

# Growth and Nutritional Status of the Bharia – A Primitive Tribe of Madhya Pradesh

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## ABSTRACT

*This study is an attempt to understand the physical growth and nutritional status of Bharia, a primitive tribe of Central India. A cross sectional study was conducted on 551 children (283 boys and 268 girls) aged 4 to 18 years. Body weight, height, sitting height, head circumference, upper arm circumference, chest circumference, biceps, triceps, sub scapular and calf skin fold thickness were measured. Body Mass Index was calculated as  $\text{weight}/\text{height}^2$  to calculate chronic energy deficiency. All anthropometric measurements except skin fold measurement exhibit uniform increase with age in both the sexes. Age-specific Body Mass Index (BMI) indicated substantial changes and falls during pre-school age and rise in adolescence. The BMI according to the Indian standard was normal, but when the data was compared with the International standard malnutrition in both sexes was noticed in childhood. Boys remained undernourished after adolescence, while girls reached the normal growth patterns.*

**Key words:** Bharia, nutritional status, BMI, growth pattern, skinfold

## Introduction

Studies on child growth and development have always occupied an important position in the scientific research curriculum and are of interest to the researchers of both Medical Science and Physical Anthropology all over the world<sup>1</sup>. The growth of children in a population reflects their nutritional status and indirectly determines their standard of living. Growth is influenced by diet intake and expenditure and general health condition of an individual. Slowing or cessation of growth is one of the first observable responses to nutritional inadequacy<sup>2</sup>. A well-designed growth study may provide a powerful tool to identify the health and nutritional status of any population or community.

India has several socially disadvantaged communities and Scheduled Tribes are the most deprived ones. The tribal population, which constitutes 8.08 percent of the total population<sup>3</sup>, is characterized by widespread poverty, illiteracy, malnutrition, lack of safe drinking water and hygienic conditions, which are the contributing factors

for their dismal health conditions. Many researchers have enumerated the trends of growth in rural and urban populations of India and observed that with increase in age, there is a tendency of increase in all-physical traits except skin fold thickness<sup>4–15</sup>. 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. This study is an attempt to study the growth pattern and nutritional status of Bharia, a primitive tribe of Central India, to understand their health status.

## Subjects and Methods

The tribal communities, which constitute about 8.08 percent of India's total population, are characterized by widespread poverty, illiteracy, malnutrition, lack of safe

drinking water and hygienic conditions<sup>3</sup>. There are number of Commissions set up, time to time by the Government of India to examine and evaluate the economic condition of these tribals, so that greater attention could be given to the tribes in India for their socio-economic development. However, there are some tribal communities who still live in extreme isolation and bare minimum condition. These communities have abnormally low growth rate and are on the verge of extinction. The Ministry of Home Affairs identified them as Primitive Tribal Groups (PTG) on the basis of their pre-agricultural level of technology and extremely low level of literacy.

Bharias of Central India are one of such primitive tribes in India. The present study was based on cross-sectional samples of 551 apparently healthy Bharia children (283 boys and 268 girls), aged 4 to 18 years. Bharia live in the forests of Central India. They are monogamous and observe clan exogamy. Bharias mainly depend on land and forest produce for their subsistence economy. Most of them are landless.

Relevant data were collected from eight villages (Dhanuapagar, Laho, Kohka, Jatadogri, Bhariatola, Barga, Gangutola and Aataria) of Dindori district of Madhya Pradesh, situated in the Central region of India. Age was determined from the school records and cross-checked with the reference to events remembered such as some important festivals, storm, floods etc. Age and sex of the girls and boys were checked and matched. Subjects who looked apparently healthy and active (but not on the basis of bodily structure or proportion) were included in the study. Efforts were made to exclude those with physical deformities.

Anthropometric measurements such as body weight, height, sitting height, head circumference, upper arm circumference, chest circumference, biceps, triceps, subscapular and calf thickness were measured according to the standard technique suggested by Weiner and Lourie<sup>16</sup> and Singh and Bhasin<sup>17</sup>. Standing and sitting height were measured to the nearest cms. using a wall-mounted stadiometer (manufactured by Harpenden). Weight was measured with a physician's beam balance scale to the nearest 0.5 kg. A skinfold caliper was used to measure the skinfold thickness to the nearest mm. Head, arm and chest circumference were measured with a tape. Height may reflect long-term consequences of nutritional intake, while weight may indicate changes in recent nutritional intake. Skinfold thickness may indicate the amount of body fat.

