ANTHROPOMETRIC STUDY OF CEPHALIC INDEX OF GOND TRIBE AND NON-TRIBE BOYS OF MUNGELI DISTRICT, CHHATTISGARH STATE, INDIA

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ABSTRACT

Introduction: Cephalic index, the percentage of breadth to length in any skull. Cephalic index is useful in establishing ethnic differences and affiliations and very useful to find out racial differences.

Materials and Methods: The present study consisted of acquisition of anthropometric data for Gond tribe and non-tribe boys from the same area. A total number of 279 Gond tribe boys and 282 non tribe boys were examined for the Head length & Head Breadth using spreading caliper. The index was calculated from measurement of the diameters of the skull. Descriptive analysis was carried out and comparative statistics was used to observe difference between Gond tibe boys and Non-tribe boys on various anthropometric measurements and mean, standard deviation, student, t- test, p value was computed to see the relationship between anthropometric variables.

Results: Most of the Gond Tribe boys were Mesocephalic (26%) and Brachycephalic (31%), while most of the Non-Tribe boys were Mesocephalic (27%), Brachycephalic (27%) and hyper Brachycephalic (27%). Few among both Gond tibe boys and Non-tribe boys were Hyperdolicocephalic and Ultra-brachycephalic.

Conclusion: In the present study we conclude that not a single head form can be defining attributes of the two groups. As head form of both GT and NT were overlapping most of them were Mesocephalic & Brachycephalic type. There is need to conduct anthropometric & genetic studies to backup these observed anthropometric similarities. Such data is of great medico legal and forensic importance which indicates that Cephalic Index can be used as marker of ethnicity, and race as it is an important parameter in forensic medicine, anthropology and genetics to know the sex and racial differences between individuals.

KEY WORDS: Cephalic Index, Length of the head, Width of head. Gond Tribe, Non-Tribe.

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INTRODUCTION

'India has several socially disadvantaged communities among which schedule tribes are the most deprived ones' [1]. Chhattisgarh is a comparatively young state in the history of India that came into independent existence only in the new millennium. Mungeli is one of the districts of Chhattisgarh. Patharia is one of the blocks of Mungeli district [Fig-1]. The population of Chhattisgarh is notable for the high proportion of Scheduled Tribes. Of the total population of Chhattisgarh, tribals constitute at least 34 percent, which is a significantly high percentage. Among the tribes of Chhattisgarh Gond tribe is considered as the most prominent one.' The oldest and most populous tribes of Chhattisgarh are the Gonds' [2].

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' this means hill. Gond Tribes are primarily located 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.' [2].

Fig. 1: Map of Chhattisgarh showing location of Patharia block Mungeli district.



Map not for scale Source: Modified from the Administrative Map of Chhattisgarh [www.veethi.com]. A few studies based on published data have indicated patterns of anthropometric variation along ethnic, geographic, latitude, longitude and altitude, nutrition and several confounding variables [1-6].

Anthropometric data can be useful for forensic medicine experts, plastic surgeons, anatomist, anthropologist, oral surgeons and for clinical and research purpose. It may provide platform for similar extended cephalometric studies based on various communities/ castes/ races of particular geographical zones [7-9].

This work is an attempt to calculate cephalic index from head measurements and determine the predominant anatomical head forms of Gond tibe boys and Nontribe boys of Mungeli district Chhattisgarh state, India and of anthropometric variation among them.

MATERIALS AND METHODS

Total 279 Gond tribe boys and 282 Non tribe boys (Total 561) were selected as subjects for the study. The data were collected on students of school. Children of schools of Patharia block, Chhattisgarh. Boys, 5+ to18+ yrs age group male and apparently healthy were included and females, apparently ill child. & boys belonging to other scheduled tribes were excluded from study. They were grouped into two groups- Non tribe (NT) and Gond tribe (GT).

