

Comparison Of Growth Parameters Of School Age Children Of Prayagraj According To WHO Standard Growth Norms – A Descriptive Survey

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Abstract

Growth is an important biological process which is influence by both genetic and environment. The growth parameters help to measure the physical growth of individual according to their age. The objective of the study is to assess the growth parameters of school age children in term of height, weight and BMI and to compare the growth parameters of school age in accordance with WHO. For the study 600 students belonging to age 7-9 years were randomly selected from Prayagraj. The result shows that majority of children are underweight with z score <-1SD. Also BMI of girls were more than boys. Comparing the mean height and weight of school going children with WHO standard, it was concluded that majority of the children are stunting.

Keywords: Growth parameters, Anthropometry, Nutritional status, Stunting, Underweight.

Date of Submission: 12-07-2023

Date of Acceptance: 22-07-2023

I. Introduction

The anthropometric analysis is an effective tool for physician for the assessment of nutritional status, growth and development of children (Cameron, 1986). Decision making and planning in child health nutrition should be based on valid assessment on updated growth charts. The growth chart reference is a need of time since it's a fact that, children worldwide have become taller and heavier (WHO, 2006); Davies, 2007). Several Indian studies tried to establish reference standards for Indian children but the data was almost a decade old (Thakor et al., 2000; Tripathi et al., 1974). Agarwal et al., (1992) published the results of a large multi-centric survey of children from the upper socioeconomic strata (USES) conducted in 12 cities from all regions of India in 1992, these data are now more than 2 decades old. In a study by Khadilkar et al documented a secular trend in the height and weight of schoolchildren but was based on a smaller sample size. We have analyzed the height, weight and BMI in 5 year 16 year age group in both schoolboys and schoolgirls. The percentile charts for BMI prepared and weight for age, height for age growth charts were made. The comparison with other four established studies was done to conclude with recommendations of our study. We present the reference growth charts and percentile charts of age and gender specific BMI based on 995 school children data representative of a public school.

Objectives of the study:

1. To assess the growth parameters of school age children in terms of height, weight and BMI.
2. To compare the growth parameters of school age children in accordance with WHO.

II. Material and method

To evaluate the growth factors of school-age children, a survey was conducted. Government and private schools in Prayagraj were chosen using a simple random sample technique. The district of Prayagraj is divided into five zones. Two of these zones in the Prayagraj district were chosen by a straightforward random sampling procedure. The same approach was used to choose four wards in each zone in the second step. Two mohallas in each chosen ward were chosen by a straightforward random process. Using simple random sampling, one school from each of the selected mohallas was selected based on its likelihood in relation to its size. 600 kids, or students between the ages of 7-9, were chosen from each school. Children below the age of 7 years and above the age of 9 years were excluded from the study.

Data collection Instruments

A demographic proforma was created with the intention of gathering background data about schoolchildren. Anthropometric measurements were taken using a tape measure and weighing scale. To evaluate the socioeconomic standing of the family, the Kuppaswamy socioeconomic status scale was adapted. Expert validation and pretesting were performed on the tool. The weighing scale and inch tape were calibrated.

Procedure for Data Collection

After outlining the purpose and nature of the study, prior approval was obtained from the school administration. The parents were told of the study's objectives and provided with written consent after receiving assurances regarding the confidentiality of their children's responses. Children aged 7-9 who were in school were used to get the data. Anthropometric measurements were done, and the investigator gathered background data. The information provided by the parents was used to determine socioeconomic level. Descriptive analysis was used to analyze the data.

III. Results and Discussion

The results according to the objectives revealed that children in the age group of 5-14 years are often considered as school-age. Since 1972, the United Nations Educational Scientific and Cultural Organization (UNESCO) consider 6-11 years as primary school age and 12-17 years as secondary school age for statistical purposes. In it is recorded that in India one fifth of the population consists of children between 5 and 14 years, which includes the primary and secondary school age. School age is considered as a dynamic period of growth and development because children undergo physical, mental, emotional and social changes. In other words the foundations of good health and sound mind are laid during the school age period. Hence the present study was formulated with the objective, to assess and find the major socio-economic correlates of nutritional status in school-age children.