Body Mass Index was used to assess the nutritional status of children as BMI value is directly related with age. The nature of BMI curve rising steeply in infancy, falling during their pre-school years, and then again rising into adulthood serves an important tool to assess the BMI of children<sup>18</sup>. Body Mass Index (BMI = weight in kg/Height in meter square) was used as an indicator of chronic energy deficiency and the grades of CED are classified as follows: BMI <16.0 as grade III, 16.0-16.9 as grade II, 17.0-18.4 as grade I and >18.5 as normal and

for children >15.0 (Normal),  $\geq 13.0 \leq 15.0$  (Moderate) and <13.0 (severe) was considered as the reference value<sup>19</sup>.

Anthropometric measurements were analysed using descriptive statistics. Weight and height of the present data was compared with US National Center for Health Statistics (NCHS)<sup>20</sup>. Analysis was done by using Windows Microsoft Excel and SPSS.

## Results

Results of the present study are described in two parts. First part deals with the cross-sectional growth pattern of anthropometric traits while the second part deals with their nutritional status measured by BMI.

### Growth pattern

Cross-sectional growth of six anthropometric traits of the Bharia boys and girls are presented in Table 1 and Figure 1 respectively. The mean values of the measurements increased steadily from 4 to 18 years. Highest increment in weight was between 17-18 years (4.0 kg), 14-15 years (3.8 kg) and 5-6 years (3.3 kg) in boys. But in case of girls, the highest increment was found between 13-14 years (4.9 kg) and the next highest was between 7-8 years (4.3 kg). Total increment between 4 and 18 years was 34.1 kg for boys and 28.9 kg for girls. The in-

