

**Research Article****A Cross-Sectional Study of Anthropometric Measurements of Adolescent Girls in an Urban School of North India****Harinder Sekhon<sup>1\*</sup>, Sukhmeet Minhas<sup>2</sup>**<sup>1</sup>Chief Medical Officer (Psychiatrist), Composite Hospital, Group Centre, Central Reserve Police Force, Bantalab, Jammu – 181123, Jammu & Kashmir, India<sup>2</sup>Reader, Department of Community Medicine, Armed Forces Medical College, Pune – 411040, Maharashtra, India**\*Corresponding author**

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**Abstract:** All individuals who have a Body Mass Index that exceeds the 95th percentile specified for age and gender are over weight. Those who have BMI that is between the 85th and the 95th percentiles are considered to be at risk of overweight. Prevalence of obesity is increasing at all ages worldwide. In fact, children are very often becoming overweight at a comparatively younger age and this can be gauged by their anthropometric measurements. The present study was undertaken in order to study the anthropometric measurements of school going girls in the age group of 13-19 years in a school in North India. Anthropometric measurements of all the study subjects were recorded by conducting a cross sectional descriptive study. All 1149 female students, aged 13 to 19 years who were enrolled in the school in class seventh to twelfth, during the study period were studied. Results had shown that the mean weight, height and BMI increased from 41.50 (SD=2.40), 149.40 (SD=3.00), and 18.58 (SD=0.44) at the age of 13 years to 44.03 (SD=4.43), 149.51 (SD=7.66), and 19.76 (SD=2.07) by the age of 19 years respectively. In conclusion, with increasing age, the mean of anthropometric measurements is increased. This increase was found to be steady as the age increased.**Keywords:** Adolescent, anthropometry, girls, obesity, overweight, urban

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**INTRODUCTION**

Overweight and/or obesity are defined as accumulation of abnormal or excessive fat that may impair health [1,2]. It may be simply just a state of excess of adipose tissue [3,4]. Evidence based on surveys indicates that there is a rising incidence of overweight and obesity among all age groups [4,5]. It has been found in many studies that the prevalence of combined overweight and obesity is more in girls (16.66%) than in boys (12.48%) [6]. A "double burden" of disease exists now. This is faced more so by many low- and middle-income countries. Also, the attitude of the family members, in many cases, is not found to be supportive towards the young girls [4-6]. All this affects their immediate growth as well as the future development too [5-7]. Anthropometry is one way of making this observation [8, 9]. Adolescent health is an important aspect of healthcare, recognized worldwide [8,9]. But in India, like many other countries, this is an issue which is insufficiently acknowledged and so far, has not received the adequate attention [10,11]. Several small scale studies have been undertaken with the objective of determining the prevailing knowledge and experiences about this phase of the life cycle, among adolescent school girls in rural and urban settings

[6,12]. In a school based study conducted with N=312 female subjects aged between 5-8 years, it was found that 15.4% of the girls were overweight whereas 5.4% were at risk of overweight [8].

