Growth pattern among Bharia boys- A tribe of Patalkot, Chhindwara (MP), India

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ABSTRACT

Tribals are most disadvantageous group. They are identified on the basis of their isolation, wide spread poverty, illiteracy, pre-agricultural state of technology and stagnant population. The general standard of living and nutritional status of a population can be measured by child growth. Therefore a cross sectional growth study was done among Bharia—a particularly vulnerable tribal group (PVGT) of Patalkot region, district Chhindwara (MP), India. A total of 247 boys of 2-18 years of age were recruited from their home, Aganwadi, schools and Ashrams (hostels) of the region. A total of 11 anthropometric measurements were taken following the standard procedure. The measurements were taken with all possible caution maintaining uniformity and accuracy in the techniques, after undergoing extensive training. It was found that the mean values for height, weight, sitting height, upper arm circumference, chest circumference and hip circumference increased with age. In height, the increment was 0.6 to 15.8 cm per annum, whereas in weight, the increment was 1.0 to 8.5 kg. Similar trend was found for other measurements. The cephalic region grows with slow rate as compared to other parts of the body. For better understanding of growth patterns among Bharia boys, the findings are compared with contemporary studies and reference data, it was found that the mean value of height and weight of Bharia boys were slightly higher during early childhood than the rural male and Kamar tribe of Chhattisgarh, but at the same time they are lagging behind from international reference (NCHS). Furthermore, cessation or delayed growth was found among the children aged 16 years and onward. During early childhood the difference in the mean of height and weight of Bharia and NCHS data is less, but, it is widen as they grown. Although the Bharia boys are showing almost similar growth pattern as other contemporary populations, still they need attention, because they are not attaining proper height and weight especially at their maturity.

Keywords: *Anthropometry, Growth spurt, Stature, Body weight, Head breadth, Head length, Bharia tribe.*

INTRODUCTION

Growth and physical development is a biological phenomenon among organisms. Growth of human child is determined by various factors viz. genetic constitution, environment, dietary practices, hormones, socio-economic and political conditions. The general standard of living and nutritional status of a population can be measured by child growth; because the growth of children, represent a complex interaction of nutritional intake and its absorption. Nutritional status and growth is influenced by dietary intake. General health and slowing or cessation of growth is one of the first observable responses to the nutrition and growth. It was reported that weight for height and height for age of Malawi children from urban upper socio economic communities were closely resembled the NCHS/WHO standards (Chimwaza, 1982), which indicated that these standards are already established and relevant. In a study, it was reported that usually high prevalence of stunting is due to environmental rather than genetic factors (Zverev and Gondwe 2001); contrary to that Eveleth and Tanner (1976) and Pelletier et al. (1991) showed that genetic factors might contribute to high level of stunting.

India has several socially disadvantaged communities among which schedule tribes are the most deprived ones. The tribal population, which constitutes almost 8 % of the total population, is characterized by widespread poverty, illiteracy, malnutrition , lack of safe drinking water and hygienic conditions. Although, health is one of the crucial parameters of development of a community, researchers have not paid much attention in studying the growth and nutritional status of the tribal communities in India. In fact, most of the works carried out in India on growth and nutritional status deal with urban and in rural populations (Currimbhoy 1963; Banik, Nayar, Krishna and Roy 1970; Chatterjee and Mandal, 1991, Thakur and Gautam, 2014). Among the tribal population the studies are limited (Mitra et al. 2002, Gautam 2007a and Gautam 2007b, Adak et al. 2012). The information on growth pattern of Indian children is insufficient and scattered. Moreover, there is absolutely no works which deal with the growth pattern of the Bharia of *Patalkot* region, district- Chhindwara (MP); therefore the purpose of this study was to find out the growth pattern of Bharia boys of 2-18 year of age and to compare it, with contemporary tribes of the region, Indian   and International data.