Anthropometric measurements: Subjects were examined for the following anthropometric measurements according to standard methods [10-12]. Definitions of landmarks, measuring techniques and instrument used were according to Singh and Bhasin as follow:

Glabella: A point above the nasal root between the eyebrows and intersected by mid-saggital plane.

Opisthocranion: It is the most posterior point on the posterior protuberance of the head in the mid sagittal plane.

Euryon: It is the most laterally placed point on the sides of the head.

Head length - The maximum head length was measured with the help of spreading calliper from glabella to opisthocranion.

Head Breadth - Maximum head width was

measured as the maximum transverse diameter between euryon to euryon using spreading calliper. [figure 2a & 2b] All measurements are recorded to the nearest centimetre.

Fig. 2 a: Head lengthFig. 2 b: Head breadth.



Statistical analysis: Total of 561 boys formed the sample for the present study. The students were classified into two categories according to the cast, and cast certificate issued by Government of India/Chhattisgarh. The categories were Gond tribe (GT) boys & Non tribe (NT) boys .Age was calculated from date of birth registered in school & they were grouped according to age group. The age of the students ranged from 5+ years to 18+ years. Cephalic index, ratio of the maximum width of the head multiplied by 100 divided by its maximum length. The index is calculated from measurement of the diameters of the skull. The length of the skull is the distance from the glabella (the midpoint between the brows) and the most projecting point at the back of the head. The breadth of the skull is the distance between the most projecting points at the sides of the head, usually a little above and behind the ears. Descriptive analysis was carried out and comparative statistics was used to observe difference between GT & NT boys on various anthropometric measurements and mean, standard deviation, student, t- test, p value was computed to see the relationship between anthropometric variables.

Analysis was done by using Windows Microsoft Excel and SPSS (Statistical Package for Social Sciences).

RESULTS AND DISCUSSION

Head length (fig.no.3 & table no.1): When Gond tribe (GT) and Non-tribe (NT) boys were compared, it was seen that the distance curve for GT boys ran below the distance curve for NT boys except at the age period of 17+ where it is above with the Non tribe. Difference is significant at the age periods of 6+, 7+, 10+, 11+, 13+, (p value < 0.05) and highly significant at the age period of 5+, (p value <0.01).





A.c.o.		GOND T	RIBE(GT)			NON T	ttest	Duralua		
Age	No.	Mean	S.D.	S.E	No.	Mean	S.D.	S.E	t-test	Pvalue
5+	19	14.61	0.46	0.46	18	16.13	0.58	0.58	-8.79	0.001
6+	17	15.26	0.7	0.17	22	16.04	0.73	0.16	-2.01	0.05
7+	18	15.82	1.07	0.25	20	16.55	0.93	0.21	-2.01	0.05
8+	17	16.06	0.75	0.18	18	16.23	4.05	0.95	-0.18	0.86
9+	23	16.55	1. <mark>1</mark> 4	0.24	19	17.38	2.25	0.52	-1.55	0.13
10+	18	16.28	0.77	0.18	25	17.3	1.55	0.31	-2.58	0.01
11+	18	16.66	1.01	0.24	19	17.92	1.59	0.37	-2.87	0.01
12+	24	17.87	0.62	0.13	22	18.41	1.71	0.36	-1.44	0.16
13+	18	17.36	0.74	0.18	22	18.87	2.82	0.6	-2.42	0.03
14+	17	18.38	1.33	0.32	19	18.95	1.76	0.4	-1.08	0.29
15+	23	17.76	1.37	0.29	21	18.21	1.7	0.37	-1.08	0.29
16+	23	17.74	1.11	0.23	18	19.24	1.94	0.46	-0.98	0.33
17+	25	18.92	4.81	0.96	19	18.27	1.29	0.3	0.57	0.57
18+	19	19.53	2.15	0.49	20	20.08	1.28	0.29	-0.97	0.34
Total	279				282					

Table 1: Head Lengths (in cm).

