Growth and Nutritional Status of the Gond tribe of Chhattisgarh, India

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Abstract- Objective - To assess the growth and nutritional status of the Gond children.

Methods - A cross sectional study of the physical growth was conducted on 409 Gond children (194 boys and 215 girls), aged 12 to 17 years, in the Bastar district of Chhattisgarh. The study aimed to find out the growth pattern of the Gond children, which is considered to be a primitive tribe of Chhattisgarh, India and was compared with other Indian tribe and the official data of NCHS1987, CDC 2007-2010 & all India (ICMR 2010). Anthropometric measurements included height, weight, sitting height, and measurements of the biceps, triceps and subscapula, supraspinale and calf skinfolds.

Results - All anthropometric measurements except skinfold thickenness exhibited uniform increase with age in both sexes. Gond boys showed higher anthropometric values than girls in height, weight and sitting height whereas in all the skinfolds measurements mean values of girls were higher as compared to boys. The Gond children showed lower mean values as compared to NCHS &CDC 2007-2010 where as height & weight were at par with ICMR 2010 and higher than Kamar tribe. Around 47% boys & 72% girls reported to be in various category of malnutrition.

Conclusion - Poor socio-economic status of this primitive tribe may be one of the reasons for this poor nutritional status & growth pattern as compared to NCHS 1987. However, further study can be conducted to get more insight

Key Words – Growth Status and Nutritional Status, Gond Tribe.

INTRODUCTION

The nutritional status of growing children in a population indirectly determines the standard of living. Nutritional inadequacy slows down the growth of children and which is observable response. Therefore, determination of nutritional status may prove to be a powerful tool to identify the health status of any population.

Tribal populations are isolated from general population with their own physical, socioeconomic and cultural environment. They are the most backward section of the society, due to various factors like ignorance, poverty, lack of development in the inaccessible areas, illiteracy and exploitation. Several studies have documented a close relationship between tribal ecosystem and their health and nutritional status.[1] The habitat of the tribe has conferred certain advantages. The dietary habits and other related modes of life contributed to their better nutritional and health status in some tribal groups, while in other groups these practices are not conducive to good health. [2]

Many studies based on published data have indicated patterns of anthropometric variation along ethnic, geographic, latitude, longitude and altitude, nutrition and several confounding variables.[3] This work is an attempt to study the growth status through anthropometric measurement of Gond, children a primitive tribe of Bastar district, Chhattisgarh state and to compare their growth & nutritional status with other studies.

The Gonds are one of the most famous and important tribes in India, known for their unique customs and traditions. They are mainly a nomadic tribe and call themselves as Koytoria. The term 'Gond' is derived from the Telugu word 'Konda' which means hill. Gond Tribes are primarily found in Madhya Pradesh, Chhattisgarh, eastern Maharashtra, northern Andhra Pradesh and Western Orissa. With a population of over

4 millions, Gonds also form the largest tribal group in central India[4], which is around 55% within the tribal population.[5] In Chhattisgarh Gond population are found in Bastar, Dantewada, Kanker, Suurguja and Raipur districts. The total population of Gond is 42,98,404 consisting of 21,20,974 males and 21,77,430 females (Census of India 2011).[6] The staple food of Gonds tribes in Bastar district are Kodo or Kutki (millet), they are usually meat consumers.

MATERIAL AND METHODS

The present study was based on cross-sectional samples of 409 apparently healthy Gond children (194 boys and 215 girls), aged 12+ to 17+ years. The subjects were selected from various tribal schools of Bastar district, Chhattisgarh. Anthropometric measurements such as body weight, height, sitting height, biceps, triceps, subscapular and calf thickness were the variable measured, according to the standard technique (Weiner and Lourie 1981 and Singh and Bhasin 1987).[7,8] 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 skin fold caliper was used to measure the skinfold thickness to the nearest mm.

Height and weight are basic measurement to under stand the growth pattern and the nutritional status, separately as well through BMI (WHO 2004).[9] Skinfold thickness are indirect but authentic method of assessment of body fat percentage in body.

Data on Anthropometric measurements were analyzed using descriptive statistics. Weight and height of the present data were compared with NCHS (1987)[10], ICMR (2010)[11,12], CDC (2007-2010)[13] and Mitra et al.(2002).[14] Analysis was done by using Windows Microsoft Excel and SPSS.

