

THE STUDY OF VERTICAL CEPHALIC INDEX (LENGTH-HEIGHT INDEX) AND TRANSVERSE CEPHALIC INDEX (BREADTH-HEIGHT INDEX) OF ANDHRA REGION (INDIA).

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ABSTRACT

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Background & objectives:

Cephalometry is a branch of anthropometry that describes measurements of head and face in cadaveric, living or radiologic specimen. The vertical cephalic index is the ratio of the maximum height of head to its maximum length. The transverse cephalic index is the ratio of the maximum height of head to its maximum breadth.

Materials and Methods:

The present study was carried out with 320 (160 male & 160 female) medical students of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation and Dr. Sudha & Nageswara Rao Institute of Dental Sciences Chinnaoutpally, Krishna District (AP), India.

Results:

The mean vertical cephalic index for male was 74.08 ± 3.24 and for female was 73.03 ± 4.64 . The mean transverse cephalic index for male was 97.91 ± 3.77 and for female was 93.41 ± 5.57 . The differences between male and female mean vertical cephalic index and mean transverse cephalic index were significant.

Discussion & conclusion:

The result of present study shows that all male and female of Andhra region are hypsiccephalic according to classification based on vertical cephalic index and acrocephalic according to classification based on transverse cephalic index. Vertical cephalic index of the male is 1-2 point higher than the female in Andhra region population. This data can be useful for forensic medicine experts, plastic surgeons, neurosurgeons, neurologists, anatomist, anthropologist, fasciomaxillary surgeons, oral surgeons and for clinical and research purpose. This study will serve as basis for comparison of future studies on Andhra region population of India and also South Asian population.

KEY WORDS: vertical cephalic index, transverse cephalic index, head length, head breadth, Andhra region.

“add few lines here to attract readers”

INTRODUCTION

Although the human race must be regarded as a unit intellectually and physically, from the anthropologists' viewpoint the particular set of bones most often measured for purposes of ethno-anthropological research are those of the head¹. Cephalometry is a branch of anthropometry that describes measurements of head and face in cadaveric, living or radiologic specimen. Cephalometry use landmarks on head and face to take specific measurements, which are used to calculate indices. These measurements and indices are used to estimate sex and race of individual². Prior to reconstructive surgeries, it is important to know the mean and standard deviation of key cranial and facial measurements at varied age³.

The vertical cephalic index is the ratio of the maximum height of head to its maximum length. The transverse cephalic index is the ratio of the maximum height of head to its maximum breadth. These two indices are very useful anthropologically to find out racial difference. It can also be utilized to find out sexual differences. Comparison of changes in vertical cephalic index and transverse cephalic index between parents, offspring and siblings can give a clue to genetic transmission of inherited characters^{1&4}.

By means of vertical cephalic index; person can be classified into following three groups⁴:

1. Chamaecephalic: vertical cephalic index below 58.
2. Mesocephalic: vertical cephalic index between 58-63.
3. Hypsicephalic: vertical cephalic index above 63.

By means of transverse cephalic index; person can be classified into following three groups⁴:

1. Tapeiocephalic: transverse cephalic index below 79.
2. Metriocephalic: transverse cephalic index between 79-85.
3. Acrocephalic: transverse cephalic index above 85.

Few reports exist on the vertical cephalic index and transverse cephalic index of Andhra region or Andhra Pradesh of India and also South Asian population. Hence we under took this study to document the cephalometric characteristics and sexual differences in cephalic index of Andhra region of India. The aim of present study is to get data for head length, head breadth and head height for population of Andhra region which will be useful in patient evaluation and treatment planning of this region.

MATERIALS AND METHODS

The present study was carried out with 320 (160 male & 160 female) medical students of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation and Dr. Sudha & Nageswara Rao Institute of Dental Sciences, Chinnaoutpally, Krishna District (AP), India. This study was conducted in the month of April and May 2010. Medical students were selected because of the easy availability. Only students belonging to Andhra region were selected for present study. They belong to age group of 20-25 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-sagittal plane.

Inion: The distal most point placed on the external occipital protuberance in the mid-sagittal 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. The 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. Auricular height (head height) was measured from external acoustic meatus to the highest point of the vertex using an auricular head spanner. The process of measurements was explained to each and every subject. Each measurement was taken to the nearest millimeter at least three times and average was considered for computation. The written consent obtained from each and every subject before taking measurements. Vertical cephalic index was calculated as maximum height of head / head length X 100. Transverse cephalic index was calculated as maximum height of head / head breadth X 100. The subjects were classified into chamaecephalic, mesocephalic and hypsicephalic by means of vertical cephalic index. The subjects were also classified into tapeiocephalic, metriocephalic and acrocephalic by means of transverse cephalic index. This study got the permission from research and ethical committee of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, Chinnaoutpally, Krishna District (AP), India.

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

RESULTS

From the collected data, statistics were analyzed and observations and results are presented in tabulated form (Table no: 1, 2 &3). The minimum vertical cephalic index was found to be 63.19 and vertical cephalic index was found to be 82.93.

