ORIGINAL ARTICLE

A COMMUNITY BASED STUDY ON BODY MASS INDEX PERCENTILES

Varsharani V. Kendre¹, Ghattegi C. H.²

HOW TO CITE THIS ARTICLE:

Varsharani V. Kendre, Ghattegi C. H. "A Community Based Study on Body Mass Index Percentiles". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 40, September 01; Page: 10153-10159, DOI: 10.14260/jemds/2014/3319

ABSTRACT: BACKGROUND: Adolescence is a critical period of biological, psychological and social changes, as achievement of optimum growth in girls is considered utmost, improving future health. Early and convenient method of assessing nutritional status and socioeconomic status of growing children is anthropometry. Body mass index (BMI) is a widely used parameter. **AIMS & OBJECTIVES:** 1) To study some socio-demographic characteristics of non-slum and slum adolescent girls of Urban Health Center, Dr. V. M. Medical College, Solapur. 2) To compare the Body Mass Indices of the same respondents. **SETTING & DESIGN:** This study was done at Urban Health Center; Solapur. It was a community based cross-sectional study done involving 246 adolescent girls (116 non-slums and 130 slums). **METHODOLOGY:** By doing house to house survey, the girls were interviewed with the help of predesigned, pretested questionnaire. Their socio demographic information was collected. Body mass index was calculated by using height and weight and compared with CDC 2000 standards (U.S.). Statistical tests-chi square test, Z-test, t test. **RESULTS:** There was significant difference between the socioeconomic status, literacy of non-slum and slum girls. Majority of the girls i.e. 78.45% were giving BMI in normal range i.e. 5th to 85th percentiles of CDC 2000 standards (U.S.). The number of girls with (BMI<5th percentile) was significantly more in slum girls as compared to non-slum adolescent girls. **CONCLUSION:** Overweight was not the problem in study population. About 8.6% non-slum and 21.54% girls were having BMI below 3rd percentile of the CDC 2000 standards (U.S.). Growth monitoring; Nutritional supplementation should be given to adolescent girls to prevent nutritional deficiencies, especially in slum area.

KEYWORDS: adolescents, body mass index, percentiles.

INTRODUCTION: Adolescent represents 22.85% of population in India.¹ It is crucial decade of life. World Health Organization (WHO) defined adolescence as being between ages of 10 to 19 years.² It is a critical period of biological, psychological and social changes, as achievement of optimum growth in girls is considered utmost, improving future health.³

During this period, more than 20% of total growth in stature and up to 50% of adult bone mass is achieved. Forty percent of adolescent girls are undernourished.¹

Health development of adolescent is dependent on complex factors viz- their socioeconomic circumstances, the environment in which they live and grow, the quality of relationships with their families, communities, peer groups and the opportunities for education and employment.¹

Height and weight represents health status in relation to heredity and environment.⁴ during adolescent growth spurt, there is moderate increase in the height velocity in the prepubescent phase (Phase 1). In the pubescent phase, both height and weight increase rapidly (Phase 2). In the post pubescent phase, the velocity of growth decelerates but the weight gain continues even after the increase in height stops due to epiphysis fusion (phase 3).¹

ORIGINAL ARTICLE

Anthropometry is important during adolescence, because it allows the monitoring and evaluation of hormone-mediated changes in growth and maturation, sensitive to nutritional deficit. Body mass index (BMI) values are age independent and the same for both sexes.⁵

With this background, the present study was undertaken to study some socio-demographic factors and body mass indices of the adolescent girls.

MATERIAL & METHODS: This was cross sectional community based observational study conducted in the area and community catered by Urban Health Training Center of Department of Preventive and Social Medicine, Dr. V.M. Government Medical College and Hospital, Solapur, after approval of institutional ethical committee. UHTC caters approximately 30, 000 population. About 20 small areas are catered by it.

The study was done during 2005-2006. Study sample was 246 adolescent girls according to the WHO criteria for adolescents i.e. 10 to 19 years. One non-slum (Gurunanak) and one slum (Bharat Nagar) with population of 1395 and 1277 respectively were chosen randomly among all the areas of Urban Health Training Center. About 116 adolescent girls out of 120 in non-slum area responded to the present study and 130 out of 132 girls responded to the study in slum area.

House to house survey was done and all the adolescent girls were interviewed in both areas using pretested proforma. The data was collected about some socio demographic factors like age, socioeconomic status, education, occupation etc. Height and weight were taken by drawing metric scale on wall and Height was recorded to nearest 0.1cm; weight was measured by using portable platform weighing machine and rounded off to nearest kilogram. The height and weight were measured bare footed. Anthropometric measurements like height and weight were carried out according to the method described by Satyavathi K. et al (1981).¹⁵

Body Mass Index was calculated using formula weight (Kg)/ height (m²). The results were compared with the CDC 2000 standards (U.S.),⁶ also comparison was done among non-slum and slum girls. Social class grading was done using modified B.G. Prasad's classification.⁷

Data thus collected was entered and analyzed by using appropriate statistical tool-Chi square test, t-test, and Z test.