RESULT

TABLE 1. Descriptive Statistics of Weight, Height and Sitting Height of Gond Boys and Girls.

Girls							
Age group	N	Weight(kg)		Height (cm)		Sitting height (cm)	
		Mean	SD	Mean	SD	Mean	SD
12+	28	32.6	5.91	137.6	7.7	53.0	4.90
13+	39	36.0	5.59	142.7	4.9	56.6	2.71
14+	37	37.0	5.72	146.7	5.6	55.7	3.70
15+	40	39.9	4.22	148.5	5.8	58.3	3.23
16+	35	41.7	4.43	150.0	4.8	58.7	3.16
17+	36	42.3	3.57	150.6	5.0	60.7	2.69
Boys							
12+	30	36.1	7.56	147.9	9.3	57.9	9.08
13+	35	38.0	7.69	148.0	8.4	58.1	7.50
14+	30	46.6	6.01	156.5	6.7	63.5	4.49
15+	35	47.7	5.24	158.7	6.7	65.5	1.00
16+	31	51.7	4.65	161.0	6.2	64.9	6.16
17+	33	52.3	5.98	163.3	5.3	64.8	4.00

Table 1 Steady increment in mean weight was observed in the present study from 12+ to 17+ years of age. In case of girls minimum weight was 32.6 kg in 12+ year & maximum 42.3 at the age of 17+ years, difference of 9.7 kg was observed between 12+ to 17+ years. Mean weight of boys at 12+ was recorded to be 36.1 kg where as at 17+ year the weight was 52.3 kg weight gain of 16.2 kg was recorded in boys from 12+ to 17+ years. Higher weight was noted in boys as compared to girls in all the age.

Mean height of 12+ year girls was 137.6 cm which increased gradually and was 150.6 cm at the 17+ year, increase of total 13 cm was recorded. Growth spurt was noted between 12+ to 13+ years (5.14 cm). In boys the increase of height from 12+ (147.9 cm) to 17+ (163.3 cm) was 15.4 cm.

Mean value for sitting height were 53 cm (12+) & 60.7 (17+) for girls &57.9 (12+) & 64.8 (17+) for boys. Total increment of 7.7 & 7.6 cm from 12+ to 17+ years were observed for girls & boys respectively.

TABLE 2. Descriptive Statistics of Skin fold measurement of Gond Boys and Girls.

Age group	N	Biceps		Triceps		Sub scapular		Suprailac		Calf	
Girls											
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
12+	28	4.99	2.19	6.46	2.50	6.87	2.39	5.62	2.39	12.1	3.64
13+	39	4.72	2.05	9.27	3.24	8.21	2.37	7.13	2.75	12.9	3.39
14+	37	5.24	2.28	8.20	2.79	8.03	2.14	7.16	2.47	13.3	3.97
15+	40	5.11	2.33	8.70	1.98	8.42	1.68	8.05	2.59	12.9	3.39
16+	35	4.65	1.74	10.0	3.50	8.66	2.95	7.56	2.65	13.6	3.69
17+	36	4.25	1.72	9.36	2.82	8.67	2.69	8.00	2.64	13.4	4.78
Boys											
12+	30	2.63	.41	4.52	.96	5.03	1.31	3.60	1.53	8.45	2.52
13+	35	2.88	.81	5.27	1.91	5.10	1.39	3.75	1.76	8.45	2.06
14+	30	3.16	1.54	5.84	1.55	5.99	1.38	4.35	1.41	10.1	3.00
15+	35	2.68	.55	5.52	1.56	5.99	1.19	4.16	1.28	8.54	2.40
16+	31	2.83	.42	5.71	1.49	6.51	1.56	4.18	1.10	7.64	1.85
17+	33	3.04	.99	5.73	1.21	7.02	1.38	4.96	2.42	7.65	2.76

Descriptive statistics of skinfold measurement are presented in table 2 all the skin fold measurement showed increment from 12+-17+ years. Mean values of all the skin fold measurement were higher in girls as compared to boys through out 12+ to 17+ years, highs SD value in measurements show greater inter individual variability. Maximum increment observed in biceps triceps, Sub scapular, Suprailiac & Calf skinfold for boys were recorded 3.54 mm, 1.8 mm, 2.74 mm & 4.5 mm respectively, whereas in girls increment recorded to be 16 mm, 1.32 mm, 1.99 mm, 1.36 mm & 1.6 mm respectively from 12+ to 17 +yrs.

