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COMPARISON OF CEPHALIC INDEX OF THREE STATES OF INDIA

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ABSTRACT

Cephalic index is the ratio of the maximum breadth of head to its maximum length. cephalic index is very useful anthropologically to find out racial differences. It has also been reported that cephalic index is less than 2-3 in individual with sickle cell anemia than normal individual. Materials and Methods: The present study was carried out at three places Mumbai (Maharashtra), Chinnaoutpalli (Andhra Pradesh) and Ahmedabad (Gujarat). This study was carried on 440 (220 male & 220 female), 420 (210 male & 210 female), 500 (302 male & 198 female) medical students of Mumbai, Chinnaoutpalli and Ahmedabad respectively. Results: The mean cephalic index for Maharashtra population was 78.14. The mean cephalic index for Andhra Pradesh population was 77.32. The mean cephalic index for Gujarat population was 80.81. Discussion & conclusion: The result of present study shows that cephalic index of Maharashtra population is almost 1 point higher than Andhra Pradesh population. In Maharashtra and Andhra Pradesh population cephalic index of the female is almost 2 points higher than the male. This study will serve as a basis of comparison for future studies on Maharashtra, Andhra Pradesh and Gujarat population.

KEY WORDS: **Cephalic index, head length, head breadth, Maharashtra, Andhra Pradesh, Gujarat.**

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INTRODUCTION

The cephalic index is the ratio of the maximum breadth of head to its maximum length . Anthropometric measurements especially craniofacial measurements are important for determining various head and face shapes. These anthropometric studies are conducted on the age, sex and racial groups in certain geographical zones. This helps in better understanding the frequency distribution of human morphologies and comparison of different race. The most important of cephalometric dimensions are height and breadth of head which are used in cephalic index determination [1 & 2].

By means of cephalic index; person can be classified into following three groups

1. Dolicocephalic: cephalic index below 76 for male & 77 for female.
2. Mesocephalic: cephalic index between 76-81 for male & 77-82 for female.
3. Brachycephalic: cephalic index above 81 for male & 82 for female.

It has also been reported that cephalic index is less than 2-3 (difference of 2.7) in individual with sickle cell anemia than normal individual [3]. Dolicocephalic person have otitis media less often than brachycephalic person [4]. Small head with varying cephalic index is found in Cohen syndrome [5]. Pathological cephalic index may indicate chromosome anomaly [6]. Standardized cephalometric records enable diagnostic comparison between patients and normal population [7]. The cephalometric results can be of assistance when evaluating a patient before craniofacial surgery [8]. Despite its significance and practical use little is known concerning the cephalic index and prevalence of cephalic phenotypes in population of Maharashtra, Andhra Pradesh and Gujarat, inhabitants of the South Asian country. Hence, this study was designed to elucidate the norms for cephalic indices, the types of head shapes and sexual differences in cephalic index of three states of India (Maharashtra, Andhra Pradesh and Gujarat).

MATERIALS AND METHODS

The present study was carried out at three places Mumbai (Maharashtra), Chinnaoutpalli (Andhra Pradesh) and Ahmedabad (Gujarat). Maharashtra part of study was carried out with 440 (220 male & 220 female) medical students of Topiwala National Medical College, Mumbai. Andhra Pradesh part of study was carried out with 420 (210 male & 210 female) medical students of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation and Dr.Sudha & Nageswara Institute of Dental Sciences Chinnaoutpally, Krishna District (AP), INDIA. Gujarat part of study was carried out with 500 (302 male & 198 female) medical students of B J Medical College, Ahmedabad. Medical students were selected because of the easy availability. Only students belonging to Andhra Pradesh, Maharashtra, & Gujarat regions in the respective groups were selected for present study. They belong to age group of 17 - 23 years.

The anatomical landmarks, glabella (g), inion (I) and euryon (eu) were marked. The anatomical landmarks were defined as follows

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

Inion: The distal most point placed on the external occipital protuberance in the mid-saggital plane.

Euryon:-The lateral most point on the side of the head.

