

## Comparative study of cephalic index in North Indian and South Indian students

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### Abstract

**Background and aims:** Cephalic Index is an important parameter for deciding the race and sex of an individual. The present study was undertaken to calculate the Cephalic Index in North Indian and South Indian medical students and to compare Cephalic Index among them. **Materials and methods :** Ninety nine North Indian and 177 South Indian students were taken for the present study. Maximum head breadth and maximum head length were measured with spreading calipers and Cephalic Index was determined. **Result:** The mean Cephalic Index in study group was 76.65. In North Indian students, mean Cephalic Index was 74.44. In South Indian students, mean Cephalic Index was 77.71. Dolicocephalic type of head shape predominated among North Indian students, whereas mesocephalic type was predominant in South Indian students. **Conclusion:** Significant gender difference and geographical variation was observed in the present study. The result of the present study will be of utmost importance in Forensic Medicine, Anthropology and in Genetics.

**Keywords:** *head-length, head-breadth, dolicocephalic, mesocephalic, brachycephalic*

### Introduction

It is a fact that no two persons are ever alike in all their measurable characters. Every person tends to undergo change in varying degrees from birth to death, in health and in disease. Cephalic Index is the terminology used in anthropology for having an easy identifying module or numerical to distinguish the given sample or individual, either into race or sex or even as identity of the individual. Cephalic Index was first defined by

Swedish Professor of Anatomy Anders Retzius (1796-1860)<sup>1</sup>. It has value in Forensic medicine where cranial remains can be compared with existing photographic records in making identification. The human body dimensions are affected by ecological, biological, geographical, racial, sex, and age factors<sup>2</sup>.

Comparison of changes in cephalic index between parents, offsprings and siblings can give information about the genetic transmission of the inherited characters<sup>3</sup>.

The present study was conducted to compare the cephalic index of north and south Indian students to look for significant difference in their cephalic phenotype.

### Materials and methods

The present study was conducted on Phase-I MBBS Students of Shri B.M Patil medical college Bijapur. Ninety nine students were North Indians (61males and 38 females) and 177 were South Indians (81males and 96 females).

The Head Length (Greatest antero-posterior diameter) was measured with the help of spreading caliper, from Glabella to Opisthocranium. The Head-breadth was measured as the maximum transverse diameter between two Auricles<sup>4</sup>. All the measurements were taken with the subject sitting in chair, in relaxed condition and head in anatomical position.

$$\text{Cephalic Index}^{[5]} = \frac{\text{Maximum head breadth}}{\text{Maximum head length}} \times 100$$

### Observation and result

Collected data was analysed statistically using mean, standard deviation and Z test and results were presented in tabular and graph forms generated using Microsoft excel.

Among the North Indian students the average head breadth was found to be 13.5cm. In males the head breadth varied from 12.33 to 15.46cm the mean was 13.62cm. In females the head breadth was in the range of 12.06 to 15.06cm with average of 13.31cm.

Average head breadth among South Indian students was found to be 13.9cm. In males the head breadth was in the range of 12.53 to 16 cm, the mean being 14.4cm. In females it ranged from 11.53 to 15.1cm, the mean being 13.5 cm.

The mean head length in North Indian students was 18.14 cm. In males it ranged from 16.93 to 19.96cm, the mean being 18.34cm. In females the head length was between 17.03 to 18.93 cm, the mean being 17.82 cm.

The mean head length in South Indian students was 17.89cm. In males it ranged from 16.63 to 20.1 cm, the mean being 18.4cm. In females the range was between 16.13 to 18.86 cm, the mean being 17.45 cm.

In North Indian students, the mean Cephalic Index was found to be 74.44. In males it ranged from 67.88 to 82.98, the mean being 74.16. In females, it ranged from 70.61 to 81.3, the mean being 74.87.