TABLE 3. Test of significance of various anthropometric measurement between the Gond tribe boys and girls

Age Group	Weight	Height	BMI	Sitting height	Biceps	Triceps	Sub scapular	Suprailac	Calf
12+	1.96	2.30*	7.20**	2.52*	5.79**	3.93**	3.65**	3.85**	4.46**
13+	1.23	4.44**	1.30	1.12	4.95**	6.37**	6.77**	6.19**	6.10**
14+	6.62**	5.84**	3.97**	7.73**	4.25**	4.13**	4.50**	5.53**	3.59**
15+	7.10**	5.60**	3.54**	4.30**	6.02**	7.63**	7.11**	8.02**	6.40**
16+	8.95**	6.42**	4.43**	5.27**	5.65**	6.42**	3.62**	6.60**	8.19**
17+	8.52**	8.16**	3.96**	5.02**	3.51**	6.80**	3.14**	4.97**	6.11**

SD – Standard Deviation,

*Significant at 5% and ** Significant at 1% level

Comparison of mean weight, height, sitting height & skin fold measurements between Gond boys & girls are shown in table 3. Statistically significant difference was observed in height between Gond boys & girls, boys being tall than girls at all age group (P<0.01). In case of weight higher mean values are seen in the boys in all the age group and statistically significant difference was observed in 14+,15+, 16+ & 17+ years of age (P<.01). In sitting height statistically significant difference was observed at all age group between boys & girls (P<0.01) except age group 13+. Mean values of biceps, triceps, sub scapular, supraillae & calf skinfold measurements were higher in girls in all the age group, statistically significant difference was noted at (P<.01).

TABLE 4. Distribution of Body Mass Index value of Gond boys and girls (According to WHO 2004 Standard)

Boys					Girls			
Normal Range (18.50-24.99)	Mild Thinness (17.00-18.49)	Moderate Thinness (16.00-16.99)	Severe Thinness <16.00	Age in Years	Normal Range (18.50-24.99)	Mild Thinness (17.00-18.49)	Moderate Thinness (16.00-16.99)	Severe Thinness <16.00
4 (13.3)	7 (23.3)	2 (6.6)	17 (56.6)	12+	4(14.2)	2(7.1)	3(10.7)	19 (67.8)

7 (20)	11 (31.4)	9 (25.7)	8 (22.8)	13+	6(15.3)	10 (26.4)	5 (12.8)	18(46.1)
19 (63.3)	6 (20)	4 (13.3)	1 (3.3)	14+	12 (32.4)	5 (13.5)	8(21.6)	12(32.4)
22 (62.8)	9 (25.7)	3 (8.5)	1 (2.8)	15+	11(27.5)	13(32.5)	10(25)	6(15)
26 (83.8)	4 (12.9)	1 (3.2)	0	16+	15(42.8)	9(25.7)	6(17.1)	5(14.2)
24 (72.7)	9 (27.2)	0	0	17+	12(33.3)	15(41.6)	6(16.6)	3(8.3)
102 (52.5)	46 (23.7)	19 (9.7)	27 (13.9)	Total	60(28.0)	54(25.1)	38 (17.6)	63 (29.3)