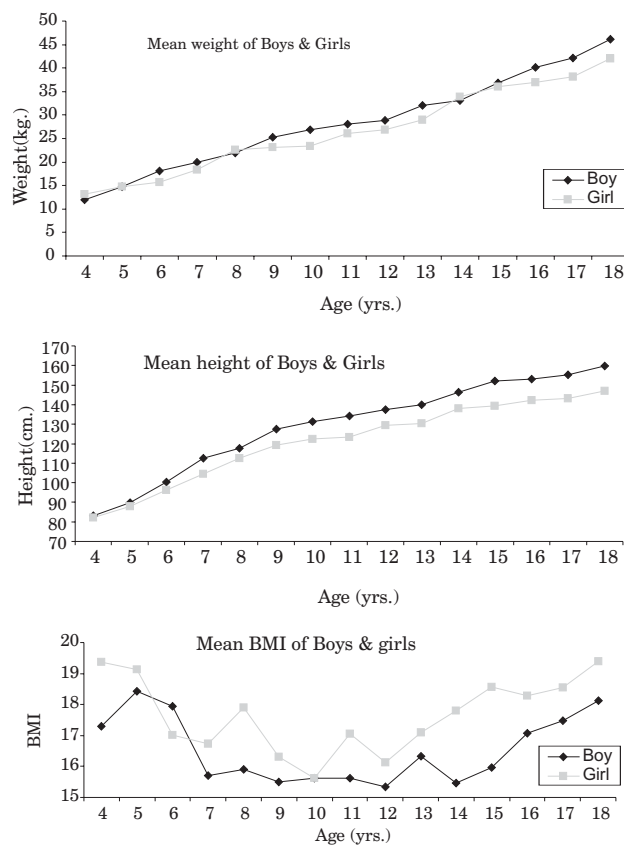


Fig. 1. Means of weight, height and BMI of Bharia Boys & Girls

TABLE 1  
MEAN AND STANDARD DEVIATION FOR ANTHROPOMETRIC MEASUREMENTS OF BHARIA BOYS AND GIRLS BY AGE

Age (yrs.)	Weight (kg)			Height (cm)			St height (cm)			Circumference (cm) of						Skin fold thickness (mm.) of						BMI							
	N	X		SD	X	SD		X	SD	X	Head		U arm		Chest		Biceps		Triceps		Sub scapular		Calf		X	SD	X	SD	
		X	SD			X	SD				X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD					
<b>Boys</b>																													
4+	24	12.0	1.05	83.2	1.01	52.2	0.82	47.2	1.08	13.5	0.79	49.3	1.34	4.5	1.10	8.4	1.01	4.3	0.93	8.3	0.93	8.3	1.23	17.3	1.59				
5+	20	14.8	1.11	89.8	3.23	54.1	1.51	48.3	1.01	14.4	1.46	52.3	2.96	4.1	0.76	7.4	0.61	4.1	0.83	7.2	0.62	7.2	0.62	18.4	2.11				
6+	18	18.1	0.70	100.4	2.53	56.2	2.12	48.5	1.11	14.4	1.57	54.3	1.15	3.0	0.64	7.2	1.00	3.7	0.74	7.1	1.29	7.1	1.29	17.9	1.06				
7+	20	19.9	1.79	112.5	2.01	60.3	3.75	48.6	0.90	14.6	0.65	54.9	1.69	2.7	0.58	5.0	1.17	3.6	0.73	5.4	0.92	5.4	0.92	15.7	1.27				
8+	21	22.0	1.02	117.6	2.22	63.2	2.56	49.0	2.30	14.6	1.11	57.3	1.26	2.5	2.08	6.0	3.53	3.7	0.53	5.6	3.87	5.6	3.87	15.9	0.70				
9+	16	25.2	0.81	127.4	2.04	66.2	1.27	49.4	1.02	15.4	1.33	63.1	2.24	2.4	0.87	5.4	0.62	3.6	0.74	5.2	0.85	5.2	0.85	15.5	0.55				
10+	18	26.9	1.43	131.2	1.60	69.1	1.19	50.2	1.06	15.5	1.26	63.3	1.88	3.0	0.87	5.3	1.87	4.2	1.16	5.4	1.21	5.4	1.21	15.6	1.01				
11+	16	28.1	1.32	134.2	1.71	72.4	1.24	51.0	0.80	15.6	0.96	63.9	1.42	3.2	0.63	5.5	1.15	4.3	1.17	5.7	0.66	5.7	0.66	15.6	0.84				
12+	16	28.9	1.29	137.4	1.79	73.1	0.86	51.3	0.94	15.9	1.95	67.1	1.43	3.4	0.83	4.1	1.18	4.6	1.25	5.2	1.17	5.2	1.17	15.3	0.95				
13+	20	32.1	1.90	140.1	1.09	74.1	0.82	51.4	0.89	16.5	1.23	68.9	2.43	3.2	1.11	4.0	0.55	4.3	1.42	6.2	1.13	6.2	1.13	16.3	0.98				
14+	20	33.1	1.30	146.4	3.51	74.4	0.73	51.5	0.77	17.5	0.85	73.5	1.65	3.5	1.05	4.5	1.17	4.6	0.71	6.3	0.91	6.3	0.91	15.5	0.95				
15+	18	36.9	1.09	152.1	1.13	75.0	1.08	51.6	0.60	18.1	1.04	74.1	0.70	3.5	1.09	4.7	0.60	4.6	1.12	6.4	1.62	6.4	1.62	19.9	0.52				
16+	20	40.1	1.93	153.2	1.00	75.6	1.74	51.6	0.74	18.0	1.52	74.2	0.69	3.8	1.21	5.2	1.23	5.4	1.24	6.4	0.95	6.4	0.95	17.1	0.86				
17+	20	42.1	1.95	155.2	2.33	75.9	1.70	51.7	0.53	18.7	0.86	74.3	0.59	4.3	1.21	6.2	1.81	6.3	1.66	6.6	1.66	6.6	1.66	17.5	0.71				
18+	16	46.1	3.26	159.7	5.85	76.0	0.83	51.9	0.66	18.7	0.96	74.7	0.76	4.3	1.22	5.1	0.36	6.2	1.24	6.5	1.62	6.5	1.62	18.1	1.73				
<b>Girls</b>																													
4+	20	13.1	1.03	82.3	1.43	51.2	1.04	45.1	1.07	14.1	0.73	48.6	1.66	4.6	1.09	9.3	0.99	5.1	1.09	8.9	1.34	8.9	1.34	19.4	1.58				
5+	18	14.7	1.56	87.8	2.64	53.1	1.69	45.2	1.49	14.6	1.07	49.5	1.85	4.3	0.79	7.7	1.05	5.0	0.93	8.2	0.94	8.2	0.94	19.1	2.22				
6+	16	15.7	1.44	96.2	2.85	54.2	1.27	46.2	1.12	14.7	1.18	52.3	1.66	5.1	1.10	7.2	0.64	4.7	0.60	9.1	1.46	9.1	1.46	17.0	2.01				
7+	20	18.3	1.36	104.4	1.81	56.4	1.47	46.5	1.10	15.4	1.47	54.4	1.70	3.1	1.13	5.3	1.26	3.6	1.04	5.3	0.70	5.3	0.70	16.7	1.14				
8+	14	22.6	1.79	112.4	2.69	61.4	1.31	48.0	0.85	17.2	1.31	60.1	0.84	3.4	0.86	6.1	1.44	3.6	0.88	5.4	0.61	5.4	0.61	17.9	1.71				
9+	16	23.2	1.28	119.2	1.21	62.4	1.26	48.6	1.18	17.4	0.79	61.5	1.43	3.4	1.08	5.2	0.85	3.7	1.00	5.3	0.57	5.3	0.57	16.3	1.04				
10+	16	23.4	1.30	122.5	1.97	63.5	1.08	49.0	1.01	17.6	1.46	61.8	1.97	3.4	1.48	5.4	2.05	4.3	1.26	6.0	2.05	6.0	2.05	15.6	1.08				
11+	18	26.0	1.33	123.5	1.81	64.0	0.95	49.4	1.33	18.0	1.78	63.3	1.55	3.3	1.03	5.5	1.14	4.5	1.09	6.3	1.38	6.3	1.38	17.1	1.01				
12+	16	26.9	1.20	129.4	2.29	69.0	1.41	49.5	0.83	18.3	0.64	64.2	1.06	4.2	1.26	5.7	1.18	4.3	1.14	6.3	1.21	6.3	1.21	16.1	1.06				
13+	20	29.0	1.93	130.3	1.98	69.5	0.67	50.0	0.76	18.4	0.68	65.4	1.18	4.3	1.07	5.7	1.76	5.3	1.12	7.3	1.64	7.3	1.64	17.1	1.29				
14+	20	33.9	1.61	138.1	2.88	71.2	0.85	51.1	0.61	20.1	0.93	70.2	1.87	4.6	1.69	6.3	1.74	5.4	1.12	7.3	1.06	7.3	1.06	17.8	1.24				
15+	20	36.0	1.67	139.3	3.15	71.2	0.94	51.3	0.77	20.1	0.95	71.2	1.28	4.6	0.97	6.3	1.01	5.4	1.14	7.3	1.41	7.3	1.41	18.6	1.11				
16+	16	37.0	1.10	142.3	1.71	71.2	0.82	51.4	0.71	20.4	0.98	76.4	2.05	4.7	1.32	8.3	1.14	6.3	1.21	8.4	1.06	8.4	1.06	18.3	0.62				
17+	18	38.1	1.50	143.3	1.73	71.3	0.77	51.4	0.67	20.4	1.09	76.6	1.91	4.5	1.20	8.3	1.09	8.3	1.83	9.4	1.81	9.4	1.81	18.6	0.96				
18+	20	42.0	3.58	147.1	2.82	71.5	0.79	51.6	0.59	20.7	1.02	79.5	1.98	4.8	1.19	8.5	1.08	7.5	1.14	9.3	1.09	9.3	1.09	19.4	1.59				

