A NORMATIVE STUDY ON BODY MASS INDEX OF 13,14 AND 15 YEARS OLD GIRLS OF DELHI SCHOOLS

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ABSTRACT

The purpose of the Study was development of Norms for Body Mass Index of school going girls of the age group 13,14 and 15 years. For the purpose of the study, the subjects were selected from different schools of all 29 zones of Delhi under the structure of Directorate of Education, Government of National capital Territory of Delhi using purposive sampling. The Sample size was 2100 subjects The variable for the study was Body Mass Index which was measured through Height and Weight. Body Composition was measured by measuring Body Mass Index (BMI) with height in meters and weight in kg. The Descriptive Statistical techniques used for the analysis of data was Mean, Standard Deviation, Minimum scores, Maximum Scores and Range. For the development of Norms, Percentile and Six Sigma Scale were used.

Keywords: Norms, Body Mass Index.

Introduction

A fit and healthy person will certainly live longer life and may become more productive at work place to enhance nation's growth and development. With an increasing prevalence of heart and other cardiovascular diseases as well as a wide range of health concerns, the importance of leading healthy lives that include a well-balanced diet and an adequate fitness regime that embodies healthy lifestyle habits is imperative.

Health has a direct impact on all activities, economic or otherwise. With massive efforts being made to effectively implement the provisions of the Right to Education Act (RTE), 2010, enroll every child below 14 years in school, it would be best if the health and fitness related schemes are implemented through the organized school system.

As per The World Health Statistics-2012 report released by WHO, one in three adults worldwide, has raised blood pressure and one in 10 adults has diabetes. Also 12% of the total population are obese. A startling observation of WHO vulnerable to these deadly diseases. In the same Report, WHO also makes a prediction that one out of every three Indians will either be a coronary patient or a diabetic by 2030. This projected population at risk about two decades from now will necessarily be the presently school going children. Given the fact that, majority of our population are in the youth category below the age of 35 years, WHO's prediction for 2030 has to be addressed at the national level urgently. Maintaining a healthy body weight is very important to all aspects of well being. It can help in avoiding serious health problems such as heart disease and type 2 diabetes.

One way of checking of healthy weight is to know your Body Mass Index (BMI). Your body mass index is calculated by dividing your weight in kilograms by your height squared in metres. In physical fitness, body composition is used to describe the percentages of fat, bone, water and muscle in human bodies. Because muscular tissue takes up less space in our body than fat tissue, our body composition, as well as weight, determines leanness.

Materials and Methods

This Chapter contains an elaborate description about the sources of the subjects, selection of the subjects, selection of the variables, criterion measures, administration of the test items, collection of data, procedure for establishing norms and statistical techniques etc. The detailed descriptions of the content are as follows:

Sources of the Subjects

For the proposed study, 2100 female subjects in the age category of 13 to 15 years i.e. 700 subjects each age category were randomly selected from various schools of Delhi.

Criterion Measures

Body composition (percentage of body fat).

The following testing items will be used for the collection of the data:

Sr. No.	Variable	Test Item	Unit of Measurement
1.	Body composition (percentage of body fat)	(i) Height and (ii) Weight	meter/ kilogram

(a) Height: Subject stands erect bare-footed with heels and back of the head touching the stands or wall. The device of measurement stand or a flatcard-board was put up on the top of the head to take the height of an individual.
Scoring: The measurement is taken to the nearest centimeter.

(b) Weight: The subject stood on the platform of the weigh-in Machine bare-footed with foot parallel and weight equally distributed on both feet. Minimum cloth shirts/t-shirt and shorts/skirt in case of girls.
Scoring: The weight is recorded from the indicator dial of the machine in kgs.

Collection of the Data

The research scholar visited various schools of Delhi to collect the data by administering the fitness tests as mentioned in the administration of the test items for the selected girls age ranging 13-15 years.

Procedure for Establishing Norms

The Normative scores were developed by testing selected 750 girls' subjects of Delhi schools on each test item considered for proposed study separately. A common method of organizing normative data is through the use of percentile tables. Percentile tables for each test items separately will indicate the percentile equivalent (rank) associated with any given raw scores.