Fig 1. Body Mass Index value of Gond boys and girls (According to WHO 2004 Standard)
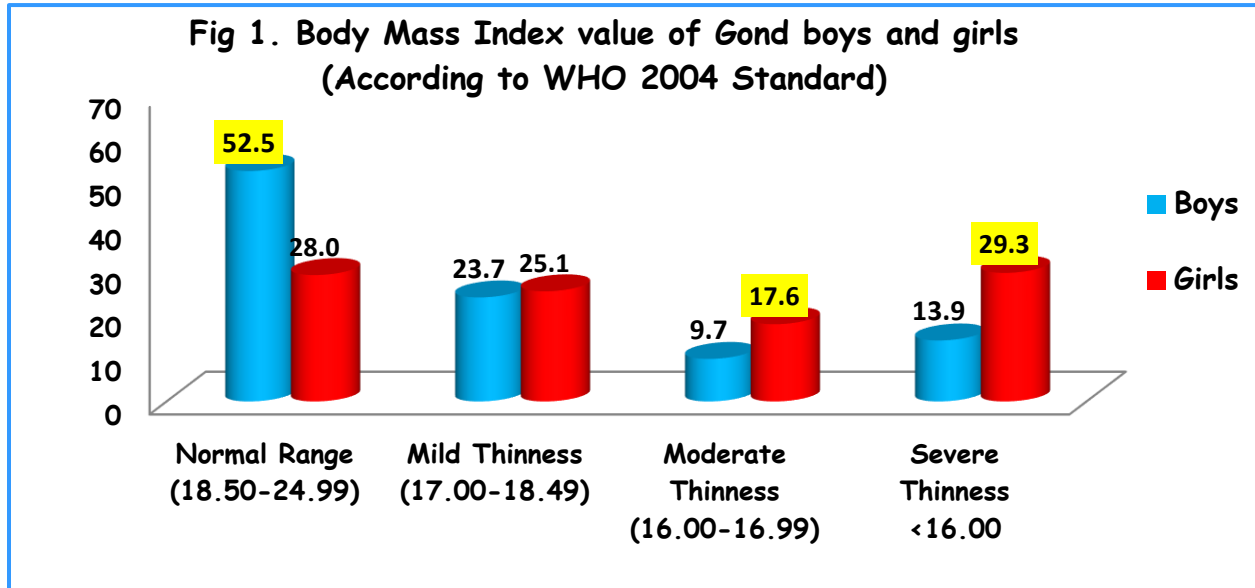
Table 4 & fig 1. shows the BMI according to WHO 2004 standard of malnutrition. BMI reveals that 52.5 % boys and 28.0% girls are classified under the normal category. 23.7 % boys and 25.1% girls suffered mild thinness 9.7% boys and 17.6 % girls suffered from moderate thinness and 13.9% boys and 29.3% girls suffered with severe thinness category of malnutrition. Distribution of girls & boys in various nutritional categories showed different trend for different age group at age 12+ 56.6 % of boys 67.8 % of girls fell in severe malnutrition categories with increases in age malnutrition status in boys and girls improved. Which is evident from the reduced number of boys and girls in severe malnutrition categories.

TABLE 5. Comparison of mean of Weight of present Study with Other Studies

Age in Years	Present study	ICMR 2010	NCHS 1987	M.Mitra 2002	CDC 2007-2010
Boys					
12+	36.1	29.2	44.2	24.8	49.1
13+	38.0	32.6	49.6	25.7	54.0
14+	46.6	36.7	56.9	26.9	64.1
15+	47.7	41.1	61.0	31.0	66.9
16+	51.7	44.2	66.8	34.1	68.8
17+	52.3	47.1	67.5	37.2	72.9
Girls					
12+	32.6	29.6	47.10	23.60	49.0
13+	36.0	33.6	51.50	25.43	55.8
14+	37.0	37.2	54.70	27.25	58.5
15+	39.9	39.8	56.40	29.84	58.1
16+	41.7	42.0	58.20	31.82	61.3
17+	42.3	43.2	59.70	34.00	62.4

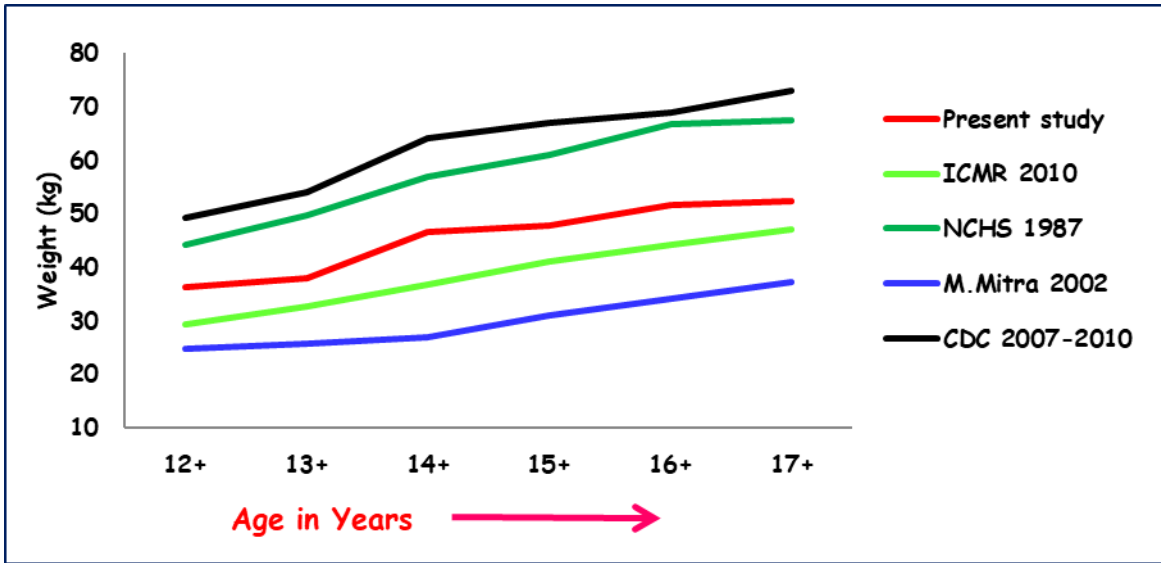FIG 2. Comparison of mean of Weight of Boys in present Study with Other Studies

