

Human Growth Studies in Northeast India

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Physical growth in human population is one of the central themes in physical anthropology. The growing interest in this subject has been witnessed by a large number of studies carried out among children of different populations all over the world (Eveleth and Tanner 1990; Roberts 1994). According to Brody (1945), "Growth is biologic synthesis, production of new biochemical units. It is the aspect of development concerned with increase in living substance or protoplasm and includes one or all of these processes: (1) cell multiplication, (2) cell enlargement, (3) incorporation of material from the environment". It may be noted that the terms 'growth' and 'development' are used simultaneously in the study of human growth. Garn (1957) writes, "The terms 'growth' and 'development' refer to the processes common to all living organisms, processes intimately linked in time but partially independent, unquestionably genetically determined, yet uniquely susceptible to environmental modification". So, it is obvious that both the terms are interdependent when one refers growth to all processes pertaining to physical and mental development, or to changes in size and form of organs or individual as a whole.

The relationship between physical anthropology and auxology can be traced back to the works of Franz Boas, who may

be regarded as the pioneer for bringing about the emergence of "modern biological anthropology which utilized the knowledge on growth to understand the ontogenetic changes that took place in human body size and body proportions with passage of time" (Sharma 1992).

One of the main objectives of growth studies in physical anthropology is to understand the processes of human evolution and the causes of human variation. According to Tanner (1960), "growth and development occupies a central place in the study of the mechanisms of evolutionary change and central place also in the study of individual differences in the structure and function within the human species". Moreover, the physical growth rate of children is now considered as one of the most useful indicators of health and nutritional status of a population. Besides genetical factors, physical growth and development is highly associated with socio-environmental factors (including nutrition and socio-economic conditions). Therefore, growth studies are very much essential not only for understanding the evolutionary changes and population variations in body shape and size, but also for understanding the health and nutritional status of population.

Unlike in other developed countries, growth studies in India have been started mostly in the middle of the present century. According to the reviews made by Sharma (1992) and Bhowmik (1993), it indicates that sporadic growth studies in India can be traced back only to 1930s and/or 1940s. The first systematic attempt to study the growth and development of Indian infants and children is that conducted by the Indian Council of Medical Research from 1956 to 1965 (ICMR 1972). Although the findings of this study are commonly referred to as growth norms for all Indian children on the basis of regional and socio-economic groups, yet it has certain limitations. For instance, this study does not cover all Indian States and/or communities, especially those in the north-eastern region of the country. It is a generally acknowledged fact that India is a country which embraces a large number of castes, tribes, communities and/or ethnic groups, inhabiting in different environmental conditions. So, Bhowmik (1993) is of the opinion that the ICMR growth data have "only limited application in view of the large environmental and genetical variation in Indian

population". Nevertheless, the ICMR growth study of Indian children still remains as a commonly cited reference of growth studies in India.

In the north-eastern region, a very few stray researches on growth and physical development of children have been published since 1970 (Das and Das 1969-71, 1972; Das 1971, 1973a, 1973b, 1974; Hazarika 1974; Das 1976, 1977, 1989-90; Das and Choudhury 1982, 1992; Choudhury et al. 1992). Most of these studies have been carried out in the state of Assam only. It may be worthwhile to mention here that late Professor P.B. Das had made a major contribution to the growth studies in this part of the country.

In this short review, an attempt has been made to show all those available published data on growth and development of children in the north-eastern region with a view to pointing out the need for further indepth researches.

Growth Studies in North-East India

Tables 1 to 14 show the results of growth studies, which have so far been reported for the populations in the north-eastern region of the country. These tables are quite self-explanatory, and we shall not make any attempt to describe them. Rather, we may point out some limitations of these growth studies, carried out in this part of the country:

1. Limited Number of Communities

All growth studies, so far reported for the populations in the north-eastern region, have been carried out only among some populations of Assam. To the best of our knowledge, no other studies have been published on physical growth and development of children, belonging to any castes, tribes and other communities in other states of the north-eastern region. Physical growth is very important not only for the study of human evolution and variation, but also for understanding the health and/or nutritional status of population. According to Tanner (1988).