Results and Discussions

The findings of the Research Study were accomplished by employing various statistical techniques. The statistics used for deriving results were mean, standard deviation, minimum & maximum values on body composition of girls from 13 to 15 years studying in Delhi schools has been calculated. These findings have been presented in the following tables:
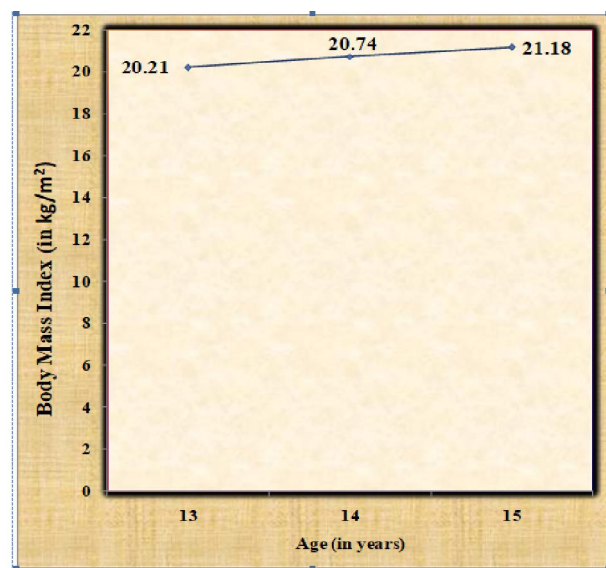
Fig. 1.01: Mean Values of the Body Mass Index of girls aged 13, 14 and 15 years studying in Delhi schools.

It is highlighted from the figure 4.1 that the body mass index was found highest among the 15 year old girls followed by the 14 year and least among the 13 year old girls studying in Delhi Schools.

Table 1.01: Descriptive Statistics of Body Mass Index (kg/m^2) of girls aged 13, 14 and 15 years studying in Delhi schools

Age	N	Mean	Std. Deviation	Minimum	Maximum	Range
13 Years	700	20.21	4.46	10.14	38.19	28.05
14 Years	700	20.74	4.39	9.96	37.31	27.35
15 Years	700	21.18	4.43	12.16	41.46	29.30

Note: n= number of subjects selected

Table 1.01 highlights the descriptive analysis of the body mass index of the 13, 14 and 15 years old girls studying in Delhi schools. The mean and standard deviation of the body mass index of the 13, 14 and 15 years old girls studying in Delhi schools were found as 20.21± 4.46 kg/m^2, 20.74± 4.39 kg/m^2 and 21.18± 4.43 kg/m^2 respectively. Further, the table highlights that the minimum value, maximum value and the range of values of the body mass index of the 13 year old girls studying in Delhi schools were 10.14, 38.19 and 28.05 kg/m^2 respectively; of the 14 year old girls studying in Delhi schools were 9.96, 37.31 and 27.35 kg/m^2 respectively; and of the 15 year old girls studying in Delhi schools were 12.16, 41.46 and 29.30 kg/m^2 respectively.

The graphical representation of the mean scores of the body mass index of the 13, 14 and 15 years old girls studying in Delhi schools is presented in the figure 1.01.

Table 1.02: Percentile Values of Body Mass Index (kg/m^2) of 13 year old girls studying in Delhi Schools

Percentile	Body Mass Index	Percentile	Body Mass Index
100	38.19	75	22.76
99	33.50	74	22.59
98	31.76	73	22.40
97	30.93	72	22.29
96	30.02	71	22.22
95	29.27	70	22.02
94	28.16	69	21.87
93	27.21	68	21.69
92	26.71	67	21.56
91	26.13	66	21.42
90	25.78	65	21.22
89	25.57	64	21.08
88	25.36	63	20.96
87	25.07	62	20.83
86	24.89	61	20.78
85	24.70	60	20.69
84	24.52	59	20.64
83	24.08	58	20.54
82	23.92	57	20.42
81	23.76	56	20.31
80	23.62	55	20.23
79	23.47	54	20.06
78	23.31	53	19.93
77	23.07	52	19.78
76	22.95	51	19.64

Percentile	Body Mass Index	Percentile	Body Mass Index
50	19.49	25	16.95
49	19.41	24	16.79
48	19.26	23	16.65
47	19.19	22	16.55
46	19.11	21	16.45
45	19.02	20	16.38
44	18.95	19	16.25
43	18.89	18	16.18
42	18.79	17	16.07
41	18.69	16	15.95
40	18.49	15	15.82
39	18.41	14	15.78

