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Growth Patterns of School Children of South Guwahati, Kamrup District of Assam

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Abstract

The result of a cross-sectional study of growth in height, horizontal circumference of head girth of bicep, girth of chest, girth of calf and weight of children of both sexes (n=1604 under 10 years of age of Guwahati city are presented. The children are divided into Assamese, Bengali and Hindi speaking groups. The study reveals that the Assamese children are the tallest and the heaviest and the Bengali children the shortest and the lightest of all in almost all the ages. In other characters also the Assamese children show the highest and the Bengali children the lowest mean values in most of the ages.

Key Words: *School Children, South Guwahati, Kamrup District, Assam.*

Introduction

Growth is one of the best indices of child health and a continuous monitoring of the growth and development of children in under and over nourished population, is, or should be a major concern of all public health authorities and government (Tanner, 1967). Anthropometry (The use of body measurements to assess nutritional status is a practical and immediately applicable technique for assessing children's development patterns during the first year of life. An evaluation of their growth also provides useful weights into the nutrition and health situation of entire population group (Gorstein et. al. 1986.)

The Indian Council of Medical Research conducted a national survey in 1972 on different aspects of growth and physical development of Indian children. But the children of North-East India were not included in that study. Consequently, in any search for the data on growth of the children of North-East India, one has to depend upon a few localized studies. These local level studies are also very limited in

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this part of India more particularly in the urban areas. The studies of Das & Das (1969-71) and Das and Choudhury (1982) on the Assamese children of Guwahati city and that of Das (1987) on the Assamese and Rajasthani children of Dibrugarh are the only available growth studies conducted on urban children in this region. Another studies like Choudhury & Begum (2001) Baruah (2006) on the growth studies of Assamese & other group are countable. In the background of the above situation, an anthropometric survey of the children of Guwahati city under 10 years of age was carried out with a view to study the growth pattern and to assess their nutritional status.

Material and Method

The present cross-sectional study is based on the data collected on 1604 school going children of Guwahati city. The data were collected in the month of July and August, 2013. The girls numbering 759 and boys 845 were from the schools of various localities (Jalukbari, Maligaon, Pandu, Bharalumukh, of South Guwahati city. The children from 4 to 10 years of age were taken into consideration. They were later divided into Assamese, Bengali and Hindi speaking group. The last group includes children belonging to different communities from Rajasthan, Panjab, Bihar and Uttar Pradesh.

Caution has been maintained while recording the age of each student. Age of each and every child has been recorded by consulting the school records and verifying the birth certificates. The numbers of children of each of the groups against their ages are given below:

Age in years	Assamese		Bengali		Hindi Speakers	
	Nos of Boys	Nos. of Girls	Nos. of Boys	Nos. of girls	Nos. of boys	Nos. of girls
4	34	20	30	22	37	18
5	41	24	32	24	42	31
6	44	49	32	41	36	37
7	48	34	36	43	43	48
8	54	29	48	31	39	41
9	41	33	36	40	33	39
10	31	35	61	46	49	54

The following measurements were taken on the children: stature horizontal circumference of head, girth of bicep, chest girth, girth of calf and weight.

Discussion

A close look into the above analysis reveals the fact that the Assamese children are the tallest and the heaviest of all the children of Guwahati city almost at all ages. The differences between the Assamese and the Bengali children in respect of height and weight are more marked than the differences between the Assamese and the Hindi speaking children. In other characters also the Assamese boys show higher mean values than the boys of other groups almost at all ages. The Bengali boys, on the other hand, show the lower mean values of all the boys almost at all ages. The differences in growth between the different groups are not so distinct in case of girls. Though growth is determined by the pre-established constitutional hereditary factors, it is influenced by the environment factors, like climate, diet, living conditions, etc. (Tanner, 1978; Frisancho et. al., 1973) Dreizen et. al. (1967) and Malcolm (1970) suggested that nutritional status is clearly associated with growth differences among genetically related children. Johnstone et.al. (1976) opined that variation in growth in height and weight during the early ages among the children of diverse ethnic groups is almost completely regulated by the environment.

Against these perspectives we can assume that the growth differences between children of the different groups of the present study are due mainly to their environmental differences. But the entire present samples are drawn from the Guwahati city and as such they are living under the same geographical and climatic condition. Apparently the socio-economic conditions of the different groups also do not show marked differences. Therefore, it is difficult to explain the causes of the differences in growth between the different groups.