"The study of growth is important in elucidating the mechanisms of evolution, for the evolution of morphological characters necessarily comes about through alterations in the inherited pattern of growth

and development. Growth also occupies an important place in the study of individual differences in form and function in man, for many of these also arise through differential rates of growth of particular parts of the body relative to others".

Further,

"A child's growth rate reflects, perhaps better than any other single index, his state of health and nutrition; and often indeed his psychological situation also. Similarly, the average values of children's heights and weights reflect accurately the state of nation's public health and the average nutritional status of its citizens, when appropriate allowance is made for differences, if any, in genetic potential. This is especially so in developing or disintegrating countries".

The nutritional and/or health status of children, in turn, reflect(s) the socio-economic conditions of population. In the north-eastern region, there are hundreds of tribal and non-tribal populations living under different ecological and socio-economic conditions. Growth studies are quite indispensable to have a better understanding of the nutritional status and/or socio-economic conditions of these populations in different states of this region. Such studies will also throw light on some evolutionary trends, which are the major interest in physical anthropology.

2. Methods of Growth Studies

It is seen from the tables presented here that most of the studies, carried out in Assam, are based on cross-sectional method of study (i.e. a study in which a group of children with different ages are measured once only). No systematic-longitudinal study (i.e. a study in which each individual is measured periodically over a period of time) has so far been reported in this part of the country, though it may be worthwhile to mention here the two mixed-longitudinal studies reported by Das and Choudhury (1982, 1992). To have a better understanding of the growth process, we need both longitudinal and cross-sectional data as these are complimentary to each other. Eveleth and Tanner (1990) write:

"For the construction of national (or local) standards of

height and weight, at least till puberty, cross-sectional study is the method of choice. For the study of growth at adolescence in a population, a five-year longitudinal study is necessary, combined with cross-sectional backing on larger numbers. For an intensive investigation of the relation between continuously unfolding events in individuals, and very often for clinical investigation of growth disorders, long-term longitudinal studies, even from birth to maturity, are necessary”.

Besides, most of the studies have dealt with limited number of sample sizes. In fact, a systematic growth study needs an increasing sample size, which is associated with sampling methods and other techniques for selecting the sample of children to be measured (Goldstein 1986; Chinn 1988; Sen 1994).

3. Different Stages of Growth

The importance of study on different stages of growth and development such as neonatal growth, growth at infancy, early childhood and adolescence, has already been pointed out by Sharma (1992) in his review on growth studies in India. In the north-eastern region, most of the studies have dealt mainly with ‘growth at school going age and adolescence’. So far, only one study has been conducted for the children aged between 1 and 7 years (Das and Choudhury 1982). Growth pattern of children under five years of age is very important from the nutritional point of view. During this period, the growth pattern of children is believed to be more susceptible to environmental factors, particularly to nutritional deficiencies (Jelliffe 1966; Gopalan 1992; Sharma 1992). Accordingly, many studies all over the world have paid special attention to the growth performance of children aged 1-5 years, with a view to assessing and understanding the nutritional status of community (WHO Working Group 1986). Unfortunately, no such study has so far attracted the attention of the scholars, especially the anthropologists in the north-eastern region.

4. Limited Parameters

It can be observed from the Tables presented here that all the studies have dealt with height and weight only, though some of

them have reported for other anthropometric measurements also. To have a better understanding of growth pattern, one should take into consideration as many growth indicators as possible, which include various anthropometric measurements and indices, skeletal maturity, age at menarche, etc. In short, most of the growth studies have been carried out in the north-eastern region with limited parameters and purposes. As already mentioned, no systematic study of growth has so far been reported for the populations of the north-eastern region. So, there is still a lot of scope for indepth research works on growth and development of children in this part of the country.

