

Anthropometric estimates of nutritional status of school going children of Sri Muktsar Sahib (Punjab) India

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Citation: Singh AP and Sekhon J. 2015. Anthropometric estimates of nutritional status of school going children of Sri Muktsar Sahib (Punjab) India. Human Biology Review, 4 (1), 74-83.

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ABSTRACT

A school based cross sectional study to assess the nutritional status was conducted on total of 863 children (495 boys + 368 girls) ranging in age from 6 to 15 years and were measured for weight and height. Body Mass Index was calculated and data was classified to the different grades of nutritional status using BMI for age percentiles. Gross body measurements shows increasing trend with advancing age irrespective of the gender variations. In boys, from 6 to 15 years mean weight, height and BMI ranging between 20.9 to 53.9 kg, 116.9 to 164.8 cms and 15.2 to 19.7 kg/m² respectively. In girls, from 6 to 15 years mean weight, height and BMI ranging between 19.1 to 49.1 kg, 115.8 to 157.7 cms and 14.1 to 19.6 kg/m² respectively. Prevalence of malnutrition is more than the overweight and obesity in both girls and boys.

Key Words Height, Weight, Body Mass Index, School Children, Nutritional Status

INTRODUCTION

Today the whole world is fully trapped with wireless and web technologies. The e-modernization has brought the entire world in our small fist but on the same way it is mutating the health status of the human race. As the child takes birth and start growing, he or she has to struggle hard with the increasing environmental pollution, unbalanced dietary conditions, family stresses etc. We are busy

with unfolding every single secret of origin of life but still keeping ourselves blind over various health issues that could directly affect the strength of the our nations “ The Child Health”.

Health of every child reflects the status of that particular nation where he or she lives. The most important segment of our society are the school going children whose nutritional status is a good indicator of the health status (**Bhargava, 1999**) and represents a general health status of a community and the nation as a whole (**Vashisht et al.2005**). Now a day’s “*kinanthropometry*” is one of the emerging techniques in the field of clinical sciences and is known to be a reliable method to assess the nutritional status of children (**Bhasin et al.1990, Bisai et al.2008**).

Anthropometry measures body mass and fractionalize its various components particularly the bone, muscle and fat compartments and provides a semi-quantitative estimates and provide information regarding the nutritional status (**Ahmed et al.2000**). Growth monitoring by anthropometric measurement during childhood and adolescent period is an important health indicator and also a predictor of various morbidities in the community. Most of the attempts of generating anthropometric profile have so far focused on pre-school children and a very few have dealt with the school going and adolescent age groups (**Qumra et al.1990**).

Children are the wealth of any country. Special attention should be paid to meet the needs of this group, constituting one fifth of the country’s population (**Khader, 1997**). The physical growth of children is reflected by different anthropometric measurements especially weight and height. The physical dimensions of the body are much influenced by nutrition in growing period of school age. Poor health and nutritional status will affect work capacity as well as cognitive functions. And it is this age group that is a dynamic period of growth and development as children undergo physical, mental, emotional and social changes. Hence, it is necessary to assess the nutritional status of this demographic group.

MATERIAL AND METHODS:

A school based cross-sectional study was conducted on total of 863 children out of which 495 were boys and 368 were girls ranging in the age from 6 to 15 years. Data has been collected from the DAV Public School, Sri Muktsar Sahib (Punjab), India during the academic session 2012-2013. All the students were measured for gross body measurements i.e. height (cm) and weight (kg) following the standard techniques given by International Society for the Advancement of Kinanthropometry (**Marfel et al.2004**). Age of each subject is verified from their date of birth certificates available in

the school records. Height of all the children was measured with anthropometric rod whose accuracy was 0.1cm and weight of the children was measured using weighing machine. The subjects were asked to remove their foot wears prior to the Gross Body Measurements. Human ethical guidelines of Helsinki Declaration (**Touitou et al.2004**) was followed for the procedure and protocol of the study. The collected data of the school children were analyzed using the Microsoft Excel software and is presented in the manuscript as a tables for Mean \pm SD values each parameter. Classification of BMI for age percentiles for both boys and girls has been done using the growth standards developed by the National Center for Health Statistics in collaborations with the National Center for Chronic Disease Prevention and health promotion 2000. Body Mass Index was calculated as weight (in kg) divided by height (in m squared). Healthy children have a BMI percentile ranging between 5th percentile to 85th percentile. The children whose weight were more than 85th to less than the 95th percentile were considered as overweight and obese who were equal to or greater than the 95th percentile (**WHO,2000**)

