THE STUDY OF CEPHALIC INDEX AMONG TRIBALS OF MEWAR REGION IN RAJASTHAN

Anatomy

Ms.Hemkanwer Joya | Ph. D. Research Scholar, Deptt. of Anatomy, R.N.T. Medical College, Udaipur.

Dr. Ghanshyam Gupta* | Senior Professor & Head, Deptt. of Anatomy, R.N.T. Medical College, Udaipur. *Corresponding Author

ABSTRACT

BACKGROUND: Cephalic index is an important factor of physical anthropology to find out racial differences in a particular area. Cephalic Index is expressed as %age of the breadth of head in relation to the length of the head.
AIMS AND OBJECTIVES: To study cephalic index on tribals of Mewar in Rajasthan.
MATERIALS & METHODS: This cephalometric study was carried out on 500 tribal subjects (269 male and 231 female) aged between 21 to 50 years, in Department of Anatomy, RNT Medical College, Udaipur, Rajasthan.
RESULTS: Statistically significant difference ($p<0.05$) was found for head length, head breadth and cephalic index between tribal males 18.67 ± 0.59, 13.76 ± 0.52, 73.76 ± 3.56 and tribal females 17.94 ± 0.49, 13.34 ± 0.37, 74.43 ± 3.02 respectively and Dolicocephalic type of head was predominated.
CONCLUSION: Sex determination and stature estimation becomes easier when standard Cephalic measurements of head for a specific population are available.

KEYWORDS

Head Length, Head Breadth, Cephalic Index

INTRODUCTION

Rajasthan is one of the significant states of India where many tribal lives, after Madhya Pradesh, Orissa, Bihar and Gujarat. Rajasthan have highest population of the tribal communities[1]. Under the tribal sub-plan area of the state, the entire district of Banswara, Dungarpur and Pratapgarh, seven tehsils viz. Jhadol, Kherwara, Kotra, Salumber, Dhariyawad and 81 villages of Girwa tehsil of Udaipur district, Arnold tehsil of Chittaurgarh district and Abu Road block of Sirohi district are included. Almost 44 % of the state tribal population resides in this tribal sub-plan area[2].

Study Area: Udaipur District: Udaipur, as formerly was the capital of the Mewar Kingdom, is a city located in the western Indian state of Rajasthan was founded by Maharana Udai Singh 2nd in 1559, it is also known as the city of lakes which comprises of many artificial lakes[3]. According to 2011 census Udaipur district has a total population of 3,068,420 out of which Male & Female were 1,566,801 & 1,501,619 respectively. Udaipur District ranks 5th in terms of population, 8th in terms of area and 14th in terms of population density. The scheduled caste & scheduled tribe population in Udaipur district is 6.1 % & 49.7% respectively[4].

Anthropometric methods can quantify changes in craniofacial composition that diversify human phenotypes and particular features that differentiate individuals and ethnic group. These standard data are accurately assessed which can be found useful in plastic surgery, legal medicine for identification of an individual or in medical genetics for the diagnosis of dimorphism or craniofacial abnormalities[5].

Cephalometric results can also be of great assistance while evaluating patient in various field of medicine like medical imaging, paediatrics, craniofacial surgery and also for studying growth trends in various castes/races with in a defined geographic zone[6]. As the cranial measurements and stature assist in identification of a missing person and helps in diagnosis and treatment of some anomalies, so knowledge of normal value for these regions produces the best visual and efficient results[7]. The significant differences was observed in previous other studies based on racial, ethnical and sexual differences with importance of anthropometric parameters, the present study was an attempt to study normal cephalic measurements along with index on tribals of Mewar region in Udaipur district of Rajasthan.

MATERIAL AND METHODS

This study was carried out on 500 tribal subjects (269 male and 231 female) aged between 21 to 50 years, in Department of Anatomy, R.N.T. Medical College & attached groups of hospitals, Udaipur,

Rajasthan. After getting approval from institutional ethical committee, Institutional Research Board and other concerned authorities, all the tribal subjects were selected randomly, after explaining them about nature and purpose of the study. After obtaining their written consent, all eligible study participants were asked to sit on stool in a relaxed position, keeping the mouth closed and teeth in central occluded position and head in anatomical position. Following Anthropometric measurements were taken by using standard instruments to nearest 1mm.

1. Maximum Head Length: It was measured from glabella to the opisthocranion.

a) Glabella (g) is a point above the nasal root between the eyebrows

b) Opisthocranion (op) is the most posterior point on the posterior protuberance of the head in the mid sagittal plane.

2. Maximum Head Breadth was measured as the maximum transverse diameter between the two euryons.

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

Figure 1: Maximum Head Length (g-op)   Figure 2: Maximum Head Breadth (eu-eu)

3. **Cephalic Index** was calculated as: Maximum Head Breadth / Maximum Head Length ×100 Classification of Head Phenotype according to Martin and Saller (1957)[8]

Sl. No.	Horizontal Head Phenotype	Range (%)	
		(Male)	(Female)
1.	Hyperdolichocephalic (Very Long Head)	≤70.9	≤71.9
2.	Dolichocephalic (Long Head)	71.0-75.9	72.0-76.9

3.	Mesocephalic (Medium Head)	76.0-80.9	77.0-81.9
4.	Brachycephalic (Broad Head)	81.0-85.4	82.0-86.4
5.	Hyperbrachycephalic (Very Broad Head)	85.5-90.9	86.5-91.9

STATISTICAL ANALYSIS
All of the statistical analysis was done with the help of SPSS (Statistical Package for Social Sciences) version 21. Since the sample size is large so it is assumed to follow normality.