Area and People

Bharia is one of the three primitive tribes, found in Madhya Pradesh. They are widely distributed in some of the districts of Madhya Pradesh. District Chhindwara is one of them. Indian tribes especially of central India are forest dwellers. For subsistence most of them are still dependent on natural resources. In majority, their economy is forest and agriculture based. Bharia being a primitive tribe is more susceptible group of population. As they have to live in isolation, they have wide spread poverty, illiteracy, pre-agricultural state of technology and stagnant population. Further among Bharia, the residents of patalkot region of district Chhindwara are known as Bharia of *Patalkot*. It is one of the most secluded land-locked regions. There is a group of 12 villages, which include 24 or more settlements. These settlements are located in a deep gorge at origination of river *Dudhi* and *Gayan*. This gorge is spread in an area of 79 sq km. In between 22.24° to 22.29° of latitude at the north of equator and 78.43° to 78.50 ° longitude at east of prime meridian, at an average height of 2750–3250 feet above from mean Sea level. The valley is located at a distance of 78 km from Chhindwara (district headquarter) in the North-West direction and 20 km from Tamia in the North-East Direction. This horse–shoe shaped valley is surrounded by giant hills and there are several pathways to reach the villages located inside the valley. According to locals, this region was ruled by a mythological character named-*Ahiravan.* He was brother of *Ravana*. According to great epic *Ramayana*- the *Ravana* was a monster and played a role of villain and killed by *Ram.* According to mythology, *Ahiravana*, the ruler of *Patalkot* was also killed during the war.

There is no archaeological evidence when the valley was occupied by human being. Some of its villages were uninhabited during last 10-20 years and some more villages may be added to this category as most of the children are enrolled for school education and they may settle out of gorge, only those villages may remain who would be connected by road.

This gorge is full of herbal medicine and 10-15 Bhariya male are engaged as medicine man, they collect roots, shoots, leave, tubers and others parts of selected medicinal plants which may not found in any other parts. They process and sale these herbal medicine.

Only two villages of *Patalkot* viz. *Ghatlinga* and *Geldubba* can be reached by road. There is no road for remaining of settlements. Some of the settlements are in extreme remote where no vehicle can reach namely: Rated, Karaem, chimptipur, Ghana (Kodiya), Sopatiya and

Harmau. Except tribes, few traders, forest officials and researchers (Anthropologist); nobody can reach to these settlements as there are deep reliefs and drainages, rivers and valleys, forests and deserted land to reach the settlements. Still there are some settlements which do not have electricity. For primary school, some of children have to walk upto 5 Km. There is no dispensary or clinic inside the *Patalkot*, the tribes are dependent on herbal medicine or they have to go to Tamia, which is upto 25 Km from some of the settlements. Recently, a primary health centre is being constructed in village-*Geldubba*. Similarly there is no market inside the *Patalkot*. The resident of the region generally do shopping from three adjoining weekly markets viz. *Chhindi, Tamia* and *Delakhedi.*

The tribal development department is paying attention for the development of Bharia tirbe. One of the most commendable works being done by the department is boarding schools in the *Patalkot*, where the children are being provided residential facilities and education at the cost of government expenditure. Although, there are many drawback in this effort, including lack of motivation/commitment of staff and corruption, which are great obstacle and need proper monitoring and further strengthening of these boarding schools. There are other plans also for rural and agriculture development. Still, economy of Bharia tribe is based on forest and forestry products; therefore there is great need of proper research and implementation of policy. Exploitation of tribes with neighboring population, politician, tribal leaders, bureaucrats and academicians are other darker aspect of tribal development and Bharia are also sufferers of all these drawbacks.

MATERIAL AND METHODS

For present cross sectional growth study, a total of 247 boys of 2-18 years of age were recruited from their home, *Aganwadi,* schools and *Ashrams* (hostels) of Patalkot region of Chhindwara district of Madhya Pradesh state of India. Boys looking apparently normal were recruited for the study. The children having mental or physical abnormality were excluded. Either verbal or written consent were obtained from parents or immediate available guardian of children for example warden of the *Ashrams* or *Aganwadi* worker or Headmaster/Principal of the school. Before recruitment of the subject, their exact age was ascertained. The data was collected during December 2012. The village wise distributions of the samples are given below:

S.No.	Name of the village	Number of children
1	Ghatlinga	25
2	Gudi Chhatri	15
3	Sopatiya	10
4	Luckka Dhana	12
5	Shrijhot	34
6	Geldubba	22
7	Kolukheda	2
8	Harmau	10
9	Sukhabhand	9
10	Khari	8
11	Rated	20
12	Kaream	10
13	Chimptipur	25
14	Ghana	24
15	Kodiya	10
16	Parsidhana	11
	Total	**247**

Calculation of Age: In connection with the studies on growth and development the information on correct age of children is extremely important (Sharma 1963). If the age of children is doubtful the result is completely misleading. For the present study, age was ascertained in completed year of each subject through their birth records. If the sample was 5 year and 6 month old, it refers to 5 year, at the same time if it refers to 5 year 7 months, and then the age was rounded up to 6 year.