St- sitting, U arm- Upper arm

**TABLE 2**  
COMPARISON OF WEIGHT OF BHARIA BOYS AND GIRLS WITH NCHS STANDARD

Age group	Present study			NCHS			P values
	N	Mean	SD	N	Mean	SD	
	Boys						
4+	24	12.0	1.05	709	17.7	5.1	21.87**
5+	20	14.8	1.11	676	19.9	5.3	19.13**
6+	18	18.1	0.70	298	22.6	5.4	14.64**
7+	20	19.9	1.79	312	25.1	5.7	9.84**
8+	21	22.0	1.02	296	27.7	6.3	8.82**
9+	16	25.2	0.81	322	31.3	5.8	5.77**
10+	18	26.9	1.43	334	35.4	6.9	5.95**
11+	16	28.1	1.32	324	39.8	7.4	6.58**
12+	16	28.9	1.29	349	44.2	8.1	7.29**
13+	20	32.1	1.90	348	49.6	8.8	6.69**
14+	20	33.1	1.30	359	56.9	8.2	11.22**
15+	18	36.9	1.09	359	61.0	7.3	10.85**
16+	20	40.1	1.93	349	66.8	7.1	13.39**
17+	20	42.1	1.95	339	67.5	6.9	13.09**
18+	16	46.1	3.26	1758	73.9	7.0	9.63**
	Girls						
4+	20	13.1	1.03	682	17.1	4.9	20.68**
5+	18	14.7	1.56	674	19.5	5.4	18.94**
6+	16	15.7	1.44	296	21.8	5.6	15.66**
7+	20	18.3	1.36	331	24.7	6.0	14.70**
8+	14	22.6	1.79	276	28.1	6.0	10.78**
9+	16	23.2	1.28	322	32.0	7.2	9.15**
10+	16	23.4	1.30	330	35.7	7.4	10.24**
11+	18	26.0	1.33	303	41.8	8.2	12.69**
12+	16	26.9	1.20	324	47.1	7.2	13.95**
13+	20	29.0	1.93	361	51.5	6.2	20.48**
14+	20	33.9	1.61	370	54.7	6.2	16.34**
15+	20	36.0	1.67	309	56.4	6.5	16.30**
16+	16	37.0	1.10	343	58.2	6.6	12.03**
17+	18	38.1	1.50	293	59.7	6.0	13.66**
18+	20	42.0	3.58	2592	60.8	6.5	10.93**