5. Sex Difference

Another important aspect of growth study is sex dimorphism, In the north-eastern region, most of the studies have dealt with the growth pattern of boys only. Studies on growth pattern of girls are negligible. In fact, growth studies in relation to sex differences are indispensable for understanding the sex differences in body dimensions. According to Tanner (1988),

“Many of the sex differences of body size and shape seen in adults are the result of differential growth patterns at adolescence.... The greater relative widths of shoulders in the male and hips in the female are largely due to specific stimulation of cartilage cells, by androgens in the first instance and oestrogens in the second. The greater growth of the male muscles also results from endrogen stimulation, as do some other physiological differences...”

Therefore, it may be suggested to undertake more auxological studies in this part of the country, taking into consideration the growth pattern of children with regard to sex dimorphism.

6. Factors Affecting Growth

Many studies have revealed the importance of some bio-socio-environmental variables in regulating the growth pattern of children (Bryan and Greenberg 1952; Kark 1956; Tanner 1962; Goldstein 1971; Bogin and MacVean 1978; Frisancho 1978; Tanner 1978; Rona and Chinn 1986; Tanner 1988; Lasker and Mascie-

Taylor 1989; Eveleth and Tanner 1990; Sharma 1992; Hauspie et al. 1992; and others). According to Eveleth and Tanner (1990),

"The ultimate size and shape that a child attains as an adult is the result of continuous interaction between genetical and environmental influences during the whole period of growth".

So, human variation in adult body dimensions is the result of this interaction between genetical and environmental factors since the time of fertilization. In the present review, it is seen from the tables presented here that there are differences between some populations of Assam, as well as between urban and rural children, in growth pattern with regard to some anthropometric characters. But none of the studies carried out in this part of the country, has even tried to find out the causes of such variations in growth pattern, nor the extent of influences of genetical and socio-environmental factors on physical growth of children. So, it will certainly be interesting to know whether these variations are due to genetical or socio-environmental factors (including nutrition and other socio-economic factors), or due to the interaction of both the factors. Ethnic or inter population differences may be highly associated with genetical factors, whereas intra population differences may be highly influenced by socio-environmental factors. As a matter of fact, our interest is not only to find out human variations, but also to understand the magnitude and causes of such variations. If we can do so, it will help not only the communities concerned in this region, but also the nation as a whole. Eventually, it will be a great service to mankind in general and the discipline of anthropology in particular.

TABLE 1. Weight Means (kg) of Rural Boys of Assam

Age (Years)	Baishya (Das 1973a, 1974)		Kaibarta (Das 1974)		Brahmin		Kalita (Das 1974)		Ahom (Hazarika 1974)	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
6	30	16.47	24	17.01	—	—	—	—	—	—
7	20	18.35	23	18.63	17	18.86	50	17.66	26	19.32
8	24	19.65	27	20.25	23	20.45	—	—	—	—
9	26	20.74	28	21.52	16	21.11	57	20.76	76	26.09
10	32	23.03	27	23.91	16	24.68	—	—	—	—
11	30	25.73	29	26.93	16	26.49	61	24.53	80	31.60
12	35	27.34	27	32.89	20	28.73	—	—	—	—
13	27	36.47	24	36.22	16	33.02	60	31.81	70	40.01
14	24	36.72	24	41.70	20	36.13	—	—	—	—
15	21	42.71	18	43.48	16	41.70	63	39.65	69	48.15
16	28	44.95	19	44.24	17	42.89	—	—	—	—
17	21	48.06	18	47.80	19	45.31	50	45.30	41	51.55
18	24	49.19	22	49.24	24	49.11	—	—	—	—
19	—	—	—	—	—	—	50	50.53	36	54.67

