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GROWTH PATTERN OF ADOLESCENT AHOM CHILDREN FROM SIBSAGAR, ASSAM

Ramesh Sahani and Bandana Das

ABSTRACT

The present study has been carried out among the Ahom children of Assam to study their growth and development during adolescent period and to see the sexual difference in the pattern of growth. The present study is part of the planned research of Anthropological Survey of India, which concentrated on growth of Children from 11 to 17 years of age from different ethnic groups and ecological zones under the 10th plan. The results indicate that the Ahom children are shorter and lighter than the NCHS reference data and Beijing reference data but taller than the Rabhas, Moplah, Kaibarta and others. It can be concluded that the growth pattern of Ahom children is in general satisfactory.

Keywords: Growth, Ahom, Anthropometry, Assam, Adolescents

INTRODUCTION

Physical Anthropologists study human growth with a view to understand constant change, ontogenic conditions and their highly varying tempos at various periods of life (Schultz, 1956). Scientists have been conducting growth studies since the publication of Buffon's work in *Historie Naturelle* in 1777. The growth pattern of humans is influenced by several factors, including hereditary and environmental factors. Several workers have focused their attention on the impact of environmental factors on growth (Shapiro, 1938; Lasker, 1952; Greulich, 1957; Frisancho and Baker, 1970; Frisancho *et al.,* 1975; Singh *et al.,* 1986; Roberts, 1953). The availability of sun light is one of the factors influencing the growth and there is a direct relationship between the amount of sunlight and the rate of growth. At high altitudes, pre-natal growth retardation, as evidenced by low birth weight, is a well-established fact. The high altitude children generally have a prolonged growth period, sometimes, lasting up to 22 years of age, with poorly defined growth spurt (Litchy *et al.,* 1957; Hass, 1973; Frisancho and Baker, 1970; Beall *et al.,* 1977; Mueller *et al.* 1978, 1980). Socio-economic status (SES) is often considered to be a proxy for an

Dr. Ramesh Sahani, Assistant Professor, Department of Anthropology, Panjab University, Chandigarh-160014 (India), *E-mail:rameshrksahani@rediffmail.com;* **Ms. Bandana Das**, Department of Anthropology, Panjab University, Chandigarh-160014 (India).

indirect influence on growth through issues related to nutrition, health care, physical labour and psychology. The relationship of the first three with growth has been abundantly described, but there is limited evidence for the effects of psychological stimulation on growth (Lindgren, 1998). A number of studies have focused on the influence of socio-economic status on human growth (Chatterjee *et al.,* 1966; Chaudhuri *et al.,* 1966; Meredith, 1979; Chatterjee and Mandal, 1991; Singh, 1975; Tanner, 1962). Some changes in growth patterns could also be due to cross-country or rural to urban migration.

The most important of all the environmental factors is nutrition (Jelliffe and Jellifee, 1960;Garn and Rohman, 1966; Srikantia, 1979; Rao, 1978; Singh and Harrison, 1996; Visweswara Rao and Rao, 1975; Chowudhury *et al.,* 1977; Gopalan, 1957). Growth and nutrition are closely correlated. There is an association between change in dietary practices and growth (Takahashi, 1984), especially milk consumption (Orr, 1928; Heighton and Clark, 1929; Takahashi 1984; Little *et al.,* 1983). Genetics also plays a vital role in growth. Ethnic differences in rate and pattern of growth are known to lead to growth differences seen in adulthood. Some of these are clearly genetically determined, while others depend perhaps on ecological condition.

The developed countries are able to generate a massive data on growth to the extent that they are reporting secular trends in growth in the context of time span and changes in the society. In our country, however, the study of human growth and development has attracted the attention of researchers only recently. Some of the earlier growth studies tried to see the changes in body size as part of the diet and nutrition survey (Aykroyd and Raj Gopal, 1936; Aykroyd and Krishnan, 1937; Aykroyd *et al.,* 1938; Wilson and Mitra, 1938; Narinder Singh, 1939; Shourie, 1939; Mitra, 1940; Bhave, 1941; Rao *et al.,* 1954). Besides these; some important studies were also conducted on various Indian populations (Mukherjee and Gupta, 1930; Mason and Benedict, 1936; Krishnan and Vareed, 1932; Rahman, 1936; Sokhey and Malandkar, 1939; Banerjee *et al.* 1963; Mason *et al.,* 1963; Banerjee and Bhattacharya, 1967; Banerjee and Sen, 1957; Banerjee *et al.,* 1958; Bhattacharya and Banerjee, 1966). The ICMR (1972) growth and development study was a massive work with a huge data. In spite of all these studies, we have no well-accepted national growth reference data.