Anthropometric measurements: Anthropometry is the universally applicable, inexpensive and non-invasive technique available for the assessment of the size and proportion of the human body (WHO 1995) and is a very useful tool in the assessment of growth and nutrition (Gorstein et al. 1994; Hamieda and Billot 2002). The technique of anthropometry has been successfully utilized by different researchers to assess and document the growth and nutritional status of various human communities, (Sharma and Sharma, 1992; Bailey and Ferro-Luzzi, 1995; Deurenberg-Yap et al., 2000; Mehta and Shringarpure, 2000; Misra et al., 2001; Khongsdier, 2002; Rao et al., 2006; Zerfu and Mekasha, 2006; Bharati et al., 2007; Semproli and Gualdi-Russo, 2007; Bisai et al., 2008; Bose et al., 2008; Chowdhury et al., 2008; Olivieri et al., 2008, Gautam et al., 2006, Gautam 2007a & b, Gautam 2008, Thakur and Gautam 2009, Gautam et al. 2013, Thakur and Gautam, 2014).

A total of 11 anthropometric measurements were taken viz. body weight, height, sitting height, chest circumference, hip circumference, waist circumference, upper arm circumference, head length, head breadth, bizygomatic breadth and head circumference; following the standard procedure as described by Gibson (1990). The measurements were taken with all possible caution maintaining uniformity and accuracy in the techniques, after undergoing extensive training. Portable digital weighing machine, anthropometer rod, tape and spreading caliper were used to measure the various anthropometric measurements. After collecting the data, it was entered into excel worksheet, where the data was filtered and cross checked to remove the errors. Some of the calculations for indices were done in Excel worksheet. After that the data was transferred to SPSS file for its further calculations, cross tabulation and analysis. To display the age wise growth pattern of stature and weight, box plot diagramme is constructed and line graph were drawn for comparative analysis.

RESULTS

Table 1. Mean and standard deviation for anthropometric measurements of Bharia boys of 2-18 year of age.

AGE(yrs)	N	Body Weight (kg)		Height Vertex cm		Sitting Height cm		Chest (cm)		Hip (cm)		Waist (cm)		Upper Arm (cm)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2	4	10.8	1.5	87.7	9.4	47.7	2.1	46.5	5.0	44.8	1.3	47.3	2.6	15.0	1.2
3	5	12.2	1.6	88.9	5.2	49.1	4.1	54.6	3.0	44.7	1.6	45.7	4.4	14.8	0.6
4	8	13.8	2.8	94.8	8.1	49.1	5.6	51.2	3.4	49.5	3.4	48.3	3.7	14.4	1.0
5	7	17.0	2.8	110.6	7.6	54.9	4.5	55.9	2.0	55.1	3.4	55.3	2.5	16.4	1.1
6	12	16.2	2.3	108.4	7.5	57.4	4.3	55.4	3.7	53.0	3.4	51.7	4.1	14.6	1.0
7	12	17.0	2.6	113.5	7.8	60.6	3.5	56.7	2.7	54.8	2.3	54.6	2.5	14.9	0.9
8	15	21.7	5.2	122.9	7.5	64.2	4.0	59.1	5.7	59.0	4.3	56.2	4.2	15.7	1.7
9	9	21.6	2.4	124.3	5.2	63.9	3.8	60.4	2.6	56.2	3.7	55.5	2.5	16.4	1.3
10	12	20.9	2.5	125.9	4.6	64.5	2.6	58.2	4.7	58.4	3.0	54.6	2.5	15.8	0.8
11	14	29.4	7.8	139.4	9.4	69.7	4.1	67.3	8.0	63.7	5.7	58.8	7.3	17.9	1.6
12	31	30.4	6.7	140.7	8.2	68.7	8.3	65.5	4.9	66.3	7.8	60.0	5.0	17.2	1.2
13	16	34.3	6.8	145.0	8.7	74.2	4.5	69.4	6.2	70.0	6.1	62.1	5.3	18.9	2.1
14	9	39.7	6.0	151.5	8.2	74.9	6.0	75.9	5.2	74.8	4.2	66.7	4.2	20.7	2.5
15	42	42.9	6.4	158.7	6.1	79.7	3.5	75.6	5.3	76.4	6.1	68.0	4.8	21.4	2.2
16	14	44.1	5.2	159.3	9.4	76.9	8.4	77.3	5.1	77.0	4.6	66.0	3.1	22.1	1.9
17	33	43.4	7.4	157.0	11.2	79.6	6.2	74.8	8.9	76.4	7.5	65.6	6.5	21.8	1.9
18	4	45.8	7.3	158.2	6.7	79.1	3.5	78.2	6.0	80.3	5.7	66.8	5.9	22.6	1.8