crease in body height was highest between 6–7 years (12.1 cm) followed by 13–14 years (6.3 cm) in boys. In girls, the highest increment was noticed between 5–6 years (8.4 cm), followed next in between 6–7 years (8.2 cm). In the 13–14 years the increment was 7.8 cm. Total increment between 4 and 18 years was 76.5 cm for boys and 64.85 cm for girls.

The mean values of sitting height indicated higher sex differences than body height (boys: 23.8 cm girls: 20.3 cm). Highest increment was noted between 6–7 years (4.1 cm) followed by 8–9 years (3.0 cm) in boys. In girls, highest value was noted between 11–12 years (5.1 cm) and 7–8 years (5.1 cm). In case of head circumference, highest increment was between 4–5 years (2.8 cm) and between 9–10, followed by 10–11 years (0.8 cm) in boys.

During 7–8 years highest increment in head circumference was noticed among the Bharia girls (1.5 cm). The second highest increment in head circumference was observed in between 13 and 14 years (1.1 cm). Total increment in head circumference between 4 to 18 years was 6.4 cm for boys and 6.5 cm for girls. Thus the total increment in case of this measurement is much lower than the earlier measurement (sitting height).

Like head circumference, the pace of increment in upper arm circumference was low. Total increment (i.e. between 4 and 18 years) in case of upper arm circumference was 5.2 cm for boys and 6.6 cm for girls. Highest increment was between 4–5 years (0.9 cm) followed by 8–9 years (0.75 cm) in boys. In girls, highest increment was between 7–8 years (1.8 cm) and 13–14 years (1.7 cm) re-

**TABLE 3**  
COMPARISONS OF HEIGHT OF BHARIA BOYS AND GIRLS WITH NCHS

Age group	Present study			NCHS			P values
	N	Mean	SD	N	Mean	SD	
				Boys			
4+	24	83.2	1.01	709	106.0	2.4	11.59**
5+	20	89.8	3.23	675	112.6	3.0	7.58**
6+	18	100.4	2.53	298	119.2	3.7	5.15**
7+	20	112.5	2.01	312	125.1	4.2	5.49**
8+	21	117.6	2.22	296	129.8	5.2	5.01**
9+	16	127.4	2.04	322	135.8	6.3	3.87**
10+	18	131.2	1.60	334	140.9	7.8	4.61**
11+	16	134.2	1.71	324	146.4	10.0	4.67**
12+	16	137.4	1.79	349	152.2	11.1	5.50**
13+	20	140.1	1.09	350	159.2	11.6	6.73**
14+	20	146.4	3.51	359	167.1	11.9	8.93**
15+	18	152.1	1.13	359	170.8	11.2	9.12**
16+	20	153.2	1.00	349	174.5	11.9	10.01**
17+	20	155.2	2.33	338	175.5	12.2	9.29**
18+	16	159.7	5.85	1755	176.6	13.4	8.29**
				Girls			
4+	20	82.3	1.43	678	105.0	2.4	7.43**
5+	18	87.8	2.64	673	112.0	3.2	6.34**
6+	16	96.2	2.85	296	118.3	3.6	6.74**
7+	20	104.4	1.81	331	124.2	4.5	6.34**
8+	14	112.4	2.69	276	129.8	6.3	3.26**
9+	16	119.2	1.21	322	135.7	7.5	4.68**
10+	16	122.5	1.97	330	141.5	8.4	5.85**
11+	18	123.5	1.81	303	148.1	11.0	6.08**
12+	16	129.4	2.29	324	154.6	10.7	7.54**
13+	20	130.3	1.98	361	158.8	11.7	8.58**
14+	20	138.1	2.88	370	160.9	11.2	8.29**
15+	20	139.3	3.15	309	163.2	11.6	7.85**
16+	16	142.3	1.71	343	162.2	11.7	7.24**
17+	18	143.3	1.73	293	162.7	13.3	6.88**
18+	20	147.1	2.82	2592	163.0	12.8	6.57**