TABLE 2. Weight Means (kg) of Urban Boys of Assam

Age (Years)	Assamese boys (Das and Das 1969-71)	Assamese boys (Das 1976)	Assamese boys (Das and Choudhury 1982, 1992)*	Guwahati boys (Choudhury et al. 1992)	Rajasthani boys (Das 1977)	Rajasthani boys (Das 1989-90)
1	—	—	10.93(15)	—	—	—
2	—	—	11.65(19)	—	—	—
3	—	—	14.33(24)	—	—	—
4	—	—	15.07(43)	15.67(101)	—	—
5	—	—	17.30(60)	17.26(115)	—	—
6	—	—	19.04(56)	18.52(112)	—	16.90(30)
7	—	—	20.89(65)	20.09(127)	—	18.10(30)
8	—	—	21.75(NA)	21.74(141)	—	19.9(035)
9	—	—	24.75(NA)	23.82(110)	—	23.30(30)
10	28.44(42)	25.40(50)	26.66(NA)	24.93(141)	25.20(38)	25.40(40)
11	28.72(45)	26.10(50)	31.29(NA)	—	29.50(43)	29.40(45)
12	31.12(60)	31.20(50)	34.73(NA)	—	31.40(50)	31.50(50)
13	37.35(60)	34.30(50)	37.13(NA)	—	32.60(50)	32.70(50)
14	41.05(60)	38.60(50)	42.27(NA)	—	37.70(39)	37.60(40)
15	45.18(61)	43.20(50)	45.52(NA)	—	41.60(30)	41.00(32)
16	45.21(60)	44.50(50)	48.42(NA)	—	45.10(50)	41.20(50)
17	47.24(30)	47.50(50)	—	—	48.70(50)	48.50(35)
18	—	50.10(50)	—	—	—	—

* Mixed longitudinal study.

NA = Not Available.

Figures within parentheses indicate number of sample.

TABLE 3. Height Means (cm) of Rural Boys of Assam.

Age (Years)	Baisiyya (Das 1973a)	Kaibarta (Das 1973b, 1974)	Brahmin (Das 1974)	Kalita (Das 1967)	Ahom (Hazarika 1974)
6	106.65(30)	107.62(24)	—	—	—
7	113.55(20)	111.87(23)	114.97(17)	111.84(50)	116.14(29)
8	117.74(24)	116.15(27)	119.32(23)	—	—
9	120.34(26)	121.65(28)	120.67(16)	120.70(57)	132.05(76)
10	125.16(32)	125.34(27)	131.32(16)	—	—
11	129.98(30)	131.59(29)	131.75(16)	128.42(61)	142.53(80)
12	135.47(35)	138.15(27)	137.35(20)	—	—
13	147.98(27)	147.50(24)	145.25(16)	141.73(60)	152.49(70)
14	148.55(24)	147.95(24)	147.25(20)	—	—
15	159.35(21)	157.57(18)	154.00(16)	153.15(63)	160.77(69)
16	159.74(28)	160.89(19)	158.73(17)	—	—
17	162.31(21)	161.33(18)	159.67(19)	160.08(50)	163.65(41)
18	164.53(24)	162.66(22)	162.30(24)	—	—
19	—	—	—	162.78(50)	164.73(36)
21	—	—	—	162.96(51)	—

Figures within parentheses indicate number of sample.

TABLE 4. Height Means (cm) of Urban Boys of Assam

Age (Years)	Assamese boys		Assamese boys		Assamese boys		Guwahati boys		Rajasthani boys	
	(Das and Das 1969-71)	(Das 1976)	(Das and Choudhury 1982, 1992)*	(Das and Choudhury 1982, 1992)*	(Choudhury et al. 1992	(Das 1977)	(Das 1989-90)			
1	—	—	80.15(15)	—	—	—	—			
2	—	—	89.86(19)	—	—	—	—			
3	—	—	98.40(24)	—	—	—	—			
4	—	—	102.72(43)	105.07(101)	—	—	—			
5	—	—	110.40(60)	110.45(115)	—	—	—			
6	—	—	114.52(56)	113.16(112)	—	—	109.03(30)			
7	—	—	120.45(65)	118.49(127)	—	—	116.0(30)			
8	—	—	123.50(NA)	123.48(141)	—	—	119.6(35)			
9	—	—	129.50(NA)	129.60(110)	—	—	128.8(30)			
10	132.82(42)	134.9(50)	134.56(NA)	132.70(141)	—	132.4(38)	137.4(40)			
11	138.01(45)	136.7(50)	140.23(NA)	—	—	141.3(42)	140.8(45)			
12	143.32(60)	144.5(50)	146.86(NA)	—	—	144.5(42)	144.7(50)			
13	152.82(60)	149.8(50)	150.02(NA)	—	—	148.5(50)	148.4(50)			
14	156.95(60)	153.6(50)	157.95(NA)	—	—	153.5(39)	153.8(40)			
15	161.97(61)	159.1(50)	161.47(NA)	—	—	157.9(31)	158.1(32)			
16	162.81(60)	160.7(50)	165.13(NA)	—	—	159.0(50)	158.6(50)			
17	164.17(30)	162.8(50)	—	—	—	165.5(35)	165.2(35)			
18	—	163.9(50)	—	—	—	—	—			