The age wise mean and standard deviation of anthropometric traits viz. Body weight, height vertex, sitting height, chest circumference, hip circumference, waist circumference and upper arm circumference of Bharia boys are shown in Table 1. It is apparent that the mean values for height, weight, sitting height, upper arm circumference, chest circumference and hip circumference have increased with age. The increment in height was estimated from 0.6 to 15.8 cm per annum, whereas in weight, the increment was 1.0 to 8.5 kg. Similar trend was found for other measurements. For further illustration of age wise growth of height and weight Figure 1 and 2 were drawn.

Table 2. Mean and standard deviation of cephalic and facial measures among Bharia boys of 2-18 years of age.

| AGE (in years)	N	Head Length cm		Head Breadth cm		Bi-zygomatic breadth cm		Head Circumference cm	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
2	4	15.7	0.9	12.5	0.6	8.0	0.4	46.9	1.6
3	5	15.3	0.9	12.3	0.6	9.1	0.2	47.3	0.9
4	8	16.2	1.1	12.4	1.0	8.9	0.7	47.4	3.1
5	7	16.5	0.8	13.0	0.6	8.7	1.2	49.6	1.6
6	12	16.8	0.7	12.8	0.5	9.8	0.8	49.3	1.2
7	12	17.0	0.8	12.8	0.5	10.1	0.8	49.1	1.8
8	15	17.0	0.6	13.0	0.5	10.0	0.6	50.6	2.7
9	9	16.9	0.8	13.1	0.5	9.6	1.4	49.7	2.5
10	12	16.9	0.6	13.2	0.5	10.2	1.2	49.5	0.7
11	14	17.2	0.9	12.8	0.8	11.4	1.2	51.7	2.7
12	31	17.5	0.7	12.9	0.6	11.4	1.0	50.6	1.6
13	16	17.4	1.0	13.2	1.2	11.2	1.2	52.8	4.3
14	9	17.7	0.6	13.5	0.4	11.3	1.0	52.7	1.6
15	42	17.6	0.5	13.5	0.5	11.6	1.8	52.3	3.0
16	14	17.8	0.7	13.4	0.5	11.6	0.8	52.7	1.9
17	33	17.9	0.5	13.5	0.5	11.2	0.9	52.7	3.3
18	4	17.1	0.4	13.4	0.5	11.1	0.8	52.0	0.9
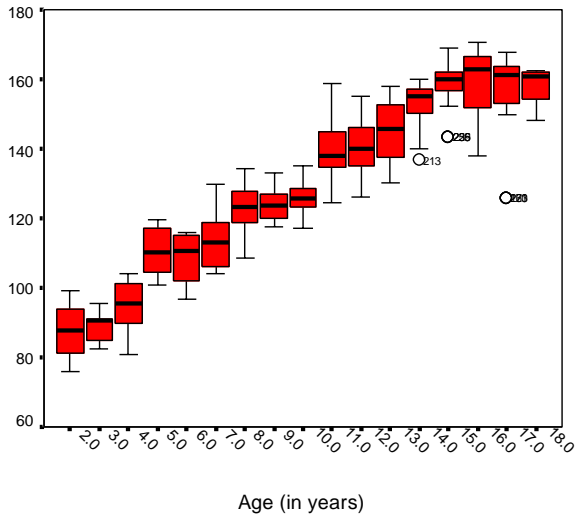
Figure 1. Box plot diagram showing age wise
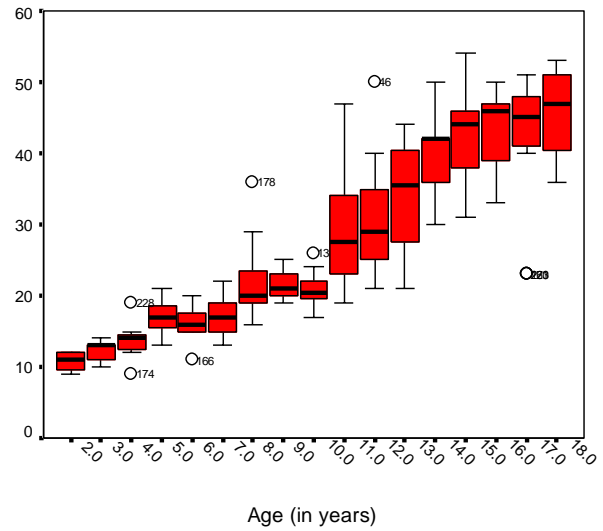height of Bharia boys.