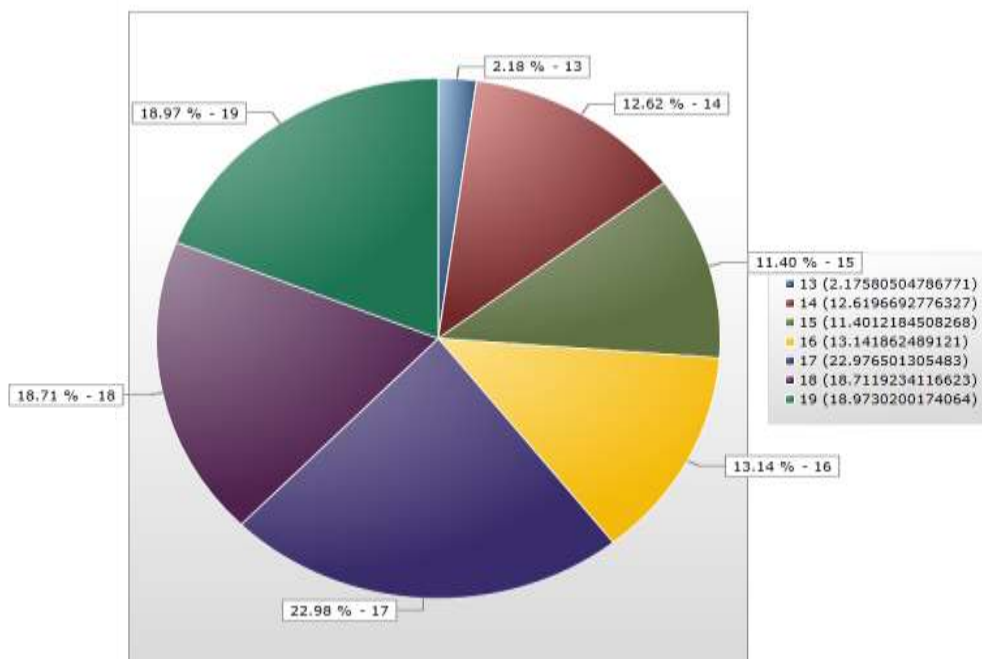
**MATERIALS AND METHODS**

The anthropometric measurements of school girls in the age group 13-19 years in an urban school of North India were studied as part of a cross sectional descriptive study. All the 1149 female students, aged 13 to 19 years enrolled in class seventh to twelfth of the school present during the study period were included in the study. Before start of the study, ethical clearance was obtained, informed consent was taken from the parents and the relevant authorities of the school were briefed about the scope of the study, with a view to solicit their cooperation. The age was recorded to the nearest completed year (6 months and above being rounded off to the next year and less than six months to the previous year) as per the official records of the school. Record of the educational status of the child was restricted to the class in which the child was studying at the time of data collection. Anthropometric Measurements recorded during the conduct of the study were weight, height, Body Mass Index (BMI), Waist

Circumference (WC), Hip Circumference (HC) and Waist to Hip ratio (WHR) was calculated. Measurements were taken with the full uniform on, less the belt and shoes and were conducted on the guidelines issued by the World Health Organisation. Data was analysed using Epi Info software.

**RESULTS**

Distribution of study subjects by their age is shown in Fig.1.



**Fig. 1: Distribution of study subjects by their age**

On calculating the means of weight of the study subjects by their age, it was observed that the mean weight increased with increase in age from 13 to 19 years (table 1).

**Table 1: Distribution of means of weight of study subjects by their age**

Age	Observations	Mean	SD
13	25	41.5200	2.4000
14	145	41.5241	10.9126
15	131	42.0534	4.5831
16	151	42.2450	4.6245
17	264	43.6629	5.1940
18	215	43.8042	5.5637
19	218	44.0321	4.4301

On calculating the means of height of the study subjects by their age, it was observed that the mean height increased with increase in age from 13 to 19 years (table 2).

**Table 2: Distribution of means of height of study subjects by their age**

Age	Observations	Mean	SD
13	25	139.4000	3.0000
14	145	143.8207	6.9319
15	131	145.4733	5.5917
16	151	148.2980	5.3026
17	264	150.3580	8.5179
18	215	153.8163	6.2551
19	218	154.5138	7.6636

**Mann-Whitney/Wilcoxon Two-Sample Test (Kruskal-Wallis test for two groups)**

Kruskal-Wallis H (equivalent to Chi square) =	306.1570
Degrees of freedom =	6
p value =	0.0000

**Mann-Whitney/Wilcoxon Two-Sample Test (Kruskal-Wallis test for two groups)**

Kruskal-Wallis H (equivalent to Chi square) =	223.0216
Degrees of freedom =	6
p value =	0.0000

Distribution of means of BMI of the study subjects by their age is given in table-3. It was observed that the mean BMI increased with increase in age from 13 to 19 years.