*Mixed-longitudinal studies.

NA=Not Available.

Figures within parentheses indicate number of sample.

TABLE 5. Mean Values of Sitting Height (cm) of Boys (Assam)

<i>Age (Years)</i>	<i>Rajsthani boys of Dibrugarh (Das 1989-90)</i>	<i>Assamese boys of Guwahati (Das and Das 1969-71)</i>	<i>Kalita boys (Das 1967)</i>
6	58.7(30)	—	—
7	62.5(30)	—	59.96(50)
8	63.0(35)	—	—
9	66.7(30)	—	63.37(57)
10	68.3(40)	69.34(42)	—
11	71.7(45)	71.25(45)	66.13(61)
12	74.0(50)	73.35(60)	—
13	74.6(50)	78.98(60)	71.80(60)
14	78.5(40)	81.17(60)	—
15	80.6(32)	83.02(61)	77.89(63)
16	81.1(50)	83.75(60)	—
17	84.9(35)	84.51(30)	80.88(50)
19	—	—	83.85(50)
21	—	—	84.57(51)

Figures within parentheses indicate number of sample.

TABLE 6. Mean Values of Chest Circumference (cm) of Rural Boys of Assam

Age (Years)	Baisitya (Das 1973a)	Kaibarta (Das 1974)	Brahmin (Das 1974)	Kalitita (Das 1974)	Ahom (Hazarika 1974)
6	54.74(30)	54.60(24)	—	—	—
7	55.82(20)	55.93(23)	56.55(17)	54.21(50)	57.24(29)
8	57.68(24)	57.00(27)	58.42(23)	—	—
9	59.33(26)	59.90(28)	58.96(16)	58.27(57)	62.41(76)
10	60.57(32)	60.62(27)	62.65(16)	—	—
11	63.04(30)	62.32(29)	62.67(16)	62.18(61)	66.07(80)
12	65.09(35)	70.34(27)	64.02(20)	—	—
13	71.88(27)	70.62(24)	68.33(16)	67.33(60)	72.14(70)
14	72.45(24)	73.76(24)	70.76(20)	—	—
15	76.15(21)	73.85(18)	74.43(16)	73.01(63)	78.20(69)
16	78.41(28)	77.33(19)	76.67(17)	—	—
17	80.10(21)	79.38(18)	76.80(19)	77.09(50)	80.18(41)
18	80.95(24)	79.59(22)	80.39(24)	—	—
19	—	—	—	81.33(50)	82.81(36)
21	—	—	—	83.99(51)	—

Figures within parentheses indicate number of sample.

TABLE 7. Mean Values of Chest Circumference (cm) of Urban Boys of Assam.