Figure 2. Box plot diagram showing age wise
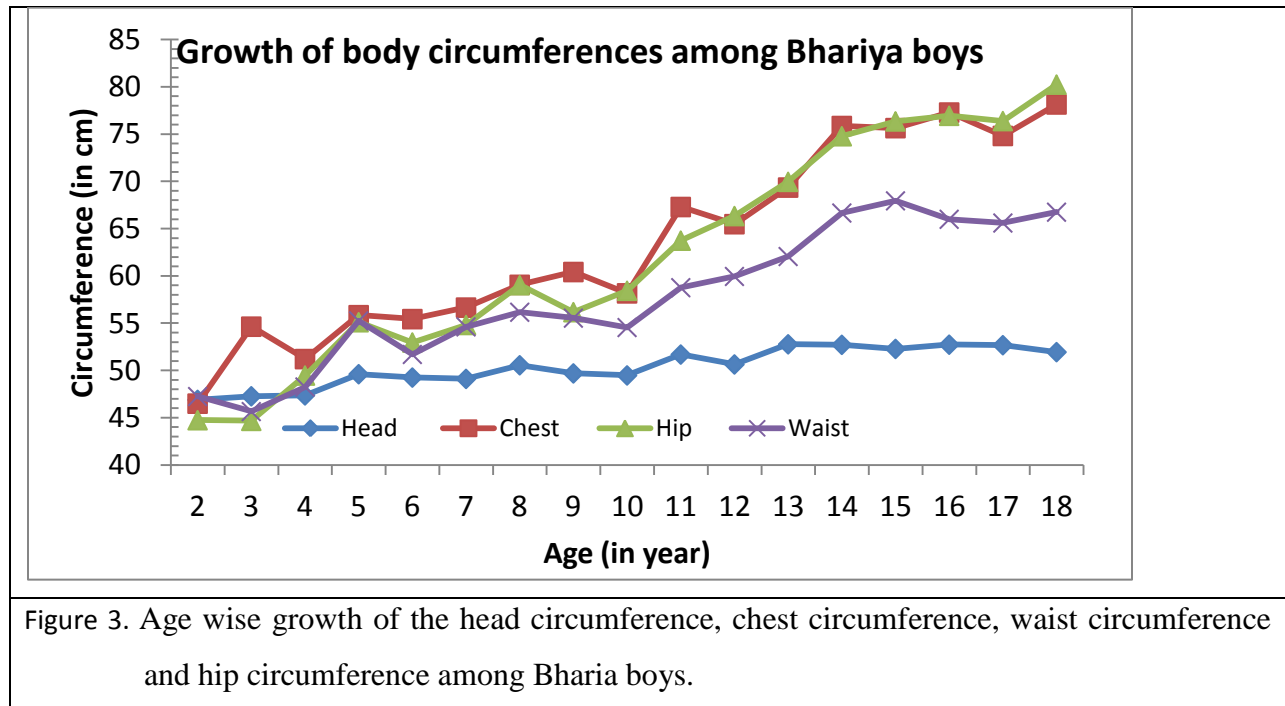Body weight of Bharia boys.