**Table 3: Distribution of means of BMI of study subjects by their age**

Age	Observations	Mean	SD
13	25	18.5784	0.4412
14	145	19.1869	3.6422
15	131	19.4214	2.9025
16	151	19.4690	1.4009
17	264	19.5548	2.9749
18	215	22.4557	4.1868
19	218	19.7561	2.0661

**Mann-Whitney/Wilcoxon Two-Sample Test (Kruskal-Wallis test for two groups)**

Kruskal-Wallis H (equivalent to Chi square) =	171.5470
Degrees of freedom =	6
p value =	0.0000

Distribution of means of hip circumference of the study subjects by their age is given in table 4.

**Table 4: Distribution of means of hip circumference of study subjects by their age**

Age	Observations	Mean	SD
13	25	85.8520	2.5400
14	145	85.2564	10.4847
15	131	89.9858	4.5875
16	151	87.3020	6.5426
17	264	87.7070	3.9054
18	215	93.9209	6.0420
19	218	87.6300	5.5351

**Mann-Whitney/Wilcoxon Two-Sample Test (Kruskal-Wallis test for two groups)**

Kruskal-Wallis H (equivalent to Chi square) =	241.9587
Degrees of freedom =	6
p value =	0.0000

Distribution of means of waist circumference of the study subjects by their age is given in table 5.

**Table 5: Distribution of means of waist circumference of study subjects by their age**

Age	Observations	Mean	SD
13	25	78.2320	2.5400
14	145	75.3241	10.2013
15	131	80.5626	4.5685
16	151	79.4970	7.4418
17	264	78.1820	4.4665
18	215	85.2259	5.8551
19	218	77.7962	6.5995

**Mann-Whitney/Wilcoxon Two-Sample Test (Kruskal-Wallis test for two groups)**

Kruskal-Wallis H (equivalent to Chi square) =	254.9005
Degrees of freedom =	6
p value =	0.0000

On calculating the waist to hip ratio (table 6), it was observed that the mean WHR hardly varied with the increase in age from 13 to 19 years.

**Table 6: Distribution of means of waist to hip ratio of study subjects by their age**

Age	Observations	Mean	SD
13	25	0.9112	0.0030
14	145	0.8831	0.0348
15	131	0.8954	0.0274
16	151	0.9095	0.0284
17	264	0.8914	0.0306
18	215	0.9076	0.0295
19	218	0.8870	0.0297

**Mann-Whitney/Wilcoxon Two-Sample Test (Kruskal-Wallis test for two groups)**

Kruskal-Wallis H (equivalent to Chi square) =	127.5890
Degrees of freedom =	6
p value =	0.0000

**DISCUSSION**

In the present study it was observed that the mean weight, height and BMI increased from 41.50 (SD=2.40), 149.40 (SD=3.00), and 18.58 (SD=0.44) at the age of 13 years to 44.03 (SD=4.43), 149.51 (SD=7.66), and 19.76 (SD=2.07) by the age of 19 years respectively. That is, with increasing age, there is an increase in the mean of anthropometric measurements. This increase was found to be steady as the age increased. Similar results were found in a community-based, descriptive, cross-sectional study conducted among adolescent girls in the age group of 10-19 years,

where the mean age of the study population was  $16.9 \pm 1.75$  years [16]. In another school based study conducted (N=699), 20.5% of the study subjects were found to be having BMI below <5th percentile 48.2% had BMI between  $\geq 5^{\text{th}}$  - <85th percentile, 15.7% had BMI between  $\geq 85^{\text{th}}$  - <95th percentile while 15.6% had BMI  $\geq 95^{\text{th}}$  percentile. The study revealed that the proportion of overweight and at risk of overweight was 15.6% and 15.7% respectively and that the risk increased with increasing age [9].

On comparing with other studies, it was observed that the mean height of the subjects in the present study is comparable to that observed in other similar studies [13-16]. Similarly, the mean weight of the subjects in the present study is also comparable to other studies. Comparison of the mean BMI with respect to age of the subjects showed that the mean BMI of subjects in the present study is generally more [8-11,14-16].

## CONCLUSION

In the present study we have observed that all the 1149 study subjects, aged 13 to 19 years had an increase in their anthropometric measurements as their age increased. The mean weight, height and BMI increased. This increase was steady as the age increased.

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