spectively. Unlike upper arm circumference, the pace of increment in chest circumference was 25.4 cm among the boys and 30.9 cm in girls. The maximum gain in case of this measurement was between 8–9 years (5.8 cm) and between 13–14 years (4.6 cm) for boys. Among the Bharia girls the maximum increment in chest circumference was between 7–8 years (5.7 cm) and 15–16 years (5.2 cm).

Means of skinfold measurements (biceps, triceps, subscapular and calf) follow a different course i.e. a general trend of decrease from 4–9 years for biceps and subscapular, 4–12 years for calf and 4–15 years for triceps skinfold thickness among the Bharia boys (Table 1). The only exception in this trend was noted in 8 years for the

triceps skinfold. Whereas, among the girls, a general trend of decrease from 4–11 years for biceps, 4–13 years for triceps and 4–9 years for subscapular and calf skinfold was observed (Table 1). The exceptions of this trend was noted in 6 years for triceps and calf skinfold and 8 years for triceps skinfold.

The weight and height of the present data was compared with NCHS growth reference and all the anthropometric measurements were significantly lower among the Bharia boys and girls (Tables 2 and 3).

The BMI of Bharia children from ages 4 to 18 years is shown in Figure 1. The distance curve of BMI is downwards at the juvenile age and rose upwards from the beginning of adolescence.

**TABLE 4**  
PERCENTAGE DISTRIBUTIONS OF BMI VALUES OF BHARIA BOYS AND GIRLS (ACCORDING TO INDIAN STANDARD)

Girls			Age (yrs.)	Boys		
<13.0 (Severe)	≥ 13.0 – ≤ 15.0 (Moderate)	>15.0 (Normal)		>15.0 (Normal)	≥ 13.0 – ≤ 15.0 (Moderate)	<13.0 (Severe)
%				%		
0.0	0.0	100.0	4+	95.8	4.2	0.0
0.0	5.6	94.4	5+	95.0	5.0	0.0
0.0	12.5	87.5	6+	100.0	0.0	0.0
0.0	0.0	100.0	7+	80.0	20.0	0.0
0.0	0.0	100.0	8+	100.0	0.0	0.0
0.0	0.0	100.0	9+	100.0	0.0	0.0
0.0	12.5	87.5	10+	83.3	16.7	0.0
0.0	6.3	97.7	11+	87.5	12.5	0.0
0.0	0.0	100.0	12+	81.3	18.8	0.0
0.0	0.0	100.0	13+	100.0	0.0	0.0
0.0	0.0	100.0	14+	90.0	10.0	0.0
0.0	0.0	100.0	15+	100.0	0.0	0.0
0.0	0.0	100.0	16+	100.0	0.0	0.0
0.0	0.0	100.0	17+	100.0	0.0	0.0
0.0	0.0	100.0	18+	87.5	12.5	0.0

**TABLE 5**  
BMI VALUES OF BHARIA BOYS (ACCORDING TO INTERNATIONAL STANDARD)

Girls				Age (yrs.)	Boys			
Grade III (<16.0)	Grade II (16.0-<17.0)	Grade I (<17.0-18.5)	Normal (Above 18.5)		Normal (above 18.5)	Grade I (<17.0-18.5)	Grade II (16.0-<17.0)	Grade III (< 16.0)
5.0	0.0	20.0	75.0	4+	20.8	41.7	25.0	12.5
5.6	0.0	33.3	61.1	5+	50.0	25.0	10.0	15.0
25.0	18.8	37.5	18.8	6+	38.9	33.3	27.8	0.0
35.0	15.0	50.0	0.0	7+	0.0	20.0	20.0	60.0
14.3	21.4	14.3	50.0	8+	0.0	4.8	47.6	47.6
37.5	43.8	12.5	6.3	9+	0.0	0.0	25.0	75.0
68.8	12.5	18.8	0.0	10+	0.0	66.7	16.7	72.2
27.8	16.7	44.4	11.1	11+	0.0	6.3	37.5	56.3
50.0	31.3	18.8	0.0	12+	0.0	6.3	18.8	75.0
25.0	20.0	40.0	15.0	13+	0.0	25.0	40.0	35.0
5.0	10.0	70.0	15.0	14+	0.0	10.0	25.0	65.0
0.0	5.0	35.0	60.0	15+	0.0	5.6	33.3	61.1
0.0	0.0	56.3	43.8	16+	5.0	50.0	45.0	0.0
0.0	0.0	50.0	50.0	17+	5.0	75.0	20.0	0.0
0.0	10.0	20.0	70.0	18+	43.8	43.8	0.0	12.5