Age (Years)	Assamese boys (Das and Das 1969-71)	Assamese boys (Das 1976)	Girwahati boys (Choudhury et al. 1992)	Rajsthani boys	
				(Das 1977)	(Das 1989-90)
4	—	—	53.69(101)	—	—
5	—	—	54.88(115)	—	—
6	—	—	55.61(112)	—	52.2(30)
7	—	—	56.70(127)	—	53.4(30)
8	—	—	58.30(141)	—	53.7(35)
9	—	—	60.20(110)	—	56.9(30)
10	64.93(42)	60.1(50)	61.72(141)	60.4(38)	60.5(40)
11	65.10(45)	61.4(50)	—	62.7(43)	62.7(45)
12	66.95(60)	61.1(50)	—	63.3(49)	63.6(50)
13	71.23(60)	66.2(50)	—	64.9(50)	64.9(50)
14	73.54(60)	68.6(50)	—	68.1(39)	68.1(40)
15	77.34(61)	74.2(50)	—	70.4(30)	70.9(32)
16	78.78(60)	73.2(50)	—	70.5(50)	71.4(50)
17	79.52(30)	75.9(50)	—	74.4(35)	73.6(35)
18	—	77.3(50)	—	—	—

Figures within parentheses indicate number of sample.

TABLE 8. Mean Values of Mid Upper Arm Circumference (cm) and Calf Girth of Urban Boys of Assam

Age (Years)	Assamese boys of Guwahati (Das and Das 1969-71)		Guwahati boys (Choudhury et al., 1992)		Rajasthani boys of Dibrugarh (Das 1989-90)	
	Arm circumf.	Calf girth	Arm circumf.	Calf girth	Arm circumf.	Calf girth
4	—	—	16.13(101)	21.16(101)	—	—
5	—	—	16.38(115)	21.99(115)	—	—
6	—	—	16.76(112)	22.29(112)	15.2(30)	20.7(30)
7	—	—	17.03(127)	22.78(127)	15.4(30)	21.7(30)
8	—	—	17.51(141)	23.64(141)	15.5(35)	21.7(35)
9	—	—	17.93(110)	24.40(110)	16.4(30)	24.0(30)
10	16.63(42)	24.04(42)	18.28(141)	25.02(141)	17.5(40)	23.8(40)
11	18.04(45)	25.84(45)	—	—	18.3(45)	25.0(45)
12	18.30(60)	26.00(60)	—	—	18.7(50)	25.9(50)
13	19.42(60)	28.12(60)	—	—	18.9(50)	26.1(50)
14	20.80(60)	28.59(60)	—	—	19.8(40)	27.5(40)
15	20.89(61)	29.93(61)	—	—	20.9(32)	28.2(32)
16	22.12(60)	30.77(60)	—	—	21.9(40)	28.4(40)
17	22.41(30)	30.41(30)	—	—	21.9(35)	29.0(35)

Figures within parentheses indicate number of sample.

TABLE 9. Mean Values of Head Circumference (cm) of Urban Boys of Assam

Age (Years)	Guwahati boys (Choudhury et al., 1992)		Rajasthani boys of Dibrugarh (Das 1989-90)	
	N	Mean	N	Mean
4	101	50.66	—	—
5	115	50.99	—	—
6	112	51.27	30	50.4
7	127	51.58	30	50.5
8	141	51.80	35	50.9
9	110	52.24	30	51.6
10	141	52.32	40	52.4
11	—	—	45	52.5
12	—	—	50	52.7
13	—	—	50	53.2
14	—	—	40	53.6
15	—	—	32	53.8
16	—	—	50	53.9
17	—	—	35	54.2

TABLE 10. Mean Values of Biacromial Diameter, Bicristal Diameter, Forearm Girth and Wrist Girth of Rajasthani Boys (Das 1989-90)

Age (Years)	N	Biacromial diameter	Bicristal diameter	Forearm girth	Wrist girth
6	30	22.6	16.8	15.3	11.7
7	30	24.8	17.4	15.8	11.9
8	35	25.3	18.3	16.1	12.2
9	30	26.9	18.7	16.6	12.7
10	40	27.8	19.9	17.5	13.5
11	45	29.4	20.8	18.9	14.0
12	50	29.9	21.0	19.0	14.2
13	50	30.7	21.3	19.1	14.5
14	40	32.2	22.0	20.0	14.9
15	32	33.1	23.1	21.3	15.6
16	50	33.7	23.2	21.7	15.7
17	35	35.0	24.3	21.8	15.9