Table 1.1: General characteristics of the sample

Sample Characteristics		N	%
Age (in years)	7	267	44.5
	8	95	15.8
	9	238	39.7
Gender	Male	300	50.0
	Female	300	50.0
Qualification of parents	Graduation		
	Post Graduation	139	23.2
	LLB	52	10.3
	Ph.D	122	20.3
	D.Phil	88	14.7
Number of Siblings	Nil	-	-
	One	224	37.3
	Two	192	32.0
	Three or more	184	30.7
Type of Family	Joint	290	48.3
	Nuclear	310	51.7
Socio economic status	HIG	115	19.2
	LIG	115	19.2
	MIG	370	61.7

The students selected for the study belongs to different age group and has different Socio-economic status and lifestyle from each other. Table 1.1 shows that 267 (44.5%) students were 7 years old, 95 (15.8) students were 8 years old and 238 (39.7%) students were of age 9 years. In the total there were 600 students out of which 300 were male and 300 were female who practice different religions.

Qualification of parents was also determined to find out the level of their education. Parents of 139 (23.2%) students were Post Graduated, parents of 52 (10.3%) students were LLB, 122(20.3%) student's parents were Ph.D and parents of 88(14.7%) students were D.Phil.

Siblings play an important aspect in the growing process of every child. The table 1.1 shows the number of siblings the students has and majority of students i.e. 224 (37.3%) has one siblings. 192 (32%)

students has two students and 184 (30.7%) has three or more siblings. Along with sibling family is also important for children’s growth and development. About 290(48.3%) out of 600 students live in a joint family and 310 (51.7%) students lives in Nuclear family.

Socio economic status defines the lifestyle and facilities an individual gets which also is responsible for the social being of the individual. In the study majority of the students belong to MIG i.e.370 (61.7%), 115(19.2%) students were from HIG and 115 (19.2%) students were from LIG.

Table 1.2: Prevalence of Obesity, Overweight, Medium and Underweight among school age children

BMI	Frequency	Percent
<-3 SD (Severe Underweight)	13	2.2
<-2 SD (Moderate Underweight)	179	29.8
<-1 SD (Mild Underweight)	187	31.1
<0 SD (Medium)	97	16.2
<1 SD (Over weight)	96	16.0
<2 SD (Obese)	28	4.7
Total	600	100.0

The above table 1.2 shows the prevalence of overweight, obesity, mild under weight, moderate underweight, and severe underweight among 600 school age children. The table shows that majority of the students were malnourished i.e. 62.1% students were underweight, thinness and Severe thinness. Prevalence of the Obese (< 2SD) is 4.7% (28 students), Overweight (< 1 SD) is 16% (96 students), Medium (<0SD) is 16.2% (97 students), under weight (<-1 SD) is 31.1% (187 student), Thinness (<-2 SD) is 29.8% (179 student) and severe thinness (<-1SD) is 2.2% (13student).

Similar study was **Hasan I et al.** in 2010 in Bangalore in which prevalence of malnutrition was 52%. This is also in contrast to a study conducted by **Saluja Neelu et al.** in 2007 in urban primary school children in Meerut found that 49.5 % were found to be malnourished. Contrast to these findings, a study was conducted by **Amruth M et al.** in 2015 in Sullia town, South India where only 26% of primary students were malnourished.