	A.c.o.	GOND TRIBE(GT)					NON T	ttest	Dyalua		
	Age	No.	Mean	S.D.	S.E	No.	Mean	S.D.	S.E	t-test	P value
	5+	19	12.18	0.28	0.28	18	13.97	1.11	1.11	-6.62	0.001
	6+	17	13.09	1.33	0.32	22	13.51	1.03	0.22	-2.4	0.02
	7+	18	13.69	0.97	0.23	20	13.32	0.57	0.13	0.22	0.02
	8+	17	13.13	0.62	0.15	18	15.25	3.16	0.75	-2.78	0.01
	9+	23	13.51	/ 1.33	0.28	19	14.68	1.46	0.34	-2.73	0.01
Table 2: Head	10+	18	13.64	0.55	0.13	25	14.54	1.33	0.27	-2.7	0.01
Breadths (in cm).	11+	18	13.53	0.79	0.19	19	14.38	1.25	0.29	-2.47	0.02
	12+	24	13.44	0.79	0.16	22	15.16	1.92	0.41	-4.04	0.001
	13+	18	13.69	0.77	0.18	22	14.93	1.77	0.38	-2.96	0.01
	14+	17	14.32	1.22	0.3	19	15.68	2.02	0.46	-2.41	0.02
	15+	23	13.98	1.12	0.23	21	15.31	1.61	0.35	-2.41	0.02
	16+	23	14.9	1.19	0.25	18	16.24	1.95	0.46	-3.21	0.001
	17+	25	15.58	<mark>2.7</mark> 4	0.55	19	15.49	1.52	0.35	0.13	0.89
	18+	19	16.87	2.28	0.52	20	17.45	1.3	0.29	-0.98	0.33
	Total	279				282					

Head breadth (fig.no.4 & table no.2)

When Gond tribe (GT) and Non-tribe (NT) boys were compared, it was seen that the distance curve for GT boys ran below the distance curve for NT boys except at the age period of 7+, 18+ where it is above with the Non tribe. Difference is significant at the age periods of 6+, 7+, 8+, 9+, 10+, 11+, and 13+, (p value < 0.05).

Fig. 4: comparison of head breadth between GT &NT boys.



Cephalic index (CI) (table no.3 & 4): The mean value for cephalic index changed markedly within the entire period of growth in both groups.

	GOND TRIBE						NON	ттест	DVALUE		
	AGE	Ν	MEAN	SD	SE	Ν	MEAN	SD	SE	TIEST	PVALUE
	5+	19	86.4	5.4	1.2	18	83.4	3.09	0.73	2.1	0.04
	6+	17	85.7	<mark>6.</mark> 8	1.7	22	84.32	6.78	1.44	0.64	0.53
	7+	18	86.6	5	1.2	20	80.73	5.58	1.25	3.43	<0.01
	8+	17	81.9	3.6	0.9	18	89.61	18.96	4.47	-1.65	0.11
	9+	23	81.7	5.3	1.1	19	85.16	8.28	1.9	-1.66	0.1
Table 3: Cephalic	10+	18	84	5.7	1.3	25	84.17	4.87	0.97	-0.11	0.92
index (CI).	11+	18	81.5	5.8	1.4	19	80.47	5.64	1.29	0.52	0.61
	12+	23	75.3	4.6	1	22	82.24	5.21	1.11	-4.75	<0.001
	13+	18	79.2	7.2	1.7	22	79.52	5.56	1.18	-0.18	0.86
	14+	17	78.1	5.7	1.4	19	82.72	6.56	1.5	-2.27	0.03
	15+	23	78.9	5.5	1.1	21	84.12	5.3	1.16	-3.23	<0.01
	16+	23	84.2	6.4	1.3	18	84.89	11.67	2.75	-0.26	0.8
	17+	25	84.3	15.3	3.1	19	84.89	7.31	1.68	-0.16	0.87
	18+	19	87.1	14.6	3.4	20	87.12	7.15	1.6	0	1