All the measurements were taken with subjects sitting on the chair; head in anatomical position. Each measurement was taken to the

nearest 1 mm. The head length was measured with spreading caliper with scale from glabella to Inion. Head breadth was measured as the maximum transverse diameter between the two euryons using spreading caliper with scale. The process of measurements was explained to each and every subject. The written consent obtained from each and every subject before taking measurements. Cephalic index was calculated as maximum breadth of head / head length X 100. The subjects were classified into dolicocephalic, mesocephalic and brachycephalic.

Data analysis: The data was entered the computer and analyzed using NCSS statistical package. The differences in means of cephalic index, head length and head breadth were tested for statistical significance by independent sample "t" test.

OBSERVATIONS AND RESULTS

From the collected data, statistics were analyzed and observations and results are presented in tabulated form (Table no: 1, 2, 3, 4 & 5). The minimum cephalic index for Maharashtra population was found to be 69.57 and maximum cephalic index was found to be 87.52. The mean cephalic index was 78.14±2.97. The mean cephalic index for male was 77.08±2.55 and for female is79.02±2.79. The difference between male and female cephalic index was significant ($p < 0.0001$ & difference 1.94). The minimum cephalic index for Andhra Pradesh population was found to be 69.11 and maximum cephalic index was found to be 84.52. The mean cephalic index was 77.32±2.86. The mean cephalic index for male was 76.28±2.35 and for female was 78.16±2.67. The difference between male and female cephalic index was significant ($p < 0.0001$ & difference 1.88). The minimum cephalic index for Gujarat population was found to be 71.10 and maximum cephalic index was found to be 89.77. The mean cephalic index was 80.81±3.72. The mean cephalic index for male was 80.42±3.87 and for female was 81.20±3.98. The difference between male and female heads cephalic index was not significant ($p= 0.0298$ & difference 0.78).

The mean head length for Maharashtra population was 177.89±7.99 mm. In the male the head length varies from 172 mm to 206 mm, the mean head length being 183.02±6.97 mm. In the female the head length varies from 160 mm to 191 mm, the mean head length being172.48±5.00 mm. The difference between male and female head length was significant ($p < 0.0001$ & difference 10.54 mm). The mean head length for Andhra Pradesh population was 177.78±7.32 mm. In the male the head length varies from 173 mm to 204 mm, the mean head length being 182.85±6.04 mm. In the female the head length varies from 165 mm to 192 mm, the mean head length being172.72±4.40 mm. The difference between male and female head length was significant ($p < 0.0001$ & difference 10.54 mm). The mean head length for Gujarat population was 175.63±0.48 mm. In the male the head length varies from 165 mm to 201 mm, the mean head length being 182.6±0.69 mm. In female, the head length varies from 141 mm to 181 mm, the mean head length being165.0±0.61 mm. The difference between male and female head length was significant ($p < 0.0001$ & difference 17.6 mm).

The mean head breadth for Maharashtra population was 136.63±3.88 mm. In the male the mean head breadth being 138.32±2.89 mm and for female138.23±4.08. The difference between male and female head length was not significant ($p = 0.7896$ & difference 0.09 mm). The mean head breadth for Andhra Pradesh population was 136.64±3.63 mm. In the male the mean head breadth being 138.28±2.80 mm and for female138.22±4.0. The difference between male and female head length was not significant ($p = 0.72362$ & difference 0.06 mm). The mean head breadth for Gujarat population was 143.78±0.57 mm. In the male the mean head breadth being 145.6±0.75 mm and for female141.0±0.72. The difference between

male and female head length was significant ($p < 0.0001$ & difference 0.09 mm).

According to classification of cephalic index 173 (99 males & 74 females) subjects of Maharashtra population were dolicocephalic; 249 (119 males & 130 females) were mesocephalic and 18 (2 males & 16 females) were brachycephalic. In Andhra Pradesh population180 (105 males & 75 females) subjects were dolicocephalic; 226 (105 males & 121 females) were mesocephalic and 14 (0 males & 14 females) were brachycephalic. Majority of Gujarat subjects were mesocephalic.