In the growth process of humans, adolescence occupies a significant period with rapid changes in growth and progressive attainment of adult status. Adolescence is characterized by the onset of major maturational events, principally the spurt in somatic growth and the accompanying appearance of secondary sexual characteristics and the onset of menarchae and spermarchae. The growth and maturation timing may be affected by environmental and health factors, though the genetic factors are primarily responsible for the timing of maturation events (Tanner 1962). Thus, the normal variability in growth at adolescence may be due to genetical and hormonal changes, which are environmentally induced (Tanner, 1962; Malina and Bouchard, 1991).

In India, growth studies of adolescents are mainly carried out by individual researchers (Sharma, 1963; Khajuria, 1968; Singh, 1968; Deka, 1969; Singh, 1970; Kaul, 1976; Malhotra, 1975; Ghai, 1979; Singh, 1978; Das, 1986; Rao and Busi, 1991, 1992, Bardhan, 1965). Some of the growth studies by Anthropological Survey of India are also remarkable (Sen, 1988; Reddy, 1989; Das, 1985; Bhowmick, 1993). In an effort to fill the gap in the studies of growth at adolescence, Anthropological Survey of India concentrated on growth of Children from 11 to 17 years of age from different ethnic groups and ecological zones under the 10th plan. The present study is part of this planned research.

Very few studies have been done so far on the growth pattern of northeast Indian populations. Das (1969-71) conducted a study among the Assamese Hindu children from Guwahati City. Subsequently, Das (1974) carried out a comparative study of four Hindu caste groups. Hazarika (1974) studied Ahom boys while Das and Choudhury (1992) conducted a mixed longitudinal study among the urban Assamese children from Guwahati City. Das (1996) conducted a comparative study of Assamese and Rajasthani boys. Dutta (1997) conducted a study among the Ahom and Kalita children (1998). Deb (2001) studied the growth of Assamese Kayastha and Bengali Kayastha girls. Choudhury (1979) conducted a study on Rabha children, while Begam and Chouudhury (1999) investigated growth of Assamese Muslim of Kamrup District. In recent years, adolescent growth studies have also been conducted among the Khasi (Basu and Sun, 2003) and Sonowal Kachari (Kotal and Barua, 2003) populations of north-east India. The present study has been carried out among the Ahom children of Assam to study their growth and development during adolescent period and to see the sexual difference in the pattern of growth.

AREA AND THE PEOPLE

Present study has been conducted among the Ahom boys and girls of rural areas of Assam. The state of Assam is situated in the north-eastern region of India between 24° and 28° N latitude and 89.50° and 96° E longitude, which is composed of hilly and plain area. The mighty river Brahmaputra flows across the entire length of the state from east to west. The population of Assam is composed of *Ahom, Brahmin, Jogi, Kachari, Kaibarta, Kalita, Koch, Lalung, Mech, Miri, Muslim, Rajbhanshi* and others. The Ahoms are offshoot of Tai or Shan group. They migrated to Assam from Myanmmar in 1228 A.D. and are of Mongoloid stock and at present assimilated linguistically and culturally with the Assamese population and are Hindu by religion. They form a major population group of Assam and are mainly concentrated in rural areas of the district of Sibsagar, Lakhimpur and Dibrugarh. Sibsagar District is a part of upper Assam and dominated by the Ahoms. The main occupation of the area is agriculture and related activities. Tea industry and the Oil and Natural Gas Commission, with its oil field, also occupy an important place in the economy of the area. Most of the developmental schemes launched by Central Government as well as by the Oil and Natural Gas Commission are doing some of the social services, besides giving employment to the local people.