RESULTS:

The trends in mean and standard deviation of weight, height and body mass index of boys and girls are given in Table 1 and Table 2 respectively. It is found that the mean height increases with advancing age irrespective of the gender variations. On an average, the boys were 116.9 cm tall at the age of six years and 164.8 cm at the age of fifteen years whereas the average height of girls was 115.8 cm at the age of six years and 157.7cm at the age of fifteen years. Thus it has been observed that height of the boys under the all age groups except 7th and 12th years age group increased slightly better than girls in the same age groups whereas girls under the age of 7th and 12th years was better than boys.

The average weight of boys at the age of 6 years was 20.9kg and 53.9kg at the age of 15years. There was substantial gain of 33.0kg in their weight during a span of 10 years. In case of girls, the mean value of weight was 19.1kg at the age of 6 years and 49.1kg at the age of 15 years and shows substantial gain of 30.0kg during the span of 10 years. On average boys dominant over the girls in their body weight.

The mean values of BMI ranged from 15.2kg/m² to 19.7 kg/m² in boys and 14.1kg/m² to 19.6kg/m² in girls. When BMI for age was used (**Table 3 & Table 4**) maximum number of boys with healthy weight (77.5%) is found at the age group of 15 years and maximum healthy weight (90.6%) girls are

found at the age group of 14 years. Prevalence of overweight and obese is higher in case of boys as compared to girls. Maximum number of underweight boys are found at the age group of 7years (25.0%) and underweight girls are maximum at the age group of 6years (31.4%) in comparison to all other age groups.

Table 1: Trends in Mean and Standard Deviation (SD) of weight (kg), height (cm) and body mass index (BMI)(kg/m²) of school boys.

Age in years	Number of subjects (n)	Weight (kg)	Height (cms)	BMI (kg/m ²)
6	38	20.9±3.97	116.9±5.33	15.2±2.39
7	48	23.1±4.53	121.2±6.07	15.7±2.41
8	52	28.1±7.90	129.3±6.89	16.5±3.18
9	50	29.2±6.97	132.2±7.08	16.5±2.68
10	44	35.6±10.64	136.8±6.46	18.8±4.68
11	68	39.2±8.86	143.8±7.77	18.8±3.47
12	49	39.8±9.46	148.5±7.16	17.9±3.42
13	48	46.1±9.58	155.8±8.93	18.9±3.17
14	58	52.1±14.16	162.6±7.18	19.5±4.39
15	40	53.9±10.70	164.8±6.76	19.7±3.12

Table 2: Trends in Mean and Standard Deviation (SD) of weight (kg), height (cm) and body mass index (BMI)(kg/m²) of school girls.

Age in years	Number of subjects (n)	Weight (kg)	Height (cms)	BMI (kg/m ²)
6	35	19.1±3.25	115.8±5.71	14.1±1.50
7	34	23.9±7.15	122.6±6.47	15.7±3.67
8	20	26.0±7.21	128.4±7.66	15.5±2.73
9	46	27.5±7.11	129.8±6.51	16.1±2.70
10	31	33.2±11.01	135.4±6.32	17.9±5.07
11	42	36.8±9.27	142.0±7.59	18.0±3.72
12	39	41.6±9.62	149.3±6.11	18.5±3.63
13	48	42.7±8.62	152.1±8.22	18.3±2.84
14	43	48.0±10.01	156.5±6.97	19.5±3.13
15	30	49.1±11.57	157.7±8.43	19.6±3.70

DISCUSSION

Gross body measurements such that height and weight gives an important indication about the health status of the children and are good indicators of a nation's progress in socio-economic terms (Tanner, 1994). In the present study overall boys are found to be taller and heavier with advancing age groups as compared to girls (Table 1 and Table 2).