TABLE 11. Weight Means (kg) of Assamese Girls

Age (Years)	Baishya girls (Das 1973a)	Assamese girls of Guwahati (Das and Choudhury 1982, 1992)*	Guwahati girls (Choudhury et al. 1992)
1	—	10.94(23)	—
2	—	12.44(33)	—
3	—	14.30(40)	—
4	—	16.12(55)	15.37 (60)
5	—	17.02(69)	16.24 (79)
6	17.27(21)	18.79(77)	17.58(127)
7	18.40(17)	20.57(77)	19.16(125)
8	20.34(18)	23.41(NA)	21.21(101)
9	23.36(18)	25.63(NA)	22.59(132)
10	25.55(19)	27.17(NA)	25.72(135)
11	26.00(16)	31.16(NA)	—
12	31.90(26)	35.28(NA)	—
13	36.04(20)	39.26(NA)	—
14	36.68(25)	40.60(NA)	—
15	41.91(18)	41.61(NA)	—
16	42.99(33)	42.17(NA)	—

*Mixed-longitudinal studies.

NA = Not Available.

Figures within parentheses indicate number of sample.

TABLE 12. Height Means (cm) of Assamese Girls

Age (Years)	Baishya girls (Das 1973a)	Assamese girls of Guwahati (Das and Choudhury et al. 1982, 1992)	Guwahati girls (Choudhury et al. 1992)	Kalita girls (Das 1967)
1	—	81.12(23)	—	—
2	—	89.02(33)	—	—
3	—	97.75(40)	—	—
4	—	104.65(55)	102.51(60)	—
5	—	109.03(69)	108.12(79)	—
6	109.40(21)	114.13(77)	112.51(127)	—
7	114.09(17)	119.54(77)	115.12(125)	109.77(51)
8	118.56(18)	124.79(NA)	120.74(101)	—
9	123.52(18)	130.69(NA)	123.69(132)	122.32(54)
10	130.18(19)	135.43(NA)	132.69(135)	—
11	130.32(16)	141.31(NA)	—	132.28(50)
12	140.68(26)	147.45(NA)	—	—
13	140.80(20)	151.59(NA)	—	142.85(62)
14	145.81(25)	152.99(NA)	—	—
15	147.89(18)	153.35(NA)	—	147.34(50)
16	151.35(33)	153.60(NA)	—	—
17	—	—	—	150.17(53)
19	—	—	—	153.40(52)
21	—	—	—	155.18(51)

* Mixed longitudinal studies.

NA = Not Available.

Figures within parentheses indicate number of sample.

TABLE 13. Mean Values (cm) of Chest Circumference and Sitting Height of Girls

Age (Years)	Chest circumference		Sitting height
	Baishya girls (Das 1973a)	Guwahati girls (Choudhury et al. 1992)	Kalita girls (Das 1967)
4	—	52.21(60)	—
5	—	53.71(79)	—
6	53.77(21)	54.77(127)	—
7	55.57(17)	55.91(125)	57.96(51)
8	56.98(18)	58.16(101)	—
9	58.01(18)	59.68(132)	63.24(54)
10	60.72(19)	62.18(135)	—
11	61.58(16)	—	66.52(50)
12	67.15(26)	—	—
13	70.72(20)	—	72.72(62)
14	72.91(25)	—	—
15	75.29(18)	—	76.02(50)
16	76.64(33)	—	—
17	—	—	76.36(53)
19	—	—	78.53(52)
21	—	—	80.14(51)

Figures within parentheses indicate number of sample.

TABLE 14. Mean Values (cm) of Head Circumference, Mid Upper Arm Circumference and Calf Girth of Guwahati Girls (Choudhury et al., 1992)

Age (Years)	N	Head circumference	Arm circumference	Calf girth
4	60	49.81	16.07	20.71
5	79	50.23	16.75	21.73
6	127	50.40	16.80	21.90
7	125	51.03	17.20	22.45
8	101	51.37	17.96	23.18
9	132	41.45	18.16	24.01
10	135	51.70	18.86	24.43

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