MATERIALS AND METHODS

The data were collected from *Ahom* community of Assam in Sibsagar District during the month of May-June, 2003. The study area is under the Hahsara and Betbari Mauzas. Data have been collected from schools as well as through house-to-house visit. Altogether, 592 apparently healthy children have been investigated for anthropometry and other variables. Anthropometric measurements include weight, stature, sitting height, bi-acromial diameter, illiocristale diameter, total arm length, triceps skinfold, chest circumference, mid-upper arm circumference (MUAC) and calf circumference. The techniques and methods described by Weiner and Lowrie (1981) were followed and care was taken for the accuracy of the measurements.

RESULTS AND DISCUSSION

Body measurements provide important information to understand growth. The mean and standard deviation of various anthropometric measurements are given in Tables-1 and 2. The weight of Ahom adolescents of both sexes shows gradual increase with age. In case of boys, the mean weight ranges from 32.56 kg to 51.58 kg and it varies from 31.18 kg to 48.23 kg in girls. As can be seen in Table 1 and Figure 1, the body weight of the boys is more than the girls, except at 13 years of age, which could be due to adolescent spurt of girls. The increment of stature is more in case of boys than the girls. The mean value of stature increases from 142.45 cm and 140.24 cm at 11 years to 165.87cm and 153.46 cm at 17 years among boys and girls, respectively. The relative rate of increment is more in case of boys throughout their growth period, except at 12 years, probably due to an early spurt of stature among the girls. The mean values of sitting height also shows gradual increase from 75.16 cm and 73.95 cm at 11 years to 87.37 cm and 82.63 cm at 17 years of age in boys and girls, respectively. Distance curve of sitting height of boys remains higher throughout their growth period than the girls, which indicates that the development of trunk of boys is more pronounced than the girls throughout growth period. The mean value Cormic index (sitting height/stature x 100) in boys increases from 52.77 at 11 years to 52.84 at 17 years. In girls, the cormic index gradually increases from 52.74 at 11 years to 53.86 at 17 years. The higher mean value of cormic index among girls indicates that the lower portion of the body grows proportionally less in girls than the boys during the growth period.

Bi-acromial diameter is an important dimension for assessing transverse growth. Mean value of this measurement in this sample increases from 32.9 at 11 years to 39.82cm at 17 years in case of boys and from 30.01 to 34.03 cm in case of girls. Higher mean value for boys than the girls indicates broader shoulder in the former. The sex differences in this measurement were found to be significant at almost all ages in the present sample.

The illiocristral diameter helps to assess the transverse growth of the hip part. The mean values range from 22.47 cm at 11 years to 26.78 cm at 17 years in boys and from 21.99 cm at 11 years to 25.50 cm at 17 years in girls. It is clear from Table 1 that

the boys have higher mean values than the girls, except at 13 years. Sexual diamorphism was significant at 16 and 17 years. The illiocristal diameter of the boys was slightly higher than the girls upto17 years of age.

The mean total arm length of boys remains higher than the girls throughout their growth period. The mean value of total arm length increases from 60.95 cm to 72.19 cm among boys and 60.01 cm to 66.28 cm among the girls. The differences between sexes were significant from 14 years onward.

The amount of accumulation of fat can be assessed by measuring the thickness of skinfold. In this study triceps skinfold has been used. The mean values of triceps skinfold show irregular increment with age in case of boys and a gradual increase in case of the girls. The girls have thicker skinfolds at almost all ages. There are significant differences in fat accumulation between boys and girls, except at 12 years of age. The minimum mean value of 6.82 mm was noticed at 13 years, instead of 11 years, while the maximum value of 7.96 mm was noticed at 17 years of age among boys.