Nutritional Status based on BMI

Table 1.3: BMI across gender of school going children

GENDER * BMI Cross tabulation								
Gender	Frequency	BMI						Total
		<-3 SD	<-2 SD	<-1 SD	<0 SD	<1 SD	<2 SD	
BOY	Count	0	139	116	33	7	5	300
	% of Total	0.0%	23.2%	19.3%	5.5%	1.2%	0.8%	50.0%
GIRL	Count	13	40	71	64	89	23	300
	% of Total	2.2%	6.7%	11%	10.7%	14.8%	3.8%	50.0%
Total	Count	13	179	187	97	96	28	600
	% of Total	2.2%	29.8%	30.3%	16.2%	16.0%	4.7%	100.0 %

The above table 1.3 compares the BMI of school going boys and girls. It was found that majority of boys (23.2%) were underweight where as majority of girls were overweight (14.8%). Only about 5.5% boys and 10.7% girls were of medium or ideal weight. About 19.3% boys and 11% girls were underweight and 0.8% boys and 3.8% girls were obese and only 2.2% of girls were highly underweight.

In the study conducted by **Amruth M et al.**, similar findings were observed in which the prevalence of thinness was 26.5%. It was more among boys (30.8%) than girls (21.8%). In contrast to this National Canadian data (2004–2013) consistently observed a higher prevalence of obesity in boys compared with girls aged 3–19.

A study conducted by **Fazili A et al.**, also assessed the nutritional status of school-age children of 5-14 years in a rural health block of North India (Kashmir) using the WHO Z-Score System. Study results showed that the overall prevalence of underweight is 11.1%, stunting is 9.25% and wasting is 12.3%.

A study was done by **Navaneethan P et al.**, among 806 school-going students of Vellore, Tamil Nadu belonging to age group 11-18 years, showed that 83% of students were underweight for their age as per WHO's international standards. Only 16% of the students were in the normal range (BMI 18.5-24.9), and of the rest, 0.39% and 0.06% were in the BMI range of 25-29.9 (overweight) and 30-35.9 (obese) respectively.

Table 1.4: BMI across age of school going children (7-9 years)

AGE * BMI Cross tabulation								
AGE		BMI						Total
		<-1 SD	<-2 SD	<-3 SD	<0 SD	<1 SD	<2 SD	
7	Count	3	110	146	8	0	0	267
	% of Total	0.5%	18.3%	24%	1.3%	0.0%	0.0%	44.5%
8	Count	10	21	25	30	9	0	95
	% of Total	1.7%	3.5%	4.2%	5.0%	1.5%	0.0%	15.8%
9	Count	0	48	16	59	87	28	238
	% of Total	0.0%	8.0%	2.7%	9.8%	14.5%	4.7%	39.7%
Total	Count	13	179	187	97	96	28	600
	% of Total	2.2%	29.8%	31.1%	16.2%	16.0%	4.7%	100.0%

The table 1.4 shows the BMI of school children across age of 7- 9 years. Majority of student of age 7 were underweight including 24% mild underweight, 18.3% moderate underweight and 0.5% severe underweight. Similarly students of age 8 include both underweight (9.4%) and overweight student (1.5%) where as only 5% student were medium weight prevalence. In contrast to this majority of student of age 9 were overweight (14%) and few were also obese (4.7%).

