161)	17.0 (2.5)	19.9	1.9
14 (n = 182)	18.7 (3.0)	9.3	5.5
15 (n = 87)	18.4 (6.2)	16.1	4.6
16 (n = 5)	19.5 (2.6)	0.0	0.0
<b>All ages (n=696)</b>	<b>17.3 (2.9)</b>	<b>22.1</b>	<b>4.0</b>

<sup>1</sup>Refers to single years of age, e.g., 10 =10.00-10.99.

<sup>2</sup>F=43.27, P=0.000000

<sup>3</sup>F=58.94, P=0.000000

<sup>4</sup>F=19.83, P=0.000000

**Table 5**

**Prevalence of stunting in girls aged 10-16 years**

Age <sup>1</sup> (year)	Height (cm) <sup>3</sup>	Stunting
	Mean (SD) cm	<-2SD %
10 (n = 19)	138.3 (6.7)	0.0
11 (n = 91)	141.0 (6.2)	11.0
12 (n = 151)	145.8 (6.4)	19.2
13 (n = 161)	149.1 (6.5)	24.8
14 (n = 182)	152.4 (5.2)	14.3
15 (n = 87)	153.2 (5.9)	20.7
16 (n = 5)	150.3 (8.1)	60.0
<b>All ages (n=696)</b>	<b>148.4 (7.4)</b>	<b>18.1</b>

<sup>1</sup>Refers to single years of age, e.g., 10 =10.00-10.99.

**Table 6**

**Age specific prevalence of stunting, thinness and overweight in relation to attain menarchae in the study population**

Age <sup>1</sup> (year)	Stunting	Thinness (BMI-for-age)	Overweight (BMI- for-age)
	<-2SD	<5 <sup>th</sup> percentile	> 85 <sup>th</sup> percentile

	Attain	No	Attain	No	Attain	No
10 (n = 1 )	0.0	0.0	0.0	33.3	100.0	0.0
11 (n = 16)	0.0	13.3	12.5	46.7	6.3	2.7
12 (n = 69)	5.8	30.5	7.23	52.4	8.7	1.2
13 (n = 116)	16.4	46.7	13.8	35.6	2.6	0.0
14 (n = 172)	12.8	40.0	7.6	40.0	5.8	0.0
15 (n = 86)	20.9	-	15.1	0.0		0.0
16 (n = 5)	60.0		0.0			0.0
<b>All ages (n=696)</b>	<b>14.2</b>		<b>10.5</b>	<b>45.5</b>		<b>1.3</b>