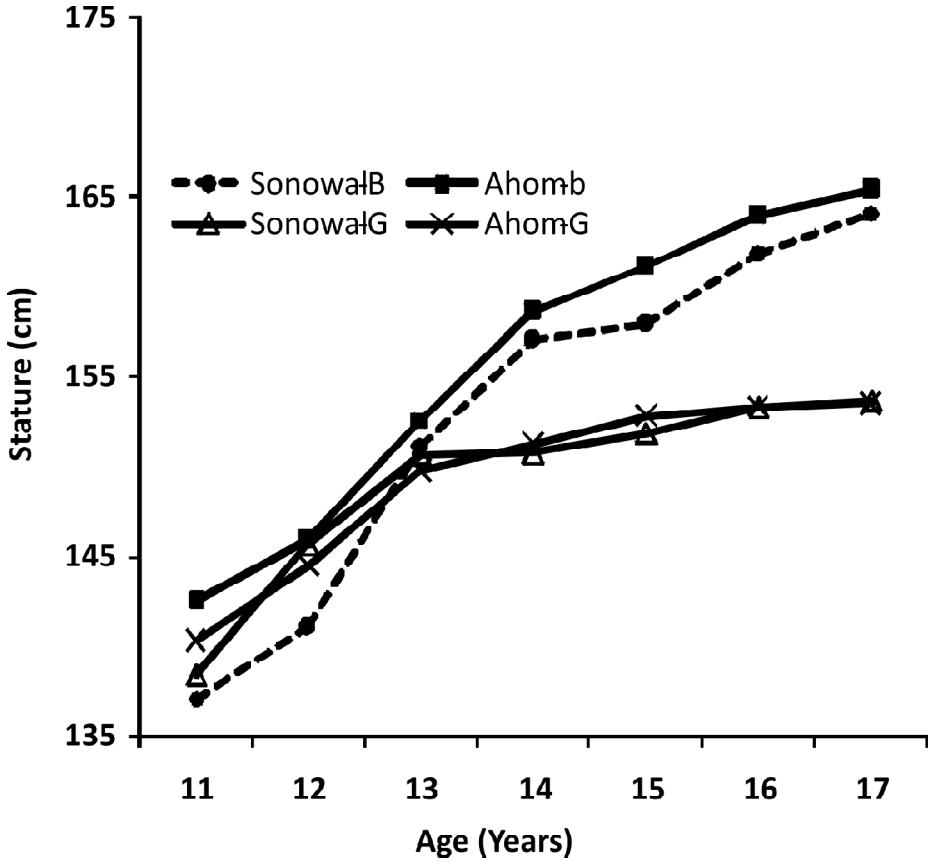

Figure 1: Comparison of Stature of Ahom and Sonowal Kachari

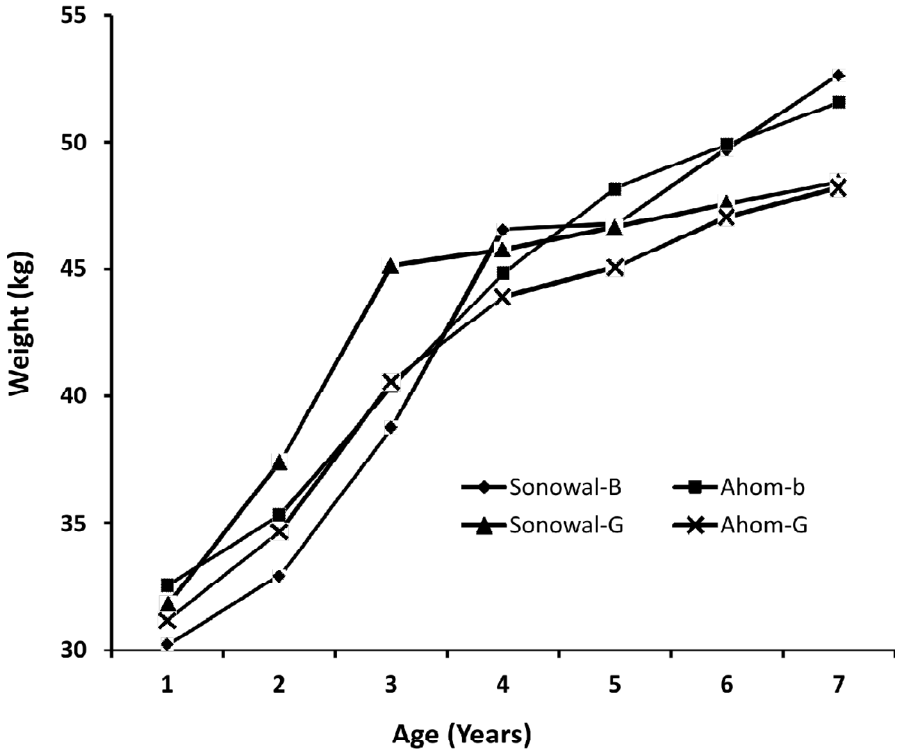

Figure 2: Comparison Weight of Ahom and Sonowal Kachari

The present study considered four circumference measurements. As is evident from Table 2 all four variables show gradual increase with increase in age. The mean values of chest circumference are significantly higher in boys than the girls ($p<0.05$) throughout their growth period, indicating broader chest than the girls. The circumference at mid upper-arm (MUAC) indicates the muscles, fat and humerus bone development of that part. The mean value of upper arm circumference increases from 18.83 cm to 23.48 cm in case of boys, whereas among girls it ranges from 18.06 cm to 23.09 cm. There are significant sex differences in mean values of MUAC at 11, 12 and 15 years of age. The mean values of calf circumference of the boys are generally more than the girls. The mean values range from 28.06 cm to 32.63 cm in boys and from 27.32 to 31.92 cm in case of girls. Sex differences were significant from 12 to 15 years of age.

The body mass index (BMI) is a measure of adiposity as well as thinness or chronic energy deficiency in humans. It can be used as a reliable tool for the prediction of under nourishment or starvation or affluence in an individual or community. The mean BMI shows a gradual increase with age in the boys and girls in the present sample. It ranged from 15.87 (kg/m^2) to 18.85 (kg/m^2) in case of boys and 15.78 (kg/m^2) to 20.44 (kg/m^2) in case of girls. The mean values of body mass index were more in case of girls than the boys, except at 11 years. The sex differences were

significant at 13, 14, 16 and 17 years of age ($p<0.05$). The mean values of Ahom BMI fall between 5th and 15th percentile value of the NCHS data.

SUMMARY AND CONCLUSION