FIG 3. Comparison of mean of Weight of Girls in present Study with Other Studies
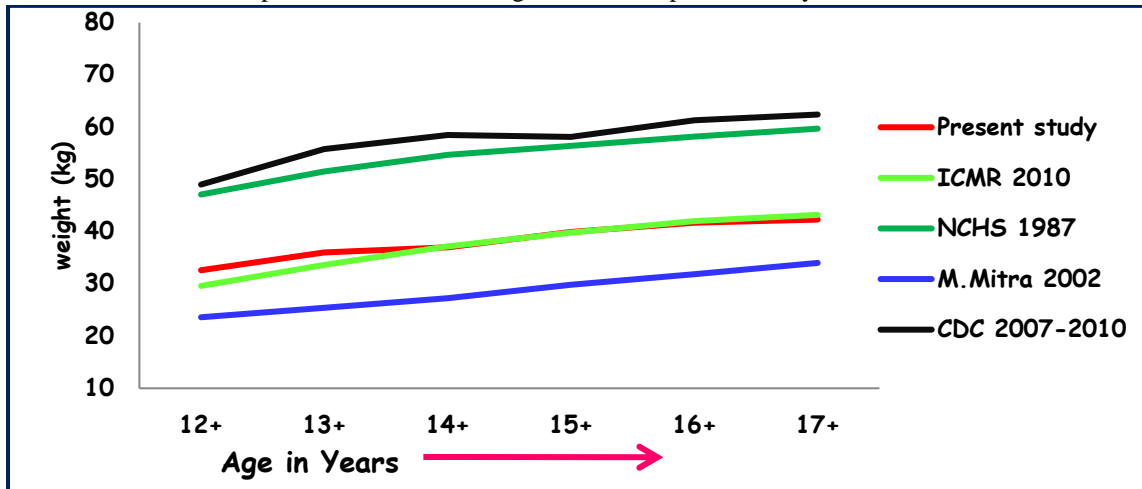

Table 5 & fig 2-3. shows the comparison of body weight of boys and girls of present study with other studies ie. reference data of NCHS (1987), ICMR (2010), CDC (2007-2010) and Mitra et al. (2002). It is revealed from the table that present study mean were lower than NCHS (1987), and CDC (2007-2010) and higher than ICMR (2010) and Mitra et al. (2002).