RESULT AND DISCUSSION
The results & discussions are presented in tabular form which was expressed as numbers and percentages.

Table 1: Comparison of Various Cephalic Parameters between Tribal Males and Tribal Females

Parameters	Gender	N	Mean	SD	'P' value*
Head Length (cm)	Male	269	18.67	0.59	<0.001
	Female	231	17.94	0.49	
Head Breadth (cm)	Male	269	13.76	0.52	<0.001
	Female	231	13.34	0.37	
Cephalic Index (%)	Male	269	73.76	0.21	0.026
	Female	231	74.43	0.19	

Table 2: Frequency Distribution of Head Phenotype According to Range of Cephalic Index

Head Phenotypes	Male	Female	Total
	F (%)	F (%)	F (%)
Hyperdolichocephalic (Very Long Head)	75 (27.88%)	60 (25.97%)	135 (27.0%)
Dolichocephalic (Long Head)	113 (42.01%)	115 (49.78%)	228 (45.6%)
Mesocephalic (Medium Head)	76 (28.25%)	53 (22.94%)	129 (25.8%)
Brachycephalic (Broad Head)	5 (1.86%)	3 (1.30%)	8 (1.6%)
Total	269 (100%)	231 (100%)	500 (100%)

Table 3: Comparison of Cephalic Index of the present study (All study participants) with previous studies

Sl. No.	Name & year of Researcher	Area/ Study location	Subject Studied	Sample Size	Male	Female	Total
1.	Present Study (2019)	Udaipur (Rajasthan)	Tribals	500	73.76	74.43	74.08
2.	Pandey N et al, (2016)9	Dharan Nepal	Students	292	75.82	78.36	77.09
3.	Shah T et al, (2015)10	Gujarat	Gujarati	901	77.14	77.38	77.20
			Non Gujarati	300	70.61	81.17	74.13
4.	Kumar A et al, (2015)11	Delhi	North Indian	80	73.75	75.22	74.40
5.	Patro Sunita et al, (2014)12	Southern Odisha	Odisha people	1030	77.28	78.38	77.83
6.	Gupta S et al, (2013)13	Haryana	North Indian	600	74.74	76.83	75.78
7.	Yagain VK et al, (2012)14	Manipal Karnataka	Medical students	100	77.92	80.85	79.38
8.	Ilayperuma I (2011)15	Sri Lanka	Medical students	400	78.04	79.32	78.68
9.	Raji JM et al, (2010)16	Nigeria	North Eastern Nigerian	343	71.90	73.92	72.91

It was found that the mean head length and head breadth of the tribal males 18.67 ± 0.59 and 13.76 ± 0.52 were higher than the tribal females 17.94 ± 0.49 and 13.34 ± 0.37 respectively. The results obtained have indicated a sexual dimorphism with significantly higher values found for head length and head breadth in males. (Table1)

Overall tribals showed Dolichocephalic phenotype at highest frequency (45.6 %), followed by Hyperdolichocephalic 27.0%, Mesocephalic 25.8%. Brachycephalic type was rarely observed however Hyperbrachycephalic was not found.

However tribal males showed highest frequency of Dolichocephalic 42.01% head type followed by Mesocephalic 28.25%, Hyperdolichocephalic 27.88% but Tribal females showed highest frequency of Dolichocephalic 49.78 % head type followed by Hyperdolichocephalic 25.97 % Mesocephalic 22.94%. It was observed that Brachycephalic element was found rarely in both males and females. (Table 2)

The mean value of horizontal cephalic index in tribal males (73.76 ± 3.56 %) was found lower than tribal females (74.43 ± 3.02 %) which was statistically significant (p=0.026). The mean of Cephalic Index for over all tribal population was **74.08**, which is nearer to the results obtained from Shah T et al (2015) who carried out his research work on Guajarati and non Guajarati population and Kumar A et al (2015) on north Indian population. However the results obtained in our study were found to be lower than the findings of various other authors such as by Pandey N et al (2016), Patro S et al (2014), Gupta S et al, (2013), Yagain VK et al, (2012), Ilayperuma I (2011), however it is found to be higher than the results carried out by Raji JM et al (2010). (Table 3)

These variations occurred due to difference in geographical location along with measurement procedures adopted, variations were found in sample size of population and difference in the period of study. Apart from this, it may also reflect the effect of genetic factors, environmental factors, different socio economic status and nutritional status of study population.

CONCLUSION
Sexual dimorphism was observed, which can arise due to hormonal influence on cephalic morphology. It is an important factor in determining race in a particular specific geographical region. Overall tribals of Mewar region showed Dolicocephalic head in majority. Such data is useful in forensic science, evolution, comparative study, reconstructive surgeries, for researchers, anatomists and anthropologist.

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