Figure 3. Age wise growth of the head circumference, chest circumference, waist circumference
and hip circumference among Bharia boys.

Tables 2 shows the age wise mean and standard deviation of head length, head breadth, bi-zygometic breadth and head circumference. These cephalic characters increased with ages, but

slowly as compared with other parts of body. Figure 3 reveals age wise growth of the head circumference, chest circumference, waist circumference and hip circumference.

For better understanding of growth patterns among Bharia boys, the findings are compared with contemporary studies and reference data, it was found that the mean value of height and weight of Bharia boys were slightly higher during early childhood than the rural male children (ICMR, 1972) and boys of Kamar tribe (Mitra, et al. 2002); but it is lower than reference population i.e. NCHS (2007); and the difference is widen as per growing age, especially after 8 years of age. Table 3 and figure 4 shows that the stature of children studied is found shorter in comparison to NCHS (2007) and slightly longer than rural (ICMR, 1972) and Kamar children (Mitra et al 2002) especially during childhood, but after adolescence the Kamar and rural children exceeds in stature as compared to Bharia boys. The similar picture can be seen in relation to body weight (Table 4 and Figure 5).

In this way the present studied children have lighter body weight as compared to NCHS reference data. At the same time, initially they are slightly heavier than Kamar (Mitra et al, 2002) and rural children (ICMR, 1972), but during adolescence the trend is reversed.

DISCUSSION

Studies on growth and development of tribal children are few (Mitra et al. 2002, Gautam 2007a & b). There is no information about the growth of Bharia boys of *Patalkot* region; hence by present study an attempt was made to understand the growth pattern of Bharia boys of *Patalkot* region. An increase in anthropometric measurements was observed with increase in age. Weight and height of the Bharia boys were slightly higher than Kamar boys another tribe (PVGT) of central India and Indian growth reference (ICMR, 1972).

However, in the early stage of childhood the Bharia boys were taller in height and heavier in weight than the Indian growth reference. However, when the anthropometric measurements were compared with the NCHS growth reference, the pattern of growth of Bharia boys indicated significant retardation.

The justification for use of NCHS as a reference population is that the well-nourished children in all communities follow very similar growth patterns (Habicht et al. 1974). The nutrition foundation of India also advocated the use of the WHO standard to be applicable to Indian children. Hence the reference values from the National Centre of Health Statistics (NCHS) have used in the present investigation

Table 3. Comparison of growth of Height among Bharia tribe and contemporary populations

Age (yrs)	Bharia boys	ICMR Rural (1972)	Kamar (2002)	NCHS (2007)
5	103.5	101.1	98.8	**109.9**
6	110.1	107.4	105	**116.1**
7	119.3	113.2	108.5	**121.7**
8	119.6	118.6	114.71	**127**
9	124.5	123	120.63	**132.2**
10	130.6	128.1	127.16	**137.5**
11	131.5	132.4	129.41	**143.3**
12	141.1	137.4	132.55	**149.7**
13	142.4	143.5	137.16	**156.5**
14	146.4	148.3	140.52	**163.1**
15	150.3	153.1	144.7	**169**
16	149.4	157.5	151.82	**173.5**
17	150.8	160.4	155.93	**176.2**
18	143.8	162.0	157.51	**176.8**

Table 4. Comparison of growth of body weight among Bharia tribe and contemporary populations