RESULTS: As per Table 1, Out of 246 adolescent girls, 116 girls were from non-slum area and 130 girls were from slum area. Out of 116 non slum girls 16.38% were of 17 years, 12.07% were of 10 years, 11.21% were of 18 years, 9.48% were of 11 years and 12 years each, 8.62% were of 13 years, 16 years and 19 years each, 7.76% were of 14 years and 15 years each.

Out of 130 slum girls 13.85% were of 15 years and 16 years each, 13.08% were of 10 years, 12.31% were of 12 years, 11.54% were of 17 years, 10.77% were of 13 years, 7.68% were of 14 years, 6.92% were of 19 years, 6.15% were of 18 years, 3.85% were of 11 years. This table shows that, the number of girls were not uniformly distributed in age groups 10-19 years in both areas, ($\chi^2 = 7.27$, d.f.-9, and $\chi^2 = 14.92$, d.f.-9 for non-slum and slum area respectively).

Table 2 depicts, in non-slum area, 58.62% girls were educated up to secondary school, 38.79% were educated up to higher secondary school, 2.59% were educated up to primary school and none was illiterate. Among slum girls 85(65.38%) were educated up to secondary school, 30(23.08%) were illiterate, 8 (6.15%) were educated up to primary school and 7 (5.38%) were educated up to higher secondary school.

ORIGINAL ARTICLE

In non-slum area, the maximum number of girls i.e. 97.41% were students, 1.72% were not working i.e. school dropouts because they have no interest in further education, 1.72% was housewife. None was laborer. In slum area, the maximum number of girls 44.62% were students, 34.62% were not working i.e. school dropouts because of their parents will, poor socioeconomic condition etc., 16.15% were laborers, 4.62% were housewives.

About 80 (68.97%) belonged to class I, and 36 (31.03%) to class II socioeconomic status in non-slum area, whereas 77 (59.23%) slum girls belonged to class V, 50 (38.46%) slum girls to class IV and 3 (2.31%) to class III socioeconomic status.

Table 3 show distribution of adolescent girls as per BMI percentiles. 14.64% non-slum and 26.16% slum girls were having BMI below 5th percentile. About 8.6% non-slum and 21.54% girls were having BMI below 3rd percentile of the CDC 2000 standards (U.S.).¹² Majority of the girls i.e. 78.45% were giving BMI in normal range i.e. 5th to 85th percentiles. Only 0.81% girls were having BMI above 85th percentile. Overall 20.73% girls had BMI < 5th percentile.

DISCUSSION: In the present study, the number of girls was not uniformly distributed in age groups 10-19 years in both areas. The literacy of non-slum girls (100%) was more than those of slum girls (87.8%). The number of girls higher educated than secondary school were significantly more in non-slum area (38.79%) than those in slum area (5.38%), ($\chi^2 = 61.56$, df- 3, $p < 0.001$), because of poor socioeconomic status, parents will, un acceptance of female education in slum area.

All the non-slum girls were of socioeconomic status (I and II) and majority of slum girls were of lower socioeconomic status (IV and V) i.e. 97.69%. This difference was significant ($X^2 = 236.62$, df- 3, $p < 0.0001$) explaining better socioeconomic status going hand in hand with the better literacy status in non-slum area.

When the mean B.M.I. of the non-slum and slum girls was compared, the mean B.M.I. of non-slum girls was significantly high than the B.M.I. of the slum girls ($Z = 3.01$, $P = 0.002$). The difference in B.M.I. between non-slum and slum girls was statistically significant at ages 15, 16, 17 years. p value- 0.01, 0.001, 0.01 respectively (by t test).

BMI-for-age continues to offer a valid and readily available measure for use in clinical and population-based applications.⁸ In the United States, BMI-for-age percentiles above the 95th percentile in children and adolescents are labeled 'overweight' and BMI-for-age percentiles between the 85th and 95th percentiles are labeled 'at risk for overweight.'¹⁴ When BMI was studied, it was found that, 14.64% non-slum and 26.16% slum girls were having BMI below 5th percentile.

The number of girls with (BMI < 5th percentile) was significantly more in slum girls as compared to non-slum adolescent girls ($Z = 2.3$, $P = 0.02$). Kapoor G. and Aneja⁹ studied nutritional disorders in adolescent girls during 1992 and found that 22.65% of girls were having thinness. These were more as compared to the non-slum girls and less than slum girls with BMI below 5th percentile of the CDC 2000 standards (U.S.)⁶ in the present study.