Different population groups living under the same geographical environment may possess' apparently similar economic conditions, but they may vary in respect of their dietary habit and also in their life style which is determined by one's own culture. A thorough study of the different aspects of the socio-cultural life of all the groups of people under study is expected to explain the causes of their variation in growth. Though we do not have, at present, sufficient data on different aspects of the socio-cultural life of the people, on the basis of our empirical

observations perhaps we can make an attempt to examine those aspects of socio-cultural life which have direct or indirect relations with the nutritional status of the people.

Under the same socio-economic condition, two cultural groups may utilize their income in a completely different way. The budgetary distribution pattern of a group of people is determined mostly by their cultural needs. It is observed that the migrant people try to save more for their future. The saving might be a necessity for their new permanent establishment. Moreover, dowry system, prevalent among different communities of India including the Bengalis and the Hindi speaking peoples of the north, also demands sizeable saving. The dowry system is not prevalent among the Assamese people and the parents need not save at least for that purpose saving is to be done at the cost of the standard of living. It demands the sacrifice of some of the material needs of the people. These may include some essential food items. In that case most of the children at their initial formation of growth are likely to suffer from malnutrition. These might be some of the cause for the shorter stature and lighter weight of the Bengali and Hindi speaking children than the Assamese children.

The Bengali children are the shortest and the lightest of all the children covered under present study. The Bengali boys covered in another study (Dutta Banik et.al., 1973) are found to be distinctly shorter and lighter than the boys from well-off families residing in Delhi. Raghaban et. al. (1971) also has show that the Bengali boys are shorter and lighter than the Indian boys of well-off families. An explanation for the shorter stature and lighter weight of the Bengali boys could be sought in the realm of their dietary habit particularly the method of preparing food, spicy, fried and overcooked food, characteristic of Bengali cuisine, might be responsible for low nutritive value of their food. A detailed study of the dietary habit of all the communities might reveal, in addition to food processing, differences in many more dietary elements which have direct bearing upon the variable growth pattern of the children. Such a study is necessary to arrive at definite conclusion.

From the analysis of our data it is also observed that the differences in growth between the girls of different groups of people are not that distinct as are between the boys. It might be because of the fact that girls apparently are less easily thrown off their growth curves by adverse circumstances than the boys (Tanner, 1978). In the Oxford Child Health Survey also it was found that poor home conditions produced a greater effect on boys than girls (Acheson and Hewitt, 1954).

It is also revealed that in all the groups, the boys are found to be taller and heavier than the girls. In other characters also the boys show the higher mean values than the girls, However, in some characters particularly in stature, the girls' are seen to supersede the boys at the age of 9 or 10 years. As the adolescent spurt begins, girls come to be temporarily larger in practically all dimensions. This situation last till boys' spurt begins to take effect and girls' to die away (Tanner, 1978). Probably adolescent spurt of the girls of the present study begins at the age of 9 or 10 years because of which the girls are seen to supersede the boys.

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RESULT

The data of different somatometric measurements with reference to their mean values, standard deviations and the rate of growth are presented in tables 1 to 6.

Table-1
Anthropometric measurements of Guwahati Children (HE/GHT) (cm.)

Age (Years)	Assamese		Bengali		Hindi speaking		All Communities	
	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum
BOYS								
4	105.24±7.03	8.30	104.32±5.27	2.82	105.52±5.03	4.43	105.07±5.77	5.38
5	113.54±6.82	0.27	107.14±4.98	3.51	109.95±5.90	4.65	110.45±5.97	2.71
6	113.81±5.58	5.54	110.65±5.15	6.41	114.60±5.23	4.13	113.16±5.54	5.33
7	119.35±7.37	7.53	117.06±5.54	0.99	118.73±7.60	6.74	118.49±7.39	4.99
8	126.88±5.71	5.05	118.05±6.97	8.52	125.47±6.65	4.53	123.48±6.39	6.12
9	131.93±4.96	3.29	126.57±5.59	3.34	130.0±7.33	4.59	129.60±5.88	3.10
10	135.22±6.90		129.91±6.22		134.59±5.44		132.70±6.09	
GIRLS								
4	104.55±6.66	4.35	102.19±5.61	5.93	102.51±5.03	5.54	103.07±5.79	5.26
5	108.90±5.40	4.43	108.12±5.32	4.39	108.05±5.19	3.71	108.33±5.29	4.28
6	113.33±5.51	4.95	112.51±5.21	2.61	111.76±5.19	5.55	112.61±55.32	4.21
7	118.28±6.71	5.60	115.12±4.45	5.62	117.31±6.26	6.87	116.82±5.16	6.22
8	123.88±10.74	7.55	120.74±5.72	2.95	124.18±6.87	0.49	123.04±7.63	3.02
9	131.43±5.20	4.12	123.69±5.88	9.00	124.67±7.08	5.84	126.06±6.25	6.50
10	135.55±7.39		132.69±6.73		130.51±8.13		132.56±7.46	