TABLE 6. Comparative Analysis of Height of present Study with Other Studies

| Age in Years	Present study	ICMR 2010	NCHS 1987	M.Mitra 2002	CDC 2007-2010
Boys					
12+	147.9	137.4	152.2	132.5	155.5
13+	148.0	142.7	159.2	137.1	161.6
14+	156.5	148.5	167.1	140.5	169.0
15+	158.7	153.8	170.8	144.7	172.8
16+	161.0	156.9	174.5	151.8	175.0
17+	163.3	159.7	175.5	155.9	176.5
Girls					
12+	142.7	137.6	154.6	130.6	156.1
13+	147.3	142.7	158.8	133.7	160
14+	147.7	146.7	160.9	140.3	161.6
15+	150.6	148.5	163.2	145	162.9
16+	152.1	150.0	162.2	147.9	162.2
17+	153.2	150.6	162.7	150.1	163.1
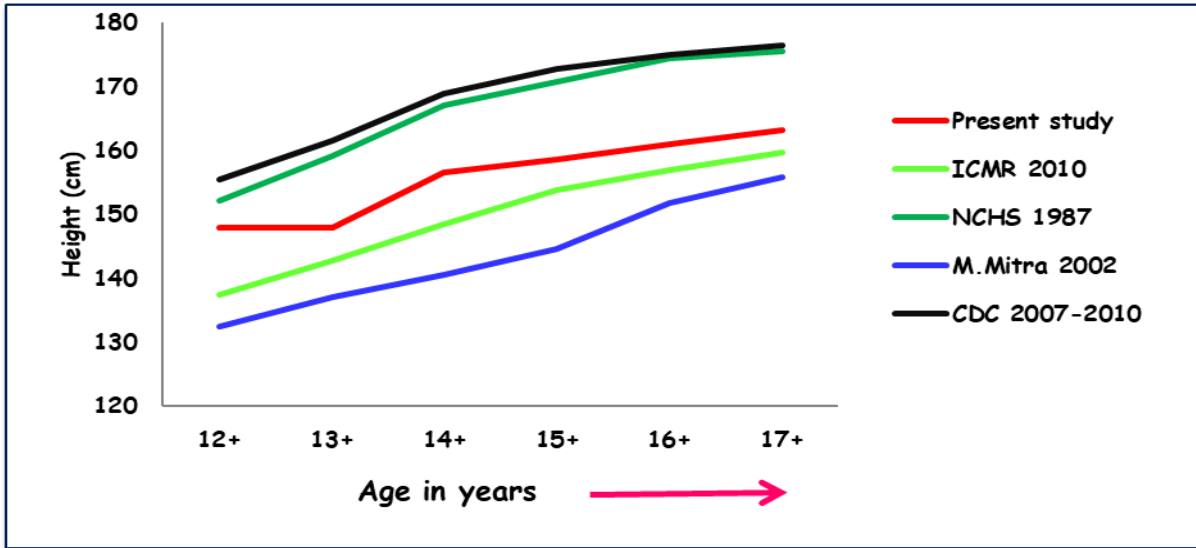
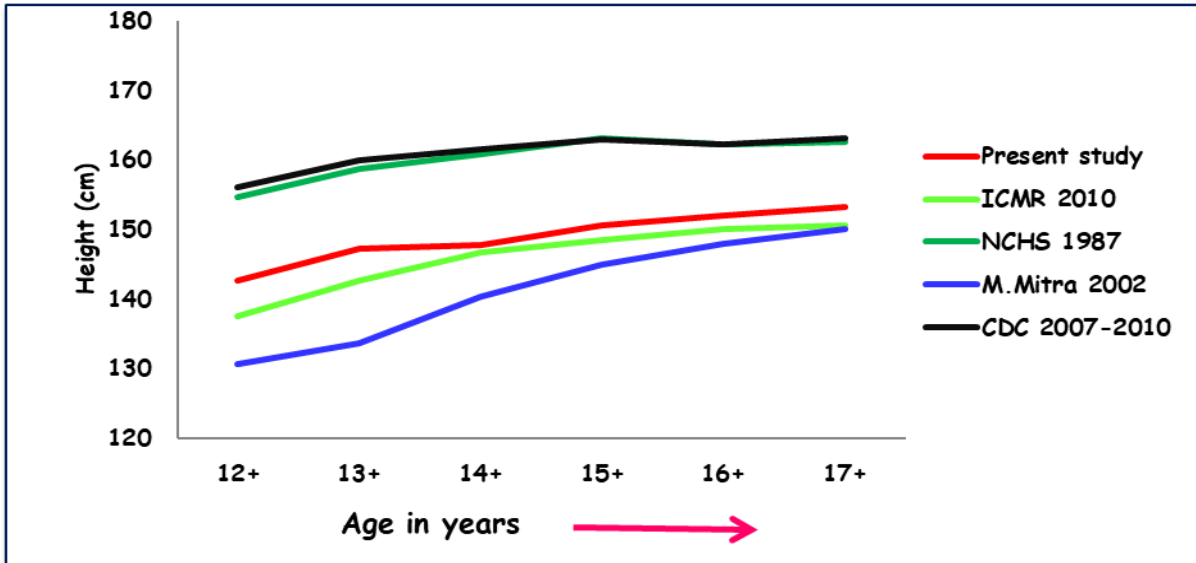FIG 4. Comparison of mean of Height of Boys of   present Study with Other Studies

FIG 5. Comparison of mean of Height of Girls in present Study with Other Studies

Height of the boys and girls of present study were compared with reference data it was revealed that means of present study were lower than NCHS (1987), and CDC (2007-2010) and higher than ICMR (2010) and Mitra et al. (2002).