In South Indian students, the mean Cephalic Index was 77.71. In males it ranged from 67.88 to 87.69, the mean being 78.26. In females, it ranged from 70.8 to 86.4, the mean being 74.87.

**Table 1: Incidence of Cephalic Index in North Indians**

Cephalic Index	Male		Female		Total	
	No	%	No	%	No	%
60.01-65	0	0	0	0	0	0
65.01-70	3	4.91	0	0	3	3.03
70.01-75	40	65.57	26	68.42	66	66.66
75.01-80	13	21.31	8	21.06	21	21.21
80.01-85	5	8.19	4	10.52	9	9.09
85.01-90	0	0	0	0	0	0
90.01-95	0	0	0	0	0	0
95.01-100	0	0	0	0	0	0
Total	61	100	38	100	99	100

**Table 2: Incidence of Cephalic Index in South Indians**

Cephalic Index	Male		Female		Total	
	No	%	No	%	No	%
60.01-65	0	0	0	0	0	0
65.01-70	2	2.46	0	0	2	1.12
70.01-75	17	20.98	32	33.33	49	27.68
75.01-80	31	38.27	42	43.75	73	41.24
80.01-85	29	35.80	19	19.79	48	27.11
85.01-90	2	2.46	3	3.12	5	2.82
90.01-95	0	0	0	0	0	0
95.01-100	0	0	0	0	0	0
Total	81	100	96	100	177	100

**Table 3: Classification of cephalic phenotype<sup>22</sup>**

Cephalic phenotype	Range of Cephalic Index
Ultradolicocephalic	55 to 59.9
Hyperdolicocephalic	60 to 64.9
Dolicocephalic	65 to 74.9
Mesocephalic	75 to 79.9
Brachycephalic	80 to 84.9
Hyperbrachycephalic	85 to 89.9
Ultrabrachycephalic	90 to 94.9
Total	

In North Indian students, dolichocephalic type of head shape was predominant in case of both males (70.49%) and females (68.42%)

Majority of South Indian students showed mesocephalic phenotype. 38.27% of males and 44.79% of females were mesocephalics.

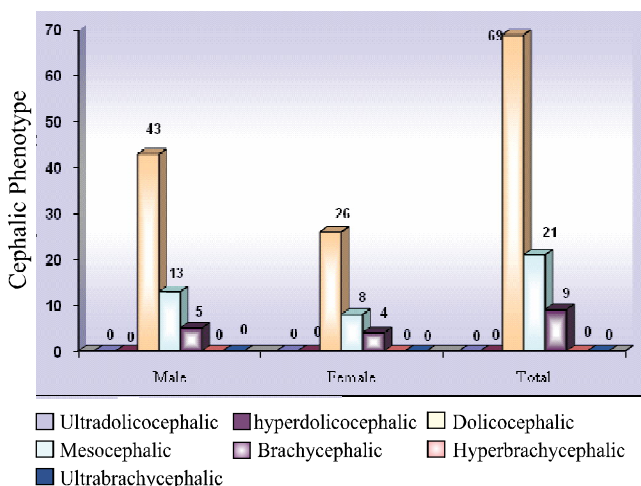
**Table 4: Comparison of Cephalic index in North Indian and South Indian students**

Region	Number	Mean CI ±S.D	Z-Test	P-value
North	99	74.44±3.17	0.0000417	<0.00001***
South	177	77.71±4.18		

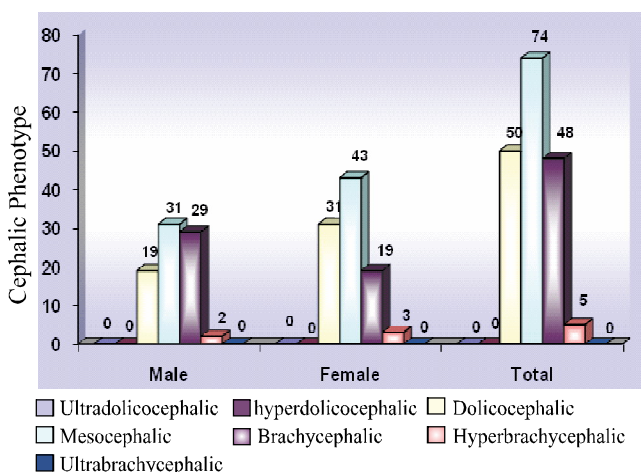
Very highly significant = \*\*\* P < 0.001

Cephalic Index of South Indians was found significantly higher than North Indians.