The poor nutritional status of adolescent girls has important implications in terms of physical work, low birth weight, anemia, and adverse reproductive outcomes. Adolescents who are at risk of overweight may show other risk factors for future obesity related diseases.⁴

Chaturvedi¹⁰ carried the study among adolescent girls belonging to poor socioeconomic group of rural area of Rajasthan in 1996 and only 6.5% of the girls were found to have a body mass index (BMI) of more than 18.5.

ORIGINAL ARTICLE

Whereas majority of girls in present study were having BMI in normal range i.e. 5th to 85th percentiles of the CDC 2000 standards (U.S.).⁶ Joseph G.A. et al¹¹ in his study in 1997 interviewed 50 girls from each of 4 villages. The body mass index varied from 16-19 and generally depicts an under nourished population.

These findings were similar with slum girls in the present study. Hitendra G. Thakor et al¹² carried the study among 2250 school children of Surat city in 2000. The weight height and BMI revealed that the median parameters of the population were comparable to the ICMR standards but were far below the 50th percentiles of NCHS standards. These findings were in contrast with that of present study.

Pawar R.¹³ studied 900 rural adolescent girls from High school and colleges from rural area of Shirur in 2000. Prevalence of thinness was 19.4% and significant early adolescent girls having more thinness than late adolescent girls. This was more as compared to the non-slum girls and less than slum girls with BMI below 5th percentile of the CDC 2000 standards (U.S.)⁶ in the present study.

CONCLUSIONS: The number of girls with (BMI < 5th percentile) was significantly more in slum girls as compared to non-slum adolescent girls. This may be due to their low socioeconomic status, illiteracy or lower education. Most of the girls were having BMI in normal range i.e. 5th to 85th percentiles.

Overweight was not the problem in study population. Growth monitoring of school girls at regular interval of every 3 months throughout schooling may be made compulsory to detect early nutritional deficiencies. In slum area, Nutritional supplementation should be given to adolescent girls to prevent nutritional deficiencies and to improve their reproductive health.

REFERENCES:

1. Ghai O.P.: Essential Pediatrics, 6th ed. CBS publishers. 2004. p 42.
2. S.K. Ganguli and Ratna Majumdar: A study of adolescent girls in Pune; PRESME: Journal of Community Health, 2001; 3(1), 26-33.
3. Sachar R.K., Harinder Singh, Soni R.K. et al: Across sectional study of growth parameters of rural adolescent girls of Punjab; Indian Journal of Maternal and child Health, 1997.8 (1); 21-25.
4. W.H.O.: Technical Report Series, 1984.No. 854: 263-311.
5. Park K. Park's Textbook of Preventive and Social Medicine. 22nd ed. Jabalpur. Banarasidas Bhanot; 2013: p- 369.
6. CDC – Center for disease control and prevention. 2000 CDC Growth charts: United States [online] Hyattsville: 2002. Accessed on: Jan 15 2005. Available from: www.cdc.gov/growthcharts.
7. Prasad B.G. (1970): Changes proposed in social classification of Indian Families, Journal of Indian Medical Association, 55 (16): 198-199.
8. Must A, Anderson SE: Body mass index in children and adolescents: considerations for population-based applications, International Journal of Obesity 2006; 30, 590-594.
9. Kapoor G. and Aneja S.: Nutritional disorders in adolescent girls; Indian Pediatrics, 1992; 29, 969-973.
10. Chaturvedi: Nutrient intake amongst girls belonging to poor socioeconomic group of rural area of Rajasthan; Indian Pediatrics, 1996.33, 197-202.

ORIGINAL ARTICLE

11. Joseph G.A. et al. General and reproductive health of adolescent girls in rural South India; Indian Pediatrics, 1997. 34; 242-245.
12. Hitendra G. Thakor et al. Physical growth standards for urban adolescents (10-15 years) from South Gujarat; Indian Journal of Community Medicine, 2000;25(2):86-92.
13. Pawar R. A cross sectional study of growth parameters of rural adolescent girls of Shirur-Thesis submitted to University of Pune for M.D.P.S.M. 2002.
14. Barlow SE, Dietz WH. Obesity evaluation and treatment: expert committee recommendations. Pediatrics 1998; 102: 1-11.
15. Sathyavathi K. et.al. (1981): The growth pattern of weight and height during adolescence; Indian Journal of Medical Research; 74, 857-865.

Age in Years	Non slum		Slum		Total	
	No.	%	No.	%	No.	%
10	14	12.07	17	13.08	31	12.6
11	11	9.48	5	3.85	16	6.5
12	11	9.48	16	12.31	27	10.97
13	10	8.62	14	10.77	24	9.76
14	9	7.76	10	7.68	19	7.73
15	9	7.76	18	13.85	27	10.97
16	10	8.62	18	13.85	28	11.38
17	19	16.38	15	11.54	34	13.82
18	13	11.21	8	6.15	21	8.54
19	10	8.62	9	6.92	19	7.73
Total	116	100	130	100	246	100

Table 1: Distribution of adolescent girls according to age

Non-slum $\chi^2 = 7.27$, df.-9, N.S. (Not significant), Slum $\chi^2 = 14.92$, df-9, N.S.