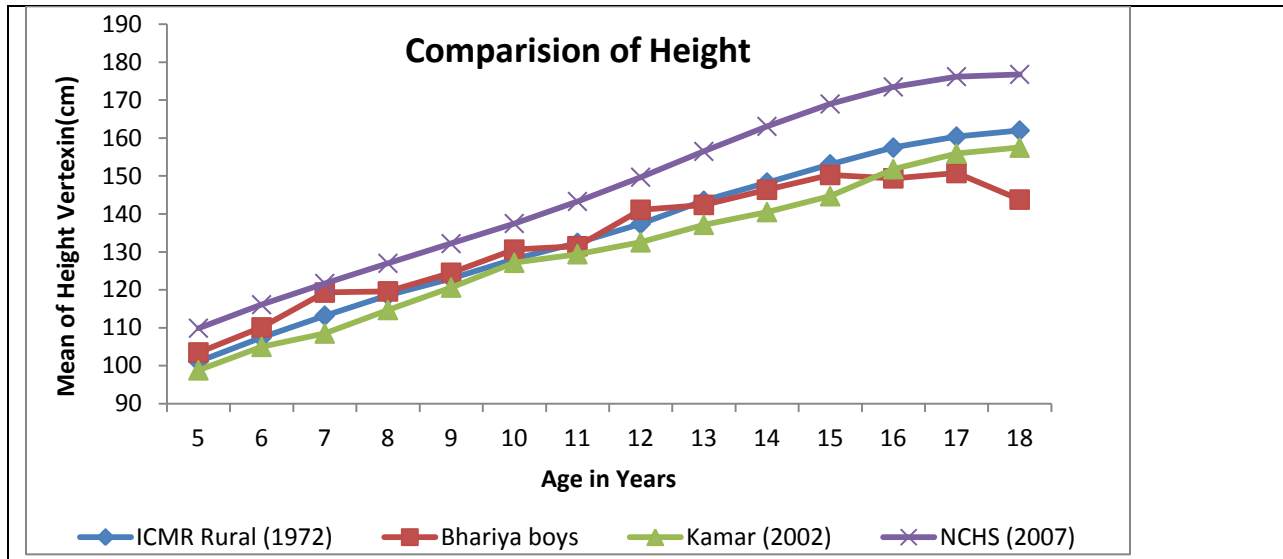|	ICMR Rural (1972)	Bharia boys	Kamar * (2002)	NCHS (2007)
5	14.4	15.5	10.5	18.7
6	15.9	16.88	13.1	20.7
7	17.6	19.4	15.92	22.9
8	19.3	21	17.15	25.3
9	21.1	23.95	19.18	31.4
10	23.1	26.03	20.04	35.3
11	25.1	26.12	22.8	39.8
12	27.8	33.8	24.85	45
13	31	33.75	25.7	50.8
14	33.7	36.63	26.94	56.7
15	37.1	41.08	31	62.1
16	41.2	39.4	34.1	62.7
17	43.9	42.5	37.23	66.3
18	45.8	41.8	40.87	68.9

*Cited from Mitra et al. 2002.