Table 1
Showing statistics of various parameters of Maharashtra

Variable	n	Min.	Max.	Mean	S.D.	S.E.	P Value
Cephalic index (male)	220	69.57	81.33	77.08	2.55	0.172	< 0.0001
Cephalic index (female)	220	71.87	87.52	79.02	2.79	0.188	< 0.0001
Cephalic index (male &female)	440	69.57	87.52	78.14	2.97	0.153	----------
Head length of male (mm)	220	172	206	183.02	6.97	0.469	< 0.0001
Head length of female (mm)	220	160	191	172.48	5.00	0.337	< 0.0001
Head length of male & female (mm)	440	160	206	177.89	7.99	0.401	----------
Head breadth of male (mm)	302	131	146	138.32	2.89	0.195	= 0.7896
Head breadth of female (mm)	198	127	144	138.23	4.08	0.275	= 0.7896
Head breadth of male & female (mm)	500	127	146	136.63	3.88	0.192	----------

Table 2
Showing statistics of various parameters of Andhra Pradesh

Variable	n	Min.	Max.	Mean	S.D.	S.E.	P Value
Cephalic index (male)	210	69.11	79.33	76.28	2.35	0.162	< 0.0001
Cephalic index (female)	210	71.67	84.52	78.16	2.67	0.184	< 0.0001
Cephalic index (male &female)	420	69.11	84.52	77.32	2.86	0.141	----------
Head length of male (mm)	210	173	204	182.85	6.04	0.477	< 0.0001
Head length of female (mm)	210	163	192	172.72	4.40	0.348	< 0.0001
Head length of male & female (mm)	420	163	204	177.78	7.32	0.409	----------
Head breadth of male (mm)	210	132	145	138.28	2.80	0.193	= 0.72362
Head breadth of female (mm)	210	127	143	138.22	4.01	0.277	= 0.72362
Head breadth of male & female (mm)	420	127	145	136.64	3.63	0.192	----------

Table 3
Showing statistics of various parameters of Gujarat

Variable	n	Min.	Max.	Mean	S.D.	S.E.	P Value
Cephalic index (male)	302	71.10	89.77	80.42	3.87	0.22	= 0.0298
Cephalic index (female)	198	72.2	71.10	81.20	3.98	0.28	= 0.0298
Cephalic index (male &female)	500	71.10	89.77	80.81	3.72	0.16	----------
Head length of male (mm)	302	165	201	182.6	0.69	0.039	< 0.0001
Head length of female (mm)	198	141	181	165.0	0.61	0.043	< 0.0001
Head length of male & female (mm)	500	141	201	175.63	0.48	0.029	----------
Head breadth of male (mm)	302	130	170	145.6	0.75	0.042	< 0.0001
Head breadth of female (mm)	198	130	160	141	0.72	0.048	< 0.0001
Head breadth of male & female (mm)	500	130	170	143.78	0.57	0.031	----------

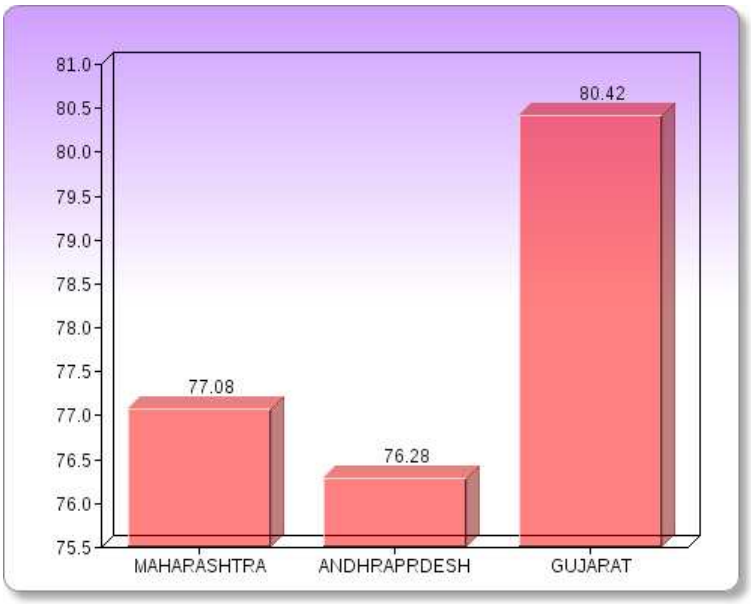
Table 4
Showing comparison of cephalic index three states.