Scientific term [head types]	Meaning	cephalic index	GT	NT
Hyperdolicocephalic	> 'long-headed'	X - 70.9	10(3.5%)	4(1.4%)
Dolicocephalic	'long-headed'	71.0 – 75.9	41(13.7%)	22(7.8%)
Mesocephalic	'medium-headed'	76.0 - 80.9	72(25.8%)	75(26.6%)
Brachycephalic	'short-headed'	81.0-85.4	85(30.5%)	74(26.6%)
Hyper Brachycephalic	<'short-headed'	85.5 - 90.9	43(15.4%)	74(26.6%)
Ultra Brachycephalic	< 'short-headed'	91.0 - X	28(10%)	33(11.7%)

Table 4: Various head types & cephalic index of GT & NT.

DISCUSSION

Cephalometry is an important tool for an anthropologist and forensic expert for identification of the racial differences, sexual differences, comparison of changes between parents, offspring and siblings towards their genetic transmission of inherited characteristics and also to a great extent for the facial reconstruction of disputed identity [14]. The cephalic index is one of the important cephalometric indices [15-17].

The five internationally recognized head types based on cephalic index using the Martin-Saller scale are: ultrabrachycephalic, hyperbrachycephalic, brachycephalic, mesocephalic and dolichocephalic head types.Cephalic index is useful in establishing ethnic differences and affiliations [18-20].

Assessment of differences in cranial structures, such as, head length, head breadth, by their direct measurements from the subjects of two groups was done to see if there are any racial characteristics. When GT & NT boys were compared, it was seen that the distance curve for GT boys ran below the distance curve for NT boys for Head length & Head breadth except at the few age period where it is above with the Non tribe. Difference is significant at the (p value < 0.05). It was seen that head measurements such as head length, head breadth, were more for NT boys as compared to the GT boys.

On comparing cephalic index it was seen that most of the GT boys were mesocephalic(26%) and brachycephalic(31%), while most of the NT boys were mesocephalic(27%), brachycephalic(27%) and hyper brachycephalic(27%). Few among both GT & NT boys were hyperdolicocephalic and ultra-brachycephalic [Table no. 4]. block, when compared with study of Gupta (2012) on North Bastar Gond tribe adult male was larger. Most of Gond tribe boys were mesocephalic (26%) and brachycephalic (31%) while adult Gond tribe males of Bastar were ultra-brachycephalic (67%) and hyper brachycephalic (27%). [6] The differences between GT boys of this study and Gond adults studied by Gupta, may be due to complex interplay of factors related to migration from hilly area of Bastar district to planes of Patharia block.

From above observation we can say that head form of both GT and NT are overlapping may be due to Genetic component and environment as both contribute to attain final body structure.

Such data are important for the anthropologist and forensic scientist as very few data are available.

CONCLUSION

Most of the GT boys were mesocephalic (26%) and brachycephalic (31%), while most of the NT boys were mesocephalic (27%), brachycephalic (27%) and hyper brachycephalic (27%). Few among both GT & NT boys were hyperdolicocephalic and ultra-brachycephalic.

Head of the most of Gond tribe boys of Patharia block, when compared with study on North Bastar Gond tribe adult male was larger. Most of Gond tribe boys were mesocephalic (26%) and brachycephalic (31%) while adult Gond tribe males of Bastar were ultra-brachycephalic (67%) and hyper brachycephalic (27%).

Form above observation we can conclude that, not a single head form can be defining attributes of the two groups. As head form of both GT and NT are overlapping. There is need to conduct anthropometric & genetic studies to backup these observed anthropometric similarities.

Head of the most of Gond tribe boys of Patharia

ABBREVIATIONS

CM - Centimeters, CG - Chhattisgarh,

CI - Cephalic index, **GT** - Gond tribe,

- HL- Head length , HB-head breadth,
- NT Non tribe, SD Standard Deviation,

SE- Standard errors

Conflicts of Interests: None

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