Figure 4. Comparison of growth of height among Bharia boys and contemporary population.
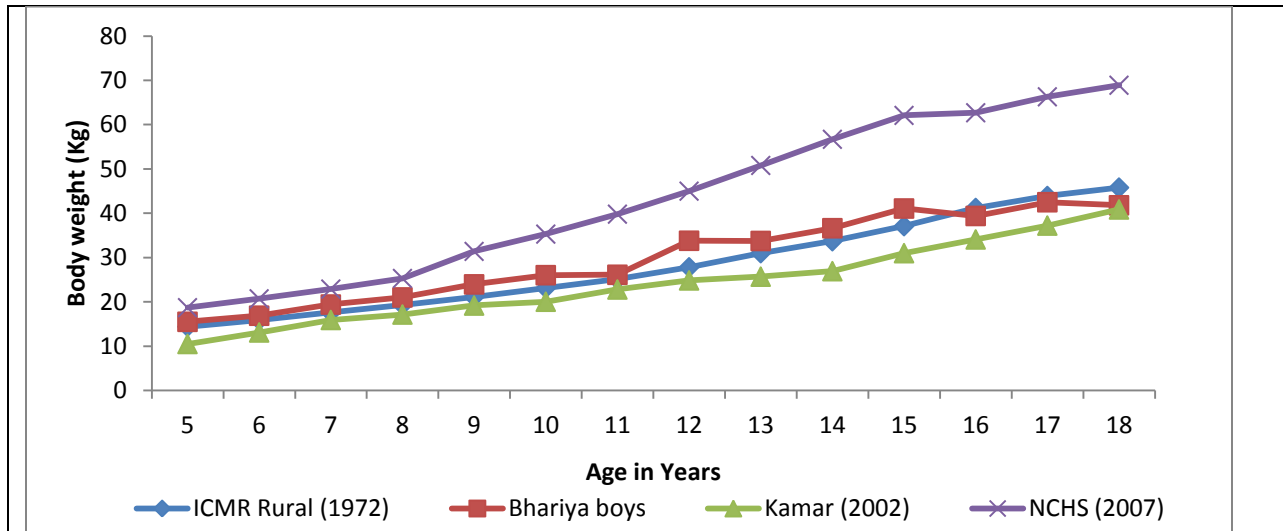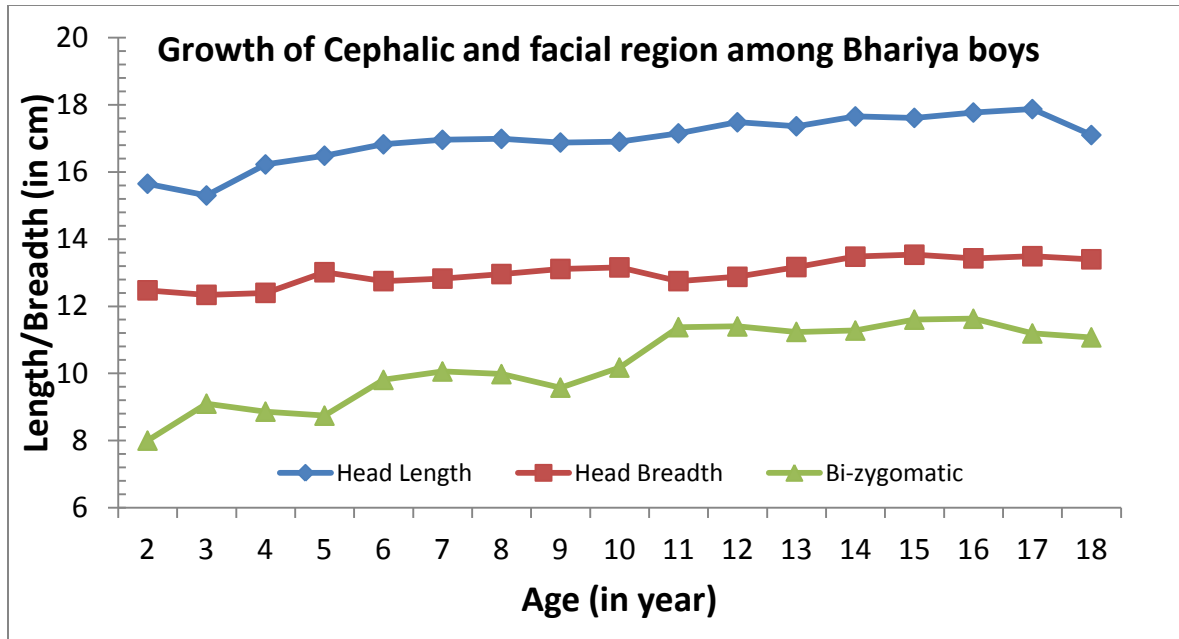

Figure 5. Comparison of growth of body weight among Bharia boys and contemporary population.

Growth of Cephalic and facial region among Bhariya boys

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Another explanation of such vast difference in findings of present and previous studies is due to the difference in area and population. The country has wide diversity, especially in socio-economic and geo-climatic condition. And, beyond that there is wide ethnic variation. The tribal and rural children are obviously deprived section and the incidence of stunting, wasting and undernutrion is higher among them; whereas the present studied boys were drawn from a secluded region. As most of the rural and tribal areas are depriving in many basic civic amenities viz. safe drinking water, proper communication and transport facilities, health services, schooling, sports etc. which have adverse impact on the growth and nutritional status of the children. And, this is reflecting in the findings of present study.

CONCLUSION

It can be concluded that the growth pattern of Bharia boys are slightly better than Kamar tribe of Chhattisgarh (Mitra, 2002) and rural Indian boys (ICMR, 1972). As apparent from line graph Figure 4 and 5 the growth of height and weight of Bharia boys is slightly better than these contemporary studies, especially upto 16 years of age; after that the growth of height and weight is delayed. At the same time, the Bharia boys are lagging behind in growth as compared with NCHS data. Although the Bharia boys are showing almost similar growth pattern as other

contemporary population, still they need attention. Why they are not attaining proper height and weight especially at their maturity should be investigated.

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