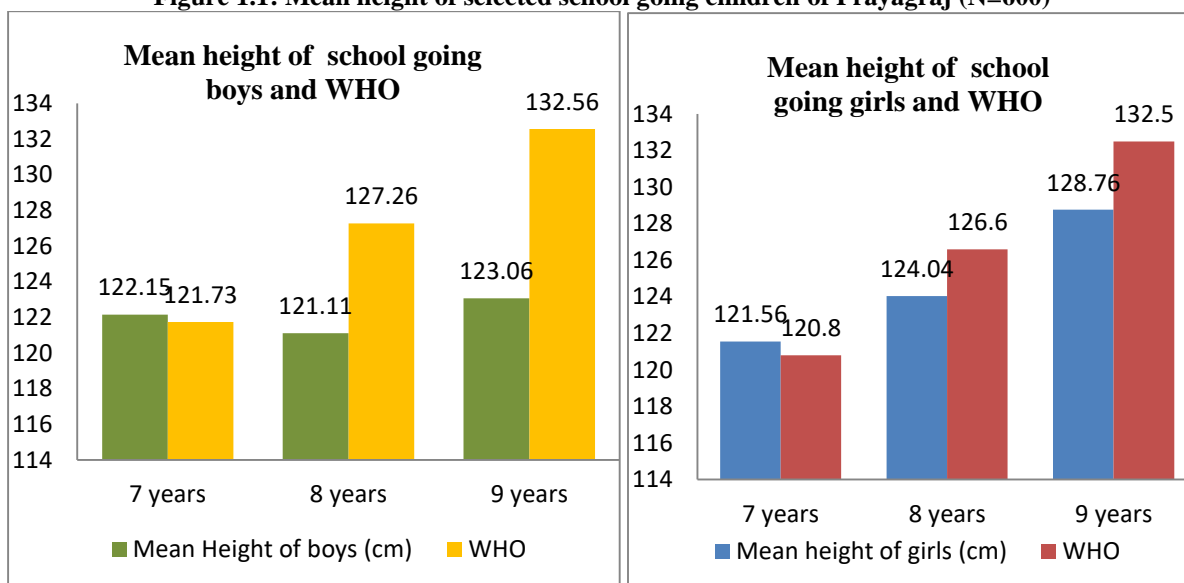
In a study, **Whitaker et al.**, reported that the prevalence of obesity was 13% at 9 years and dropped to 9% at 14 years and then increase again. **Ranjani et al.**, found that prevalence of obesity in under-fives was less than 2% across India. In children > 5 years, it varied from 2 to 8%. Overweight rates were about 2 times higher and were higher in North and East India than in South India. Among adolescents, the overall prevalence of overweight and obesity ranged between 3 and 24.7% and 1.5 – 28% respectively.

Comparison of mean height of the selected school going children

Table 1.5: Mean Height of selected school going children of Prayagraj (N=600)

GENDER	Age (years)	Mean Height (cm) ± SD	WHO Standard (cm)	Difference (cm)
BOYS (n=300)	7 years (n=151)	122.15 ± 1.17	121.73	0.42
	8 years (n=46)	121.11 ± 0.79	127.26	-6.15
	9 years (n=103)	123.06 ± 2.97	132.56	-9.5
GIRLS (n=300)	7 years (n=116)	121.56 ± 0.94	120.80	0.76
	8 years (n=49)	124.04 ± 2.01	126.60	-2.56
	9 years (n=135)	128.79 ± 1.77	132.50	-3.71

Figure 1.1: Mean height of selected school going children of Prayagraj (N=600)



Comparison of the mean height of the children with the WHO standard is given in table 1.5 which shows mean height of boys (7-9 years) was less than the reference and boys of 7-9 years were also short. Among both the age groups mean values were shorter when compared to their respective standards. Boys of age group 8 and 9 years were shortest for their respective standards followed by girls of same age group respectively.