It is revealed from table 1 and 1a and 1b that there is a continuous increase in height from 4 years onwards. The increment is however, not uniform throughout the age period. Both the Assamese and Hindi speaking boys are taller than the respective girls at all ages except at 10 years when the Assamese girls are slightly taller than the Assamese boys. The sexual dimorphism in height is not well defined among the Bengali children. The Assamese children are the tallest of all the children at all ages except at 4 and 8 years. At the age of 4 years the Hindi speaking boys are slightly taller than the Assamese boys and at 8 years the Hindi speaking girls are taller than the Assamese girls. The Bengali girls are seen to be taller than the Hindi speaking girls at the age of 5, 6 and 10 years.

Table-2 : Anthropometric measurements of Guwahati Children (Horizontal Circumference of Head) (cm.)

Age (Years)	Assamese		Bengali		Hindi speaking		All Communities	
	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum
BOYS								
4	50.74±1.29	0.64	50.24±1.13	0.24	50.94±1.34	0.06	50.66±1.26	0.33
5	51.38±1.41	0.17	50.48±1.56	0.58	51.00±1.34	0.10	50.99±1.43	0.28
6	51.55±1.75	0.32	51.06±1.21	0.49	51.10±1.31	0.17	51.27±1.45	0.31
7	51.87±1.58	0.32	51.55±1.40	0.24	51.27±1.20	0.02	51.58±1.40	0.22
8	52.19±1.57	0.14	51.79±1.39	0.45	51.29±1.87	0.83	51.80±1.59	0.44
9	52.33±1.71	0.13	52.24±1.14	0.05	52.12±1.74	0.15	52.24±1.53	0.08
10	52.46±1.33		52.29±1.34		52.27±1.31		52.32±1.33	
GIRLS								
4	50.35±1.45	0.31	49.75±1.36	0.45	49.81±1.17	0.42	49.97±1.33	0.38
5	50.66±1.19	0.03	50.20±1.24	0.17	50.23±1.60	0.17	50.35±1.19	0.15
6	50.69±1.77	0.06	50.37±1.19	0.09	50.40±1.07	0.63	50.50±1.38	0.26
7	50.75±1.40	0.27	50.46±1.39	0.24	51.03±1.50	0.34	50.76±1.43	0.30
8	51.02±1.41	0.23	50.70±1.33	0.24	51.37±2.44	0.08	51.06±1.80	0.19
9	51.25±1.49	0.26	50.94±1.50	0.76	41.45±1.53	0.25	51.25±1.51	0.40
10	51.51±1.24		51.70±1.27		51.70±1.48		51.65±1.35	

Table 2 shows a continuous but slow increase of horizontal circumference of head throughout all the age levels. It is observed that the boys of all the groups show the higher mean values than the respective girls at all ages except at 8 years when the Hindi speaking girls show the higher mean values than the boys of respective group (fig- 2a and 2b).

The mean values of the horizontal circumference of head of the Assamese boys are the highest of all the children at all age levels except at 4 years when the Hindi speaking boys show the higher mean value in case of girls, the differences between the different groups are not well marked.

Table-3 : Anthropometric measurements of Guwahati Children (Girth of Bicep) (cm.)

Age (Years)	Assamese		Bengali		Hindi speaking		All Communities	
	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum
BOYS								
4	16.38±0.79	0.13	16.06±0.91	0.12	15.96±0.93	0.44	16.13±0.88	0.25
5	16.51±1.45	0.24	16.18±0.88	0.37	16.40±0.95	0.55	16.38±1.11	0.38
6	16.75±0.92	0.34	16.55±0.89	0.36	16.95±1.40	0.10	16.76±1.07	0.27
7	17.09±1.04	0.75	16.91±1.16	0.34	17.05±1.32	0.31	17.03±1.17	0.48
8	17.84±1.48	0.07	17.25±1.16	0.44	17.36±1.69	0.85	17.51±1.43	0.42
9	17.91±1.49	0.57	17.09±1.73	0.40	18.21±1.62	0.08	17.93±1.61	0.32
10	18.48±2.07		18.09±1.50		18.29±1.62		18.25±1.67	
GIRLS								
4	16.15±1.29	0.30	16.11±1.68	0.47	16.07±0.75	0.68	16.11±1.27	0.50
5	16.45±0.78	0.10	16.58±0.92	0.15	16.75±0.88	0.05	16.61±0.86	0.07
6	16.55±1.21	0.11	16.73±1.49	0.15	16.80±1.11	0.40	16.68±1.27	0.26
7	16.66±1.13	0.96	16.88±1.26	0.40	17.20±1.21	0.76	16.94±1.21	0.71
8	17.62±0.98	0.96	17.28±1.31	0.76	17.96±1.25	0.20	17.65±1.19	0.58
9	18.58±1.23	0.44	18.04±1.30	0.97	18.16±1.85	0.70	18.23±1.53	0.83
10	19.42±1.45		19.01±1.88		18.86±2.24		19.06±1.91	