TABLE 7. Period of Occurrence of Adolescent Spurt As Indicated By »Hpv« In Different Body Measurements Among the Gond tribe of Chhattisgarh

Measurement	Boys adolescents spurt		Girls adolescents spurt	
	Age Group	HPV	Age Group	HPV
Body weight	13-14	8.6 kg	12-13	3.4 kg
Height	13-14	8.5 cm	12-13	4.6 cm
Sitting height	13-14	5.4 cm	12-13	3.6 cm
Biceps	14-15	0.48 mm	15-16	0.46 mm
Triceps	12-13	0.75 mm	12-13	2.81 mm
Sub Scapular	13-14	0.89 mm	12-13	1.34 mm
Supraspinale	16-17	0.78 mm	12-13	1.51 mm
Calf	13-14	1.65 mm	12-13	0.80 mm

HPV – Highest peak velocity

DISCUSSION

The present study examined growth and nutritional status of children from 12+-17+ years and increase in all anthropometric measurements under study was observed with increase in age. Weight and height of the Gond boys and girls were higher than Kamar boys and girls(Mitra et al 2002),[14] another primitive tribe of central India where as it was lower as compared to CDC 2007-2010 & NCHS 1987 data.

The growth pattern of Gond boys and girls showed increasing trend in almost all the variables, the rate of increase showed different pattern for different variables. Highest peak velocity corresponding to the occurrence of growth spurt was observed between 12+ - 15+ years in girls and 12+ - 16+ years in boys. Among the boys out of eight body measurements five measurements (Weight, Height, Sitting height, Sub Scapular, Calf) showed the highest peak velocity between 13-14 years indicating an adolescent spurt in these measurements. Highest peak velocity was observed in the 12+ -13+ for Triceps Skinfold at 14+ - 15+ for Biceps Skinfold and at 16+ - 17+ for Supraspinale Skinfold. In case of the girls, highest peak velocity was observed in seven measurements (Weight, Height, Sitting height, Triceps, Sub Scapular, Supraspinale, Calf skinfold) out of eight, between 12+-13+ years. One measurements (Biceps skinfold) indicated highest peak velocity in the 15+-16 + years

Present study shows that 28.8% girls were found to be normal. Deshmukh et al (2006)[15] in their study of adolescents in rural Wardha district reported that 44% of adolescents girls to be in normal category of nutrition status. Nagamani et al (2015) [16] in another study on adolescent Girls in Urban Slums of Visakhapatnam City, Andhra Pradesh State reported that 35% girls were chronic energy deficient (BMI<18.5). 80% of the girls were undernourished in a study done by Kalhan et al (2009) [17] on adolescent girls of rural Haryana and 75.5% in a study done by Guduri et al (2014) [18] on early adolescents girls (11-14) attending Government school of Visakhapatnam city.

Present study shows that 47.8% boys were underweight. Hunshal et al. (2010)[19] in a study on subjects of 10 to 13 years in Dharwad district of Karnataka state have reported 82.6% of adolescents boys to be underweight. Similarly Prashant & Shaw (2009)[20] reported 42.6% & 22.9% prevalence of under weight in girls as per NCHS & Indian standard respectively.

CONCLUSION

Height, weight, sitting height and skinfold measurement (Triceps, Biceps, Sub Scapular, Supraspinale, Calf skinfold) of Gond boys & girls were similar to ICMR 2010 and lower as compared to NCHS 1987 & CDC 2007-2010 standards. The Gond tribe when compared to other tribe Chhattisgarh it was found that the height, weight, sitting height and skinfold measurement (Triceps, Biceps, Sub Scapular, Supraspinale, Calf skinfold) of boys and girls of Gond tribes were higher. It is also concluded that 47.3% of boys 72 % girls suffered from different categories of malnutrition it was also observed that the malnutrition status improved with advancement of age.

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