38	18.24	**13**	15.65
37	18.14	**12**	15.54
36	18.06	**11**	15.41
35	18.01	**10**	15.24
34	17.92	**9**	15.15
33	17.85	**8**	14.95
32	17.65	**7**	14.76
31	17.53	**6**	14.59
30	17.44	**5**	14.32
29	17.30	**4**	14.13
28	17.21	**3**	13.87
27	17.12	**2**	12.81
26	17.08	**1**	12.42
-	-	**0**	10.14

Table. 1.02 shows the 100th to 0th Percentile Values of Body Mass Index (kg/m^2) of 13 year old girls studying in Delhi Schools.

Table 1.03: Percentile Values of Body Mass Index (kg/m^2) of 14 year old girls studying in Delhi Schools

Percentile	Body Mass Index	Percentile	Body Mass Index
100	37.31	**75**	23.37
99	33.30	**74**	23.16
98	31.33	**73**	23.05
97	30.17	**72**	22.93
96	29.28	**71**	22.75
95	28.71	**70**	22.67
94	28.37	**69**	22.58
93	27.88	**68**	22.39
92	27.56	**67**	22.33
91	27.21	**66**	22.12
90	27.02	**65**	22.03
89	26.50	**64**	21.89
88	26.24	**63**	21.71
87	25.89	**62**	21.59
86	25.72	**61**	21.49
85	25.54	**60**	21.33
84	25.29	**59**	21.13
83	25.01	**58**	21.03
82	24.82	**57**	20.89
81	24.62	**56**	20.76
80	24.44	**55**	20.65
79	24.21	**54**	20.57
78	24.05	**53**	20.45
77	23.85	**52**	20.30
76	23.69	**51**	20.20

Percentile	Body Mass Index	Percentile	Body Mass Index
50	20.17	**25**	17.50
49	20.08	**24**	17.37
48	19.87	**23**	17.26
47	19.77	**22**	17.09
46	19.59	**21**	17.02
45	19.48	**20**	16.92
44	19.39	**19**	16.75

43	19.28	**18**	16.68
42	19.22	**17**	16.61
41	19.13	**16**	16.47
40	18.86	**15**	16.34
39	18.74	**14**	16.23
38	18.66	**13**	16.13
37	18.53	**12**	16.06
36	18.49	**11**	15.88
35	18.44	**10**	15.79
34	18.35	**9**	15.60
33	18.28	**8**	15.47
32	18.13	**7**	15.33
31	18.05	**6**	15.25
30	17.90	**5**	14.97
29	17.84	**4**	14.70
28	17.73	**3**	14.27
27	17.64	**2**	13.60
26	17.57	**1**	12.39
-	-	**0**	9.96

Table 1.03 shows the 100th to 0th Percentile Values of Body Mass Index (kg/m^2) of 14 year old girls studying in Delhi Schools.

Table 1.04: Percentile Values of Body Mass Index (kg/m^2) of 15 year old girls studying in Delhi Schools

Percentile	Body Mass Index	Percentile	Body Mass Index
100	41.46	**75**	23.76
99	33.24	**74**	23.59
98	32.09	**73**	23.44
97	30.90	**72**	23.32
96	29.94	**71**	23.18
95	29.52	**70**	23.04
94	29.14	**69**	22.88
93	28.56	**68**	22.75
92	28.13	**67**	22.61
91	27.70	**66**	22.50
90	27.30	**65**	22.39
89	27.01	**64**	22.23
88	26.67	**63**	22.02
87	26.50	**62**	21.88
86	26.28	**61**	21.71
85	25.94	**60**	21.53
84	25.58	**59**	21.41
83	25.46	**58**	21.31
82	25.24	**57**	21.12
81	25.01	**56**	21.07
80	24.87	**55**	20.96
79	24.62	**54**	20.88
78	24.39	**53**	20.72
77	24.08	**52**	20.55
76	23.90	**51**	20.38

Percentile	Body Mass Index	Percentile	Body Mass Index
50	20.32	25	18.05
49	20.23	24	17.96
48	20.16	23	17.88
47	20.02	22	17.77
46	19.92	21	17.65
45	19.82	20	17.57
44	19.75	19	17.43
43	19.60	18	17.31
42	19.52	17	17.12
41	19.42	16	17.01
40	19.33	15	16.92
39	19.24	14	16.77
38	19.15	13	16.69
37	19.13	12	16.52
36	19.08	11	16.33
35	18.95	10	16.01
34	18.88	9	15.82
33	18.77	8	15.72
32	18.69	7	15.48
31	18.61	6	15.32
30	18.50	5	15.15
29	18.37	4	14.96
28	18.29	3	14.78
27	18.21	2	14.08
26	18.10	1	13.46
-	-	0	12.16

Table 1.04 shows the 100th to 0th Percentile Values of Body Mass Index (kg/m^2) of 15 year old girls studying in Delhi Schools.