All the variables considered in this study show constant increase among the present Ahom boys and girls. However, in boys the triceps skinfold shows a variable trend. The sex differences were significant in bi-acromial diameter, triceps skinfold, BMI, calf circumference and chest circumference. The comparison of the present data with the 1976 data of the same population does not give any clear cut idea, probably due to different sampling cluster. But in comparisons to Sonowal Kachari of the same year, the present Ahom boys are taller, except at 12 and 13 years of age. Ahom girls are taller but for sitting height. Most of the variables considered here show more mean values in Ahom boys than the Sonowal Kachari boys. But in case of girls the comparison is not so distinct. Similarly the present Ahom boys and girls show comparatively more mean value of stature and weight and other variables than the Khasi children (Khongsdier and Mukherjee 2003a and 2003b) and Assamese Muslim and Rabhas. In comparison with Moplah of Andaman, the Ahom adolscents are always ahead, except the skin fold at triceps.

Most of the variables considered in this work show a spurt at 13 years of age in both sexes. However, a few measurements and indices, such as MUAC, triceps skin fold, BMI and cormic index in boys do not show spurt at 13 years, but show it at 14, 15 and 16 years, respectively. In case of girls, only cormic index does not show spurt at 13 years of age. Ahom children are shorter and lighter than the NCHS reference data and Beijing reference data but taller than the Rabhas, Moplah, Kaibarta and others. It can be concluded that the growth pattern of Ahom children is in general satisfactory.

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Table 1: Mean and S.D. of Weight, Height, Sitting Height, Cormic Index, Bi-acromial diameter, Ilio-cristal diameter and total arm length of Ahom Children