The girth of bicep is seen to increase continuously along with age (Table 3 and Fig.3a and 3b). The Assamese boys show the highest mean value of girth of bicep at all ages except at 6 and 9 years when their mean value are slightly lower than the mean values of the Hindi speaking boys. The Bengali boys, on the other hand, show the lowest mean values at all ages except 4 years when their mean value is slightly higher than that of the Hindi speaking boys. No distinct difference between the girls of the different groups is observed. The mean values of girth of bicep are higher for the Assamese boys than the girl's up to 8 years of age. At 9 and 10 years the girls show the higher mean values. The sex difference is not well defined in case of Bengali and Hindi speaking children.

Table-4 : Anthropometric measurements of Guwahati Children (Chest Girth) (cm.)

Age (Years)	Assamese		Bengali		Hindi speaking		All Communities	
	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum
BOYS								
4	53.90±2.55	1.88	53.42±2.69	0.18	53.71±2.15	0.72	53.69±2.18	1.19
5	55.78±2.52	0.22	53.60±2.24	1.15	54.43±2.18	1.46	54.88±2.32	0.73
6	56.00±2.51	1.12	54.75±2.09	1.41	55.89±3.01	0.80	55.61±2.55	1.09
7	57.12±2.41	2.46	56.16±1.73	0.47	56.69±3.05	1.88	56.70±3.00	1.60
8	59.58±1.63	0.70	56.63±2.63	3.21	58.57±4.20	1.93	58.30±3.45	1.90
9	60.28±2.75	2.72	59.84±5.14	1.34	60.50±5.31	1.07	60.20±4.30	1.52
10	61.00±5.33		61.18±2.93		61.57±3.18		61.72±3.54	
GIRLS								
4	51.55±3.33	0.37	52.09±2.42	0.39	50.36±1.21	1.65	52.21±2.36	1.50
5	51.92±2.19	0.92	52.48±2.03	1.81	54.51±2.53	0.71	53.71±2.27	1.06
6	54.81±1.85	1.67	54.29±3.73	0.47	55.22±2.81	1.71	54.77±2.74	1.14
7	56.51±1.23	2.42	54.76±2.77	1.43	56.93±3.19	2.18	55.91±3.06	2.25
8	58.93±2.57	2.32	56.19±2.95	2.85	59.11±2.60	0.13	58.16±2.60	1.52
9	61.25±2.93	1.60	59.04±3.23	4.85	59.24±4.77	1.29	59.68±3.84	2.50
10	62.85±4.87		63.62±4.56		60.53±5.96		62.18±5.20	

It appears from table 4 and Fig. 4a & 4b that the chest girth of Assamese boys is distinctly the greatest of all the boys at all ages except at 9 years when their mean value is slightly lower than that of the Hindi speaking boys. At 8 years the Bengali boys show slightly higher mean value than the Hindi speaking boys. In other ages their mean values are the lowest of all the boys. The Bengali girls also show the lowest mean values of all the girls except at 10 years when their mean value is the highest. The chest girths of the boys of all the groups are higher than the respective girls at all ages except at 10 years when the Bengali girls show higher mean value.

Table-5 : Anthropometric measurements of Guwahati Children (Girth of Calf) (cm.)