Table 1.05: 6 Sigma Scale Values of Body Mass Index (kg/m^2) of 13 year old girls studying in Delhi Schools

6 Sigma Score	Body Mass Index
100	33.59
90	30.91
80	28.24
70	25.56
60	22.89
50	20.21
40	17.53
30	14.86
20	12.18
10	9.51
0	6.83

Mean- 20.21, Standard Deviation: 4.46

Table. 1.05 shows the 100th to 0th 6 Sigma Scale Values of Body Mass Index (kg/m^2) of 13 year old girls studying in Delhi Schools.

Table 1.06: 6 Sigma Scale Values of Body Mass Index (kg/m^2) of 14 year old girls studying in Delhi Schools

6 Sigma Score	Body Mass Index
100	33.91
90	31.28
80	28.64
70	26.01
60	23.37
50	20.74
40	18.11
30	15.47
20	12.84
10	10.20
0	7.57

Mean- 20.74, Standard Deviation: 4.39

Table. 1.06 shows the 100th to 0th 6 Sigma Scale Values of Body Mass Index (kg/m^2) of 14 year old girls studying in Delhi Schools.

Table 1.07: 6 Sigma Scale Values of Body Mass Index (kg/m^2) of 15 year old girls studying in Delhi Schools

6 Sigma Score	Body Mass Index
100	34.47
90	31.81
80	29.15
70	26.50
60	23.84
50	21.18
40	18.52
30	15.86
20	13.21
10	10.55
0	7.89

Mean- 21.18, Standard Deviation: 4.43

Table. 1.07 shows the 100th to 0th 6 Sigma Scale Values of Body Mass Index (kg/m^2) of 15 year old girls studying in Delhi Schools.

Table 1.08: Norms under Percentile Scale of Body Mass Index (kg/m^2) of girls aged 13, 14 and 15 years studying in Delhi schools

Age	Obese	Over Weight	Normal Weight	Under Weight
13 Years	>24	23-24	16-22	<16
14 Years	>25	24-25	17-23	<17
15 Years	>25	24-25	18-23	<18

Table 1.08 shows that the norms based on the percentile scale, body mass index of girls aged 13, 14 and 15 years studying in Delhi schools has been divided into four categories namely obese, overweight, normal weight and underweight. Below 16, 16-22, 23-24 and above 24 body mass index are considered as obese, overweight, normal weight and underweight respectively for girls aged 13 years studying in Delhi schools.

Similarly, below 17, 17-23, 24-25 and above 25 body mass index are considered as obese,

overweight, normal weight and underweight respectively for girls aged 14 years studying in Delhi schools.

While, below 18, 18-23, 24-25 and above 25 body mass index are considered as obese, overweight, normal weight and underweight respectively for girls aged 15 years studying in Delhi schools.

Conclusions

Based on the findings and within the limitations of this study, the following conclusions were drawn:

1. The normative scales namely the Percentile Scales and 6 Sigma Scales were prepared for girls aged 13, 14 and 15 years studying in Delhi Schools.
2. The norms based on the percentile scale for body mass index of girls aged 13, 14 and 15 years studying in Delhi schools has been divided into four categories namely obese, overweight, normal weight and underweight. Below 16, 16-22, 23-24 and above 24 body mass index are considered as obese, overweight, normal weight and underweight respectively for girls aged 13 years studying in Delhi schools. Similarly, below 17, 17-23, 24-25 and above 25 body mass index are considered as obese, overweight, normal weight and underweight respectively for girls aged 14 years studying in Delhi schools. While, below 18, 18-23, 24-25 and above 25 body mass index are considered as obese, overweight, normal weight and underweight respectively for girls aged 15 years studying in Delhi schools.

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