ORIGINAL ARTICLE

Education		
	Non-slum No. (%)	Slum No. (%)
Illiterate	-	30(23.08)
Primary	3(2.59)	8(6.15)
Secondary	68(58.62)	85(65.38)
Higher secondary	45(38.79)	7(5.38)
$\chi^2 = 61.56$, df- 3, $p < 0.001$		
Occupation		
Student	113(97.41)	58(44.62)
Laborer	-	21(16.15)
Housewife	1(0.86)	6(4.62)
Not working	2(1.72)	45(34.62)
SE Status		
I	80(68.97)	-
II	36(31.03)	-
III	-	3(2.31)
IV	-	50(38.46)
V	-	77(59.23)

Table 2: Socio-demographic characteristics of adolescent girls

$\chi^2 = 236.62$, df- 3, $p < 0.0001$ (IV & V are pooled together)

Table 3: Distribution of adolescent girls with reference to CDC 2000 Standards BMI percentiles.

A) Non-slum:

Age in Years	No.	<3 rd Percentile		<5 th Percentile		5 th to 85 th Percentile		>85 th Percentile		BMI Mean $\pm$ SD
		No.	%	No.	%	No.	%	No.	%	
10	14	1	0.86	2	1.72	12	10.35	-	-	16.11 $\pm$ 1.63
11	11	1	0.86	2	1.72	9	7.76	-	-	16.29 $\pm$ 1.2
12	11	-	-	3	2.59	8	6.9	-	-	16.49 $\pm$ 1.57
13	10	2	1.72	2	1.72	8	6.9	-	-	17.83 $\pm$ 3.17
14	9	2	1.72	1	0.86	8	6.9	-	-	19.0 $\pm$ 1.85
15	9	-	-	-	-	9	7.76	-	-	20.26 $\pm$ 1.23
16	10	-	-	-	-	9	7.76	1	0.86	20.4 $\pm$ 2.34
17	19	2	1.72	2	1.72	17	14.65	-	-	20.4 $\pm$ 2.18
18	13	1	0.86	3	2.59	10	8.62	-	-	18.56 $\pm$ 1.26
19	10	1	0.86	2	1.72	8	6.9	-	-	18.9 $\pm$ 1.26
Total	116	10	8.60	17	14.64	98	84.5	1	0.86	18.41$\pm$1.67

Table 3A

ORIGINAL ARTICLE

B) Slum:

Age in Years	No.	<3 rd Percentile		<5 th Percentile		5 th to 85 th Percentile		>85 th Percentile		BMI Mean $\pm$ SD
		No.	%	No.	%	No.	%	No.	%	
10	17	3	2.31	3	2.31	14	10.77	-	-	15.17 $\pm$ 1.2
11	5	1	0.77	1	0.77	4	3.08	-	-	15.92 $\pm$ 2.19
12	16	1	1.54	2	1.54	14	10.77	-	-	16.41 $\pm$ 0.89
13	14	1	1.54	4	3.08	9	6.92	1	0.77	17.64 $\pm$ 2.77
14	10	-	-	-	-	10	7.69	-	-	18.23 $\pm$ 1.88
15	18	4	3.08	4	3.08	14	10.77	-	-	18.08 $\pm$ 2.34
16	18	6	4.61	8	6.15	10	7.69	-	-	17.36 $\pm$ 1.56
17	15	7	5.38	7	5.38	8	6.15	-	-	18.28 $\pm$ 2.08
18	8	3	2.31	3	2.31	5	3.85	-	-	18 $\pm$ 2.25
19	9	2	1.54	2	1.54	7	5.38	-	-	18.28 $\pm$ 2.08
Total	130	28	21.54	34	26.16	95	73.07	1	0.77	17.34 $\pm$ 1.12
Grand Total	246	38	15.45	51	20.73	193	78.45	2	0.81	Z value- 3.01 P=0.002

Table 3B

Z = 2.3, p = 0.02

AUTHORS:

1. Varsharani V. Kendre
2. Ghattegi C. H.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Community Medicine, Government Medical College, Latur, Maharashtra.
2. Professor and HOD, Department of Community Medicine, S. N. Medical College, Bagalkot, Karnataka.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Varsharani V. Kendre,
Plot No.77,
Near Vithal Rukmini Temple,
New Renapur Naka, Bhakti Nagar,
Sai Road, Latur-413512,
Maharashtra.
Email: mundevarsharani@yahoo.com

Date of Submission: 11/08/2014.
Date of Peer Review: 12/08/2014.
Date of Acceptance: 18/08/2014.
Date of Publishing: 01/09/2014.