Variable	Maharashtra	Andhra Pradesh	Gujarat
Cephalic index (male)	77.08	76.28	80.42
Cephalic index (female)	79.02	78. 16	81.20
Cephalic index (male &female)	78.14	77.32	80.81

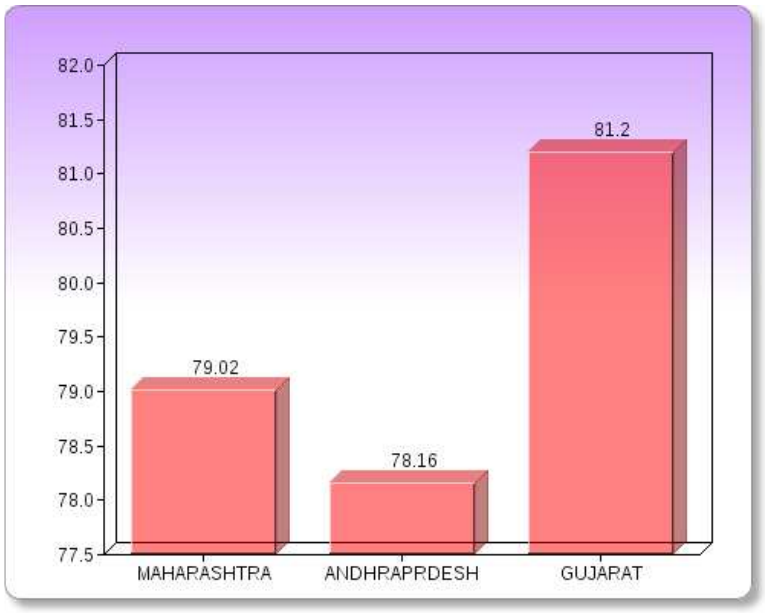
Table 5
Showing cephalic index in different Indian groups.

Sr. No.	Name of Worker	Place	n	Mean cephalic index	Mean cephalic index (Male)	Mean cephalic index (Female)
1	Yagain V. K. et al	Manipal, Karnataka	100 (66+34)	78.92	77.92	80.85
2	Mahajan A et al	Amritsar, Punjab	400 (256+144)	85.53	81.34	85.75
3	Anitha M. R. et al	Karnataka	100 (66+34)	--------	79.14	80.74
4	Present study Maharashtra part	Mumbai	440 (220+220)	78.14	77.08	79.02
5	Present study Andhra Pradesh part	Chinnaoutapalli	420 (210+210)	77.32	76.28	78.16
6	Present study Gujarat part	Ahmedabad	500 (302+198)	80.81	80.42	81.20

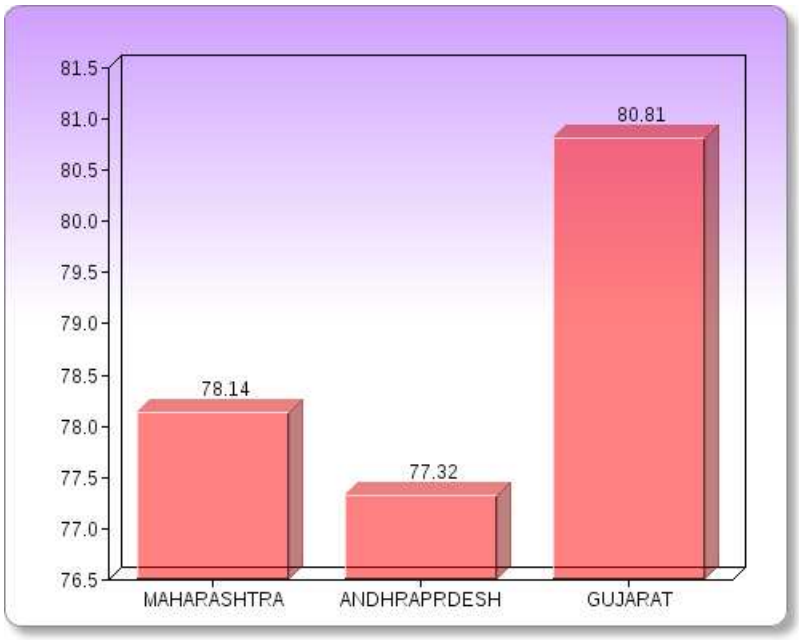
Legends (abbreviation)
For Table no 1, 2, 3, 4 & 5.
Min. – minimum, Max. – maximum, n – sample size, S.D. – Standard deviation, S.E. – Standard error of mean.