According to Indian standard of age-specific BMI very few boys and girls are moderately malnourished. Most of them are in normal category (Table 4). But according to the NCHS growth reference, boys between 7-15 years (50 to 75 %) were in 'Grade III' degree of Chronic Energy deficiency and the number of normal is very few. In girls, the normal are few in number from age 5 to 14 but after 14, they are mostly normal (Table 5).

### Discussion

Several studies on growth and nutritional status were done in rural or urban India<sup>4-15</sup>. Studies on primitive tribes are very few<sup>2</sup> and there is no report on the growth or nutritional status of Bharia children. The present study examined the growth and nutritional status of children from 4-18 years and an increase in anthropometric



measurements was observed with increase in age. Weight and height of the Bharia boys and girls were higher than Kamar boys and girls, another primitive tribe of central India. The height and weight of the Kamar boys and girls were also lower than the Indian growth reference<sup>21</sup>. Another growth study on the Sugalis- a tribal community of south India also revealed shorter and lighter boys and girls between 1–20 years than the boys and girls of well to Indian families<sup>14</sup>. However, the Bharia boys and girls had higher height and weight than the Indian growth reference. However, when the anthropometric measurements were compared with the NCHS growth reference<sup>20</sup>, the pattern of growth of both Bharia boys and girls indicated significant retardation.

Age-specific BMI changed substantially with age and it followed a consistent pattern, falling during pre-school age and rising again in adolescence. In case of nutritional assessment, the Bharia children were mostly normal and obesity was absent. Few of them indicated moderate malnourishment. Therefore, the Bharia boys and girls have better growth and nutrition status when compared with some other tribal boys and girls of nearly the same

age group. But when compared with the NCHS growth references<sup>20</sup> both boys and girls are malnourished during childhood and after adolescence, the number of under nourished boys was greater than girls. Nutritional anthropometry of girls was normal after the onset of puberty, which may be due to hormonal changes. The boys do more physical work than girls after puberty. Girls usually stay at home due to social norms and customs.

From the above discussion, it can be attributed that the poor growth pattern of the Bharia children in comparison to the international standard may be due to the poor socio-economic condition of that tribe. Most of the Bharia populations of Madhya Pradesh live in forest tracts, without modern health care and transport facilities. Hence, the Bharia of the study area face many health and nutritional hazards due to poverty, illiteracy and ignorance. The poor growth status of the Bharia children requires an immediate attention in the implementation of short-term supplementary feeding programmes, general medical, and awareness and health care facilities.

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## RAST I PREHRAMBENI STATUS BAHRIA – PRIMITIVNOG PLEMENA IZ MADHYA PRADESHA

### SAŽETAK

Ova istraživanja rađena su kako bi proučili rasti i prehrambeni status Bahria, primitivnog plemena iz centralne Indije. Istraživanja su obuhvatila 551 djece (283 dječaka i 268 djevojčica) u dobi između 4 i 18 godina. Uzete antropometrijske mjere bile su: težina i visina tijela, sjedeća visina, obujam glave, gornjeg dijela ruke, pluća, te kožni nabori tricepsa, bicepsa kao i subskapularni kožni nabori. Sve antropometrijske mjere osim mjera kožnih nabora, povećavale su se s godinama. Indeks tjelesne mase opada u predškolskoj dobi, a raste u adolescentskoj dobi. Prema Indijskim standardima indeks tjelesne mase je bio u granicama normale, no u usporedbi sa međunarodnim prehrambenim standardima kod oba spola ustanovljena je malnutricija. Dječaci postaju podhranjeni nakon adolescentske dobi, dok djevojke imaju normalan slijed razvoja.