Age	*Sex*	*N*	*Weight*		*Height*		*Sitting Height*		*Cormic Index*		*Bi-acromial Diameter*		*Ilio-cristal Diameter*		*Total Arm Length*	
			Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*32.90**	*2.46*	*22.47*	*1.67*	*60.95*	*4.59*
11	Boys	41	32.56	6.42	142.45	8.70	75.16	4.54	52.77	0.99	30.01	1.98	21.99	1.39	60.01	2.63
	Girls	40	31.18	4.73	140.24	4.85	73.95	2.70	52.74	1.25	33.06*	2.44	23.10	1.73	62.45	4.61
12	Boys	49	35.33	6.45	145.82	8.72	76.71	4.11	52.64	1.28	30.66	1.81	23.01	1.42	62.24	3.19
	Girls	40	34.69	4.09	144.46	5.52	76.42	3.02	52.91	1.16	35.04*	2.53	24.08	1.94	65.72	5.00
13	Boys	53	40.38	7.65	152.56	10.17	79.94	4.96	52.43*	1.34	32.40	1.52	24.19	1.50	64.56	2.73
	Girls	40	40.58	4.65	149.72	4.78	79.69	2.75	53.24	1.44	36.68*	2.38	25.22	1.80	68.43*	4.06
14	Boys	48	44.82	7.12	158.56*	8.48	82.78*	4.84	52.21*	1.22	33.03	1.43	24.60	1.29	65.94	3.09
	Girls	40	43.93	6.23	151.19	5.72	80.46	2.75	53.24	1.23	37.53*	2.02	26.04	1.47	69.48*	3.33
15	Boys	42	48.18*	6.95	161.08	6.40	84.33*	3.60	52.37*	1.34	33.73	1.53	25.48	1.43	66.26	2.58
	Girls	40	45.05	5.26	152.78*	5.19	81.48	3.04	53.35	1.65	38.81*	1.67	26.378*	1.04	71.05*	3.09
16	Boys	39	49.91*	6.50	163.87*	6.10	87.05*	2.96	53.14	1.16	34.02	1.09	25.49	1.20	66.26	2.74
	Girls	40	47.06	5.34	153.31	4.40	81.94	2.35	53.46	1.18	39.82	2.12	26.78*	1.29	72.19*	3.59
17	Boys	40	51.58*	5.35	165.37*	6.69	87.37*	3.59	52.84*	1.19	34.03	1.43	25.50	1.17	66.28	2.69
	Girls	40	48.23	6.26	153.46	5.11	82.63	2.42	53.86	1.01	32.90*	2.46	22.47	1.67	60.95	4.59

*Significant difference

Table 2: Mean and S.D. of Triceps skinfold, Chest Circumference, Upper arm Circumference, Calf Circumference and Body mass index of Ahom Children

Age	*Sex*	*N*	*Triceps Skinfold*		*Chest Circumference*		*Upper Arm Circumference*		*Calf Circumference*		*Body Mass Index*	
			Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
11	Boys	41	7.22*	2.04	67.39*	5.03	18.83*	2.02	28.06	2.33	15.87	1.49
	Girls	40	8.44	1.72	62.60	3.88	18.06	1.40	27.32	2.17	15.78	1.67
12	Boys	49	7.90	2.30	69.35*	5.64	19.31*	1.83	28.83*	2.07	16.49*	1.68
	Girls	40	8.59	2.24	65.00	3.42	18.41	1.48	27.99	1.87	16.61	1.61
13	Boys	53	6.82*	1.89	74.68*	6.06	20.32	1.70	30.13*	2.41	17.19*	1.68
	Girls	40	11.26	3.06	69.45	3.74	20.08	1.48	29.33	1.66	18.09	1.73
14	Boys	48	7.06*	2.04	76.07*	5.30	21.42	2.02	31.27*	2.48	17.73*	1.64
	Girls	40	12.71	3.90	71.45	3.94	20.60	1.89	30.25	2.14	19.19	2.23
15	Boys	42	7.24*	2.03	80.19*	5.63	22.24*	2.27	32.18	2.48	18.51	2.28
	Girls	40	13.25	2.69	72.64	3.21	21.29	1.42	30.99	1.94	19.26	1.62
16	Boys	39	7.67*	2.67	81.35*	5.26	23.28	2.16	32.53	2.09	18.57*	2.06
	Girls	40	15.02	4.62	74.51	4.28	22.64	2.04	31.88	2.12	20.04	2.33
17	Boys	40	7.96*	2.41	83.12*	3.52	23.48	1.54	32.63	2.30	18.85*	1.56
	Girls	40	15.03	3.75	74.68	3.98	23.09	1.80	31.92	2.28	20.44	2.16

* Significant difference

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