Age (Years)	Assamese		Bengali		Hindi speaking		All Communities	
	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum
BOYS								
4	21.48±0.98	0.92	20.86±1.42	0.75	21.12±1.13	0.76	21.16±1.17	0.83
5	22.40±1.79	0.33	21.61±1.28	0.14	21.88±2.72	0.49	21.99±1.98	0.30
6	22.73±1.34	0.55	21.75±1.35	0.80	22.73±1.36	0.03	22.29±1.35	0.49
7	23.25±1.33	1.02	22.55±1.81	0.58	22.40±1.81	0.95	22.78±1.63	0.36
8	24.30±1.96	0.35	23.13±1.39	0.76	23.35±1.74	1.31	23.64±1.71	0.76
9	24.65±1.46	1.25	23.89±1.86	0.38	24.66±2.47	0.75	24.40±1.89	0.62
10	25.90±2.53		24.27±1.47		25.41±1.85		25.02±1.84	
GIRLS								
4	21.35±1.78	0.47	20.80±2.08	0.48	20.71±0.92	1.02	20.96±1.63	0.67
5	21.82±1.30	0.39	21.28±1.75	0.13	21.73±1.64	0.17	21.63±1.57	0.23
6	22.21±1.60	0.50	21.41±1.65	0.83	21.90±1.36	0.55	21.86±1.54	0.59
7	22.71±1.19	0.98	22.24±1.77	0.86	22.45±1.46	0.73	22.45±1.49	0.85
8	23.69±1.33	0.67	23.10±1.47	0.69	23.18±1.54	0.83	23.30±1.46	0.73
9	24.36±1.52	0.85	23.79±1.74	1.10	24.01±2.14	0.42	24.03±1.86	0.76
10	25.21±1.59		24.89±1.88		24.43±2.31		24.79±1.98	

It is observed from table 5 and fig 5a & 5b that the Assamese boys show the highest and the Bengali boys show the lowest mean values of girth of calf at all ages except at 9 years when the Assamese and the Hindi speaking boys show almost the same mean values. The same trend is observed in case of girls also.

The Assamese and the Hindi speaking boys show the higher mean value of girth of calf than the respective girls at all ages. The sex difference in case of the Bengali children is not distinct.

Table-6 : Anthropometric measurements of Guwahati Children (Weight) (Kg.)

Age (Years)	Assamese		Bengali		Hindi speaking		All Communities	
	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum	Mean± S. D.	Absolute Growth per annum
BOYS								
4	16.15±1.66	2.13	15.25±1.99	0.33	15.57±1.93	1.98	15.67±1.49	1.59
5	18.28±2.87	0.15	15.58±1.95	1.82	17.55±2.37	2.09	17.26±2.43	1.26
6	18.43±2.51	1.52	17.40±2.05	2.34	19.64±2.60	0.93	18.52±2.41	1.57
7	19.95±2.50	2.87	19.74±3.54	0.73	20.57±2.71	1.25	20.09±2.87	1.65
8	22.82±3.19	0.46	20.47±2.69	3.04	21.82±3.19	3.01	21.74±3.02	2.08
9	23.28±4.41	2.82	23.51±4.88	0.17	24.83±4.57	0.92	23.82±4.61	1.11
10	26.10±5.83		23.68±2.88		25.75±3.50		24.93±3.74	
GIRLS								
4	15.95±2.80	0.50	15.30±3.33	0.75	14.82±1.40	1.41	15.37±2.57	0.87
5	16.45±2.08	1.67	16.05±2.02	1.72	16.23±2.40	0.43	16.24±2.19	1.34
6	18.12±1.75	1.68	17.77±2.14	0.83	16.66±2.35	2.54	17.58±2.05	1.58
7	19.80±2.47	2.27	18.60±2.36	1.70	19.20±2.92	2.08	19.16±2.60	2.05
8	22.07±2.10	1.68	20.30±2.36	1.35	21.28±2.93	1.30	21.21±2.52	1.38
9	23.75±2.61	1.75	21.65±3.16	3.95	22.58±4.08	3.37	22.59±3.43	3.13
10	25.50±3.92		25.60±4.11		25.95±5.94		25.72±4.79	

It is revealed from table 6 and fig. 6a & 6b that the increase of weight, though continuous, is not uniform. The Assamese boys are found to be the heaviest of all the boys almost at all the ages. At 6 year the Assamese boys are lighter than the Hindi speaking boys and at 9 years they are lighter than the Bengali boys. Except at 9 years the Bengali boys are the lightest of all the girls. The Assamese girls are also the heaviest of all the girls except at 10 years. The difference between the Bengali and Hindi speaking girls is not distinct. The boys of all the groups are distinctly heavier than the respective girl's up to 8 years. At 9 years the Assamese boys are slightly lighter than Assamese girls. Both Bengali and Hindi speaking boys are lighter than the respective girls at 10 years.