Graph 1
Showing comparison of cephalic index (male) of three states.



Graph 2
Showing comparison of cephalic index (female) of three states.



Graph 3
Showing comparison of cephalic index (male & female) of three states.

DISCUSSION

The present study provides valuable new data pertaining to the cephalic indices and shapes of the heads in an adult population of Maharashtra, Andhra Pradesh and Gujarat. It is stated that the racial characters are best defined in the skull. As a result cranial

morphometry, and hence the cephalic indices constitute the most important characters for determining the racial difference [2]. Yagain V. K. et al studied 100 (66 males & 34 females) students of Kasturba Medical College, Manipal. The mean cephalic index was 78.92±6.31. The mean cephalic index for male was 77.92±5.2 and for female was 80.85±7.71. Most of their subject belongs to brachycephalic group [1]. Shah G. V. and Jadhav H.R. studied 500 (302 males & 198 females) medical students of Gujarat In their study the mean cephalic index is 80.81. The mean cephalic index for male was was 80.42 and for female was 81.20. Most of their subject belongs to mesocephalic group. The mean head length for male is 18.26 cm and for female is 16.5 cm [9].

Mahajan A et al studied 400 (256 males & 144 females) medical students of Punjab aged 17-23 years. The mean cephalic index was 85.53. The mean cephalic index for male was 81.34 and for female was 85.75. The difference between the mean cephalic index of male and female of Punjab was statistically significant. Punjabi community can be categorized as brachycephalic [10]. Anitha M. R. et al studied 100 (66 males & 34 females) students of north Indian origin in the age group of 17 – 20 years. The mean cephalic index for male was 79.14±4.72 and for female was 80.74±3.97. The difference between the mean cephalic index of male and female is 1.60 [11].

Lobo S. W. et al studied 267 (157 males & 110 females) subjects of Gurung village, Nepal. The mean cephalic index for male was 83.10±6.08 and for female was 84.60±5.14. Most of their subject belongs to brachycephalic group. The mean head length for male is 18.0±0.85 cm and for female is 17.4±0.78 cm [12]. According to Bhasin M. K., the value of cephalic index is quite high among the population of Maharashtra (77.79), Andhra Pradesh (77.79), and Gujarat (78.89). The value of cephalic index for scheduled tribes, scheduled caste, and community are different from each other for these three states [13]. In our study the mean cephalic index of Andhra Pradesh population is 77.32 which is slightly lower than the mean cephalic index of Bhasin M. K for Andhra Pradesh. In our study the mean cephalic index of Maharashtra population is 78.14 which are slightly higher than the mean cephalic index of Bhasin M. K for Maharashtra. In our study the mean cephalic index of Gujarat population is 80.81 which are slightly higher than the mean cephalic index of Bhasin M. K for Gujarat. But in our study; we did not record the caste of students (subjects). This may be the reason for the difference between the mean cephalic index of our study and the mean cephalic index of Bhasin M. K for these three states of India. But our results were almost nearer to that of Bhasin M. K.

CONCLUSION

The result of present study shows that cephalic index of Maharashtra population is almost 1 point higher than Andhra Pradesh population. Cephalic index of Gujarat population is almost 2-3 points higher than Maharashtra population. The difference between male and female cephalic index for Maharashtra population was significant ($p < 0.0001$ & difference 1.94). The difference between male and female cephalic index for Andhra Pradesh population was significant ($p < 0.0001$ & difference 1.88). Thus we can conclude that in Maharashtra and Andhra Pradesh population cephalic index of the female is almost 2 points higher than the male. For Gujarat population cephalic index of the female is almost 1 point higher than the male. This data can be useful for forensic medicine experts, plastic surgeons, anatomist, anthropologist, oral surgeons and for clinical and research purpose. This study will serve as basis of comparison for future studies on Maharashtra, Andhra Pradesh and Gujarat population.

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