**Graph 1: Bar Chart showing different types of Cephalic Phenotype among North Indians**



**Graph 2: Bar Chart showing different types of Cephalic Phenotype among South Indians**



**Discussion**

Cephalic Index is affected by geographical, racial, gender and age factors<sup>6</sup>.

In North Indian students of present study, the mean Cephalic Index was found to be 74.44. In study by Bhargav and Kher<sup>7</sup>, the mean Cephalic Index was 76.98.

In South Indian students of the present study, the mean Cephalic Index was 77.71.

In study by Gangadhar and Reddy<sup>8</sup>, the average Cephalic Index was 77.79.

In North Indian students, dolichocephalic type of head shape was predominant in case of both males (70.49%) and females (68.42%).

South Indian students of present study showed mesocephalic phenotype (38.27% of males and 44.79% of females).

A study conducted throughout India in 1895<sup>9</sup>, showed Rajasthan people were dolichocephalic. In Punjab, majority were dolichocephalic to hyperdolichocephalic. People living in North -Western states of India i.e. Uttar Pradesh, Bihar and Bengal were predominantly dolichocephalic. In Tamil Nadu among seven castes the head was mesocephalic in above 50%, in Kerala dolichocephalic and in Karnataka mesocephalic This is consistent with the present study.

Anthropometric study of Kayasthas of Bengal revealed cephalic index average of 79.50 which was marginal between meso and brachycephaly<sup>10</sup>.

According to a study conducted in Gujarat state mean cephalic index was found to be 80.81 and are of mesocephalic phenotype<sup>11</sup>.

In a study conducted among students of various regions of India, cephalic index among north Indian students was 79.72 i.e mesocephalic phenotype and 81.99 among south Indian students i.e brachycephalic head type<sup>12</sup>.

The value of mean cephalic index in a study conducted among various castes and races of Gujarat state was 80.20 i.e brachycephalic variety of head shape<sup>13</sup>.

A study conducted among Indian students by Yagain<sup>14</sup> and colleagues found the mean cephalic index to be 78.92±6.31 which says that the dominant head shape among Indians was brachycephaly.

A study conducted among three states of India i.e Andhra Pradesh, Maharashtra and Gujarat showed Cephalic index of , 77.32, 78.14, 80.81 respectively<sup>15</sup>.

A research conducted showed that Haryanvi Baniyas have typical dolichocephalic phenotype which is consistent with the present study among North Indian Population<sup>16</sup>.

A study conducted in South Gujarat shows South Gujarati males and females belong to Brachycephalic type of head<sup>17</sup>.

The mean cephalic index of males and females suggested the Brachycephalisation in north Indian students of Teerthanker Mahaveer University which differs from our study<sup>18</sup>.

A study done among Mumbai students revealed mean cephalic index in both sexes to be 78.481 and can be classified as mesocephalic which is consistent with the present study<sup>19</sup>.

The results of a study indicate a mean cephalic index of Maharashtra population to be 78.25 showing mesocephalic predominance<sup>20</sup>.

In Southern Odisha population, the mean cephalic index in males was 77.28 and in females was 78.38. The dominant head shape was mesocephalic in both sexes<sup>21</sup>.

### Conclusion

In the present study, significant gender difference and geographical variation were observed in cephalic index. The result of the present study will be of utmost importance in Forensic Medicine, Anthropology and in Genetics.

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