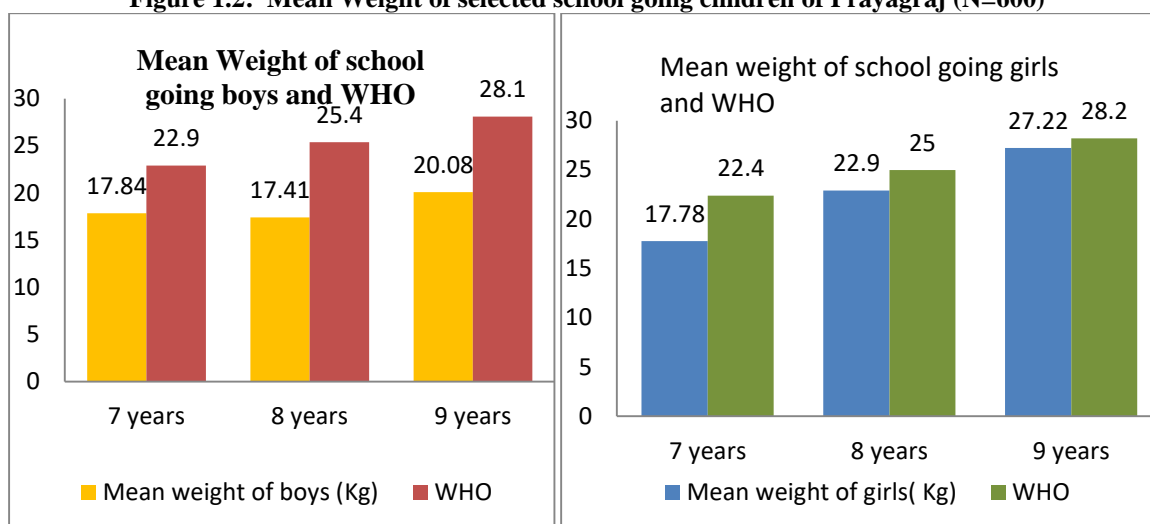
In a study done by **Y. Bogale et al.**, prevalence of stunting was 57%, about, 3.5% were severely stunted, 27.3% moderately stunted and 26.4% mildly stunted, and the mean (SD) was $-1.1 (\pm 1.2)$. About 7 (1.1%) boys and 15 (2.4%) girls were severely stunted. Age groups 10–12 years had significantly higher rate of stunting than others. Age (AOR = 1.7, 95% CI = 1.1–2.6), big family size (AOR = 4.6, 95% CI = 2.2–9.5) and field disposal of wastes (AOR = 2.7, 95% CI = 1.2–5.8) were factors significantly associated with stunting.

Comparison of mean weight of the selected school going children

Table 1.6. Mean Weight of selected school going children of Prayagraj (N=600)

GENDER	Age in years	Mean Weight (Kg) ± SD	WHO Standard (kg)	Difference (kg)
BOYS (n=300)	7 years (n=151)	17.84 ± 1.00	22.90	-5.06
	8 years (n=46)	17.41 ± 0.88	25.40	-7.99
	9 years (n=103)	20.08 ± 3.29	28.10	-8.02
GIRLS (n=300)	7 years (n=116)	17.78 ± 1.13	22.40	-4.62
	8 years (n=49)	22.90 ± 1.74	25.00	-2.1
	9 years (n=135)	27.22±1.38	28.20	-0.98

Figure 1.2: Mean Weight of selected school going children of Prayagraj (N=600)