Table 3: WHO classification of Body Mass Index (BMI) for age of school boys.

Age in years	Number of subjects	Underweight (BMI for age < 5 th percentile)	Healthy weight (BMI for age 5 th to <85 th percentile)	Overweight (BMI for age 85 th to <95 th percentile)	Obese (BMI for age ≥95 th percentile)
6	38	08 (21.0%)	25(65.7%)	02(05.2%)	03(07.8%)
7	48	12 (25.0%)	29(60.4%)	02(04.1%)	05(10.4%)
8	52	10 (19.2%)	29(55.7%)	06(11.5%)	07(13.4%)
9	50	06 (12.0%)	33(66.0%)	07(14.0%)	04(08.0%)
10	44	05 (11.3%)	26(59.0%)	07(15.9%)	06(13.6%)
11	68	05 (07.3%)	38(55.8%)	17(25.0%)	08(11.7%)
12	49	11 (22.4%)	33(67.3%)	02(04.0%)	03(06.1%)
13	48	05 (10.4%)	34(70.8%)	05(10.4%)	04(08.3%)
14	58	08 (13.7%)	36(62.0%)	11(18.9%)	03(05.1%)
15	40	04 (10.0%)	31(77.5%)	04(10.0%)	01(02.5%)

Table 4: WHO classification of Body Mass Index (BMI) for age of school girls.

Age in years	Number of subjects	Underweight (BMI for age < 5 th percentile)	Healthy weight (BMI for age 5 th to <85 th percentile)	Overweight (BMI for age 85 th to <95 th percentile)	Obese (BMI for age ≥95 th percentile)
6	35	11(31.4%)	23(65.7%)	Nil	01(02.8%)
7	34	09(26.4%)	19(55.8%)	Nil	06(17.6%)
8	20	04(20.0%)	13(65.0%)	01(05.0%)	02(10.0%)
9	46	06(13.0%)	33(71.7%)	04(08.6%)	03(06.5%)
10	31	05(16.1%)	20(64.5%)	Nil	06(19.3%)
11	42	07(16.6%)	29(69.0%)	03(07.1%)	03(07.1%)
12	39	05(12.8%)	26(66.6%)	04(10.2%)	04(10.2%)
13	48	06(12.5%)	37(77.0%)	05(10.4%)	Nil
14	43	02(04.6%)	39(90.6%)	Nil	02(04.6%)
15	30	04(13.3%)	24(80.0%)	01(03.3%)	01(03.3%)

In general physical growth of boys and girls follow the same trend during pre-adolescent period and after this girls are ahead of boys in maturity and growth. During 10th to 12th year, girls are characterized by a more intense development, whereas in boys this occurs between 12th and 14th year which is marked by the adolescent spurt, an important feature of human growth (Ravanshad et al.,1998, Stefancic & Tomazo-Runik, 1998). Similarly supporting the above facts, in the present study at the age group of 12 years mean height and weight of the girls was higher than boys of the same age group and remarkable increases in the both parameters for boys between 12 years onwards indicating the pubertal or adolescent growth spurt respectively.

Table 5: Comparison of gross body measurements of school boys of present study with urban school boys of Raichur (Karnataka).

Age (yrs)	Present Study		Age (yrs)	Urban School Boys of Karnataka (Bharti et al.2005)	
	Height (cm)	Weight (kg)		Height (cm)	Weight (kg)
6	116.9	20.9	5-6	111.3	17.3
7	121.2	23.1	7+	118.7	19.3
8	129.3	28.1	8+	123.8	21.1
9	132.2	29.2	9+	125.7	21.1
10	136.8	35.6	10+	133.7	26.5
11	143.8	39.2	11+	134.6	25.9
12	148.5	39.8	12-13	141.4	29.6
13	155.8	46.1			
14	162.6	52.1	-	-	-
15	164.8	53.9	-	-	-

Table 6: Comparison of gross body measurements of school girls of present study with urban school girls of Raichur (Karnataka).