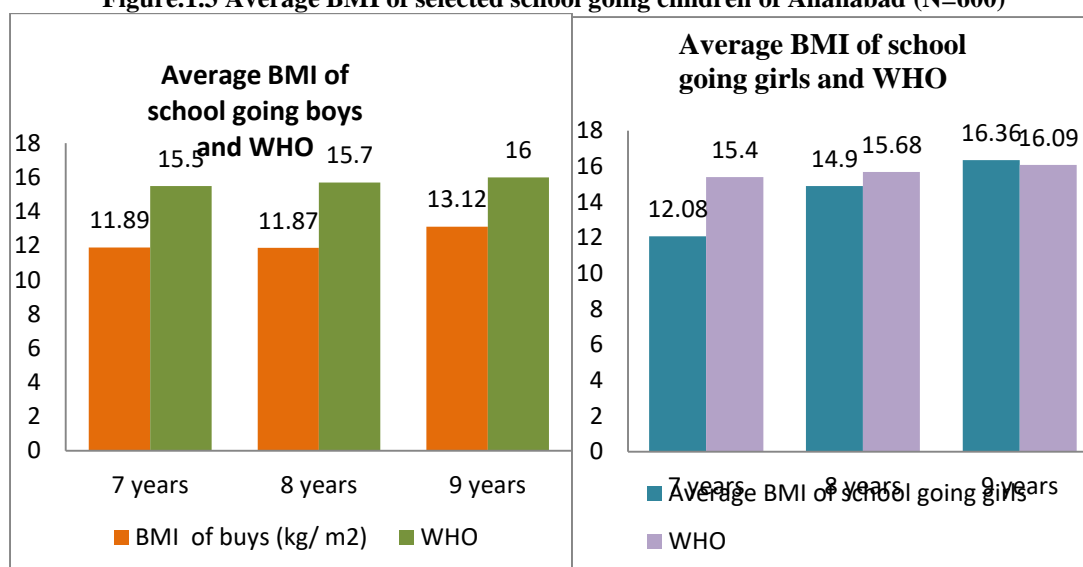
The mean weight of the selected school going children is compared with the WHO standards (Table 1.6). As given in figure 1.2, the observed mean weight of boys and girls was below the WHO standard for the age group of 7 years. Similar trend was found among the children of age group of 8 and 9 years, where the observed mean weight of boys and girls was low as compared to their respective standard. It is to be noted that both boys and girls belonging to the age group of 7 and 8 years were lighter as compared to that of 9 years which indicates constant deprivation of adequate nutrition, infections and related morbidities which persist and cannot meet the increased nutritional requirements as the body grows. In order to perceive a comparative view, the selected children of the present study were compared to the above reference (Table 1.6) and it was found that all were below standards. Similar to the findings a study done by **M Premanath *et al.*, in 2010**, the prevalence of underweight are found to be 17.2%, overweight 8.5% and obesity 3.4% in the study population.

Comparison of average BMI of the selected school going children

Table 1.7: BMI of selected school going children of Allahabad (N=600)

GENDER	Age in years	Mean BMI (Kg/m ²) ± SD	WHO Standard (Kg/m ²)	Difference (Kg/m ²)
BOYS (n=300)	7 years (n=151)	11.89 ± 0.62	15.50	-3.61
	8 years (n=46)	11.87 ± 0.54	15.70	-3.83
	9 years (n=103)	13.12 ± 1.53	16.00	-2.88
GIRLS (n=300)	7 years (n=116)	12.08 ± 0.68	15.40	-3.32
	8 years (n=49)	14.90 ± 0.89	15.68	-0.78
	9 years (n=135)	16.36 ± 0.60	16.09	0.27

Figure.1.3 Average BMI of selected school going children of Allahabad (N=600)



Body Mass Index (BMI) of selected children and its comparison with WHO standard is presented in table 1.7 and figure 1.3. BMI of boys and girls of all the age groups (7 to 9 years) was less than WHO standards except 9 years of age girls. BMI was least for the boys 7 years; followed by boys of 8 years; girls of 7 years and lastly girls of 8 years respectively.

A study carried out in Bengaluru by **Sunil Kumar *et al.***, on school-based obesity prevalence, documented that prevalence of overweight and obesity among school children was 7.09% and 4.08%. Also in a study conducted by **Ramesh (2010)** among high school students of Trivandrum city, Kerala, reported that the prevalence of overweight was 12% and obesity was 6.3%. **Shashidhar *et al.*** reported in a study that 9.9% overweight and 4.8% obesity among school children in Mangalore, South Karnataka.

IV. CONCLUSION

Various literatures and studies are available on Growth Parameters of School Age Children. It is seen from that there is significant disparity in anthropometric parameters of children belonging to different social economical group and different culture. Also we know that growth of an individual, besides genetic factors, is affected by different environmental, economical, cultural and nutritional factors. Creating awareness among school children and their parents about their physical growth and physical health and be improved it by providing a proper care and nutrition to the children right from early childhood period. There is also an urgent need to understand and tackle the problem regarding the underweight and malnutrition of the children. In the present study the growth pattern of school children of Prayagraj has been studied. The differences noticed in the growth parameters between the girl and boys and their age might be due to the nutrition intake and their socio-economic status. However more growth studies with larger sample size are required to establish it.

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