Age (yrs)	Present Study		Age (yrs)	Urban School Girls of Karnataka (Bharti et al.2005)	
	Height (cm)	Weight (kg)		Height (cm)	Weight (kg)
6	115.8	19.1	5-6	108.6	15.5
7	122.6	23.9	7+	114.5	16.8
8	128.4	26.0	8+	123.3	21.2
9	129.8	27.5	9+	127.5	21.3
10	135.4	33.2	10+	122.4	22.8
11	142.0	36.8	11+	137.3	25.1
12	149.3	41.6	12-13	138.8	27.8
13	152.1	42.7			
14	156.5	48.0	-	-	-
15	157.7	49.1	-	-	-

Unfortunately, malnutrition continues to be a major public health problem in most developing countries, including our own and Nutritional deficiency diseases account for a considerable increased proportion of hospital admissions and the underlying state of malnutrition modifies adversely the course of many non-nutritional diseases (ICMR, 1984; Gopalan, 1992). Body Mass Index (BMI) is an inexpensive and non-invasive measure that has been extensively utilized to assess nutritional status (WHO, 1995). In India, there is a limited research studies have been carried out to study the overweight/obesity in school children and majority of them which have been carried out belongs to metropolitan cities in high income schools (Subramanyam et al., 2003; Kaur et al., 2005; Sidhu et al., 2005; Kaneria et al., 2006; Laxmaiah et al., 2007; Aggarwal et al., 2008). In present study maximum number of the subjects from both sexes is found to be under the healthy weight category followed by underweight and overweight/obese (Table 3 & Table 4). Malnutrition rates are more than the overweight or obese in both girls and boys. Possible cause for the malnutrition in the children might be due to busy professional status of parents who unable to concentrate properly on balanced nutritional diet for their children. Moreover school work burden and competitiveness also plays important role in non management of food habits of the children or may be due to socio-economic conditions of the family. Under-nutrition or malnutrition in children made them prone to the severe deficiency disorders such that anemia, weak eye sightedness and various vitamin deficiency disorders (Saraswathi et al., 2011).

As prevalence of overweight and childhood obesity is also observed in the present study. Boys are dominating over the girls. Now a day's children are very much fond of eating junk foods and playing computer or mobile oriented games or watching television etc. The sedentary life style decreased the sports participation and other physical activities which play a big role in raising the graph of obesity in childhood and makes them physically inactive which prove to be fatal for their health in the later years such that development of heart disease and other chronic diseases including hyperlipidaemia, hyperinsulinaemia, hypertension and early atherosclerosis (Klesges et al., 1993; Saraswathi et al., 2011; Sil et al., 2012; Cole et al., 2000). Comparing the present study (Table 5 & 6) with the urban school children of Raichur (Karnataka) (Bharti et al., 2005) it has been observed that school going boys and girls of Sri Muktsar Sahib (Punjab) are taller and heavier than the urban school boys and girls of Raichur (Karnataka). The substantial increase in weight and height is also more in both the sexes of Sri Muktsar Sahib (Punjab) in comparison to Raichur (Karnataka) although the trend of

increase in the gross body measurements with advancing age has been observed in both boys and girls of Raichur (Karnataka). Differences existed in gross body measurements between the two states school children may be attributed to the nutritional status, genetic variations or socio-economic status of the respective population (**Khader, 1997**).

Conclusion:

Malnutrition and Childhood obesity is a serious problem in developed as well as developing countries. Concluding the results of the present study there is need of a serious attention towards the health of school children. Every school should organize health related awareness programs for both parents and children. Regular monthly health monitoring camps should be arranged and the children diagnosed with malnutrition and overweight should be counsel regarding the improvement in their health status and take part in the marathon of nutritional status improvement.

Acknowledgement

We thank the management and principal of DAV Public School, Sri Muktsar Sahib (Punjab), India for their support and co-operation in conducting this study at their campus.

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