The mean vertical cephalic index was 73.56 ± 4.03 . The mean vertical cephalic index for male was 74.08 ± 3.24 and for female was 73.03 ± 4.64 . The difference between male and female heads vertical cephalic index was significant ($p < 0.02$ & difference 1.05).

The minimum transverse cephalic index was found to be 82.27 and maximum transverse cephalic index was found to be 106.11. The mean transverse cephalic index was 95.67 ± 5.26 . The mean transverse cephalic index for male was 97.91 ± 3.77 and for female was 93.41 ± 5.57 . The difference between male and female heads transverse cephalic index was significant ($p < 0.001$ & difference 4.50).

The mean head length was 177.75 ± 7.32 mm. In males the head length varies from 173 mm to 203 mm, the mean head length being 182.25 ± 6.04 mm. In females the head length varies from 163 mm to 191 mm, the mean head length being 172.68 ± 4.40 mm. The difference between male and female head length was significant ($p < 0.001$ & difference 10.15 mm).

The mean head breadth was 136.61 ± 3.43 mm. In males the head breadth varies from 132 mm to 144 mm, the mean head breadth being 138.25 ± 2.44 mm. In females the head breadth varies from 128 mm to 143 mm, the mean head breadth being 134.98 ± 3.50 mm. The difference between male and female head breadth was significant ($p < 0.001$ & difference 3.27 mm).

The mean head height was 130.68 ± 7.77 mm. In males the head height varies from 117 mm to 142 mm, the mean head height being 136.33 ± 4.8 mm. In females the head height varies from 115 mm to 140 mm, the mean head height being 126.04 ± 7.37 mm. The difference between male and female head height was significant ($p < 0.001$ & difference 10.29 mm).

Table no 1: Showing statistics of various parameters of present study

| Variable | n | Min. | Max. | Mean | S.D. | S.E. | P Value |
|------------------------------------|-----|-------|--------|--------|------|--------|---------|
| VCI (male) | 160 | 65.02 | 81.14 | 74.08 | 3.24 | 0.2563 | < 0.02 |
| VCI (female) | 160 | 63.19 | 82.93 | 73.03 | 4.64 | 0.3672 | < 0.02 |
| VCI (male & female) | 320 | 63.19 | 82.93 | 73.56 | 4.03 | 0.2255 | ----- |
| TCI (male) | 160 | 84.78 | 105.97 | 97.91 | 3.77 | 0.2962 | < 0.001 |
| TCI (female) | 160 | 82.27 | 106.11 | 93.41 | 5.57 | 0.4408 | < 0.001 |
| TCI (male & female) | 320 | 82.27 | 106.11 | 95.67 | 5.26 | 0.2946 | ----- |
| Head length of male (mm) | 160 | 173 | 203 | 182.83 | 6.04 | 0.477 | < 0.001 |
| Head length of female (mm) | 160 | 163 | 191 | 172.68 | 4.40 | 0.348 | < 0.001 |
| Head length of male & female (mm) | 320 | 163 | 203 | 177.75 | 7.32 | 0.409 | ----- |
| Head breadth of male (mm) | 160 | 132 | 144 | 138.25 | 2.44 | 0.193 | < 0.001 |
| Head breadth of female (mm) | 160 | 128 | 143 | 138.25 | 3.50 | 0.277 | < 0.001 |
| Head breadth of male & female (mm) | 320 | 128 | 144 | 136.61 | 3.43 | 0.192 | ----- |
| Head height of male (mm) | 160 | 117 | 142 | 136.33 | 4.83 | 0.382 | < 0.001 |
| Head height of female (mm) | 160 | 115 | 140 | 126.04 | 7.37 | 0.582 | < 0.001 |
| Head height of male & female (mm) | 320 | 115 | 142 | 130.68 | 7.77 | 0.434 | ----- |

Legends (abbreviation):

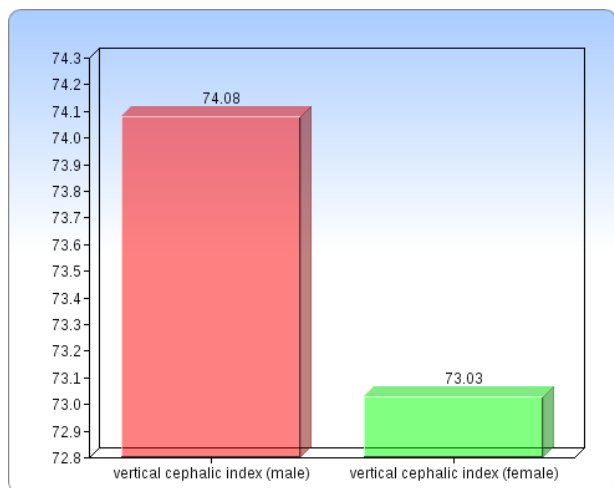
Table no 1: Showing statistics of various parameters of present study. Min. – minimum, Max. – maximum, n – sample size, S.D. – Standard deviation, S.E. – Standard error of mean, VCI - vertical cephalic index, TCI - transverse cephalic index .

Table no 2: Showing classification of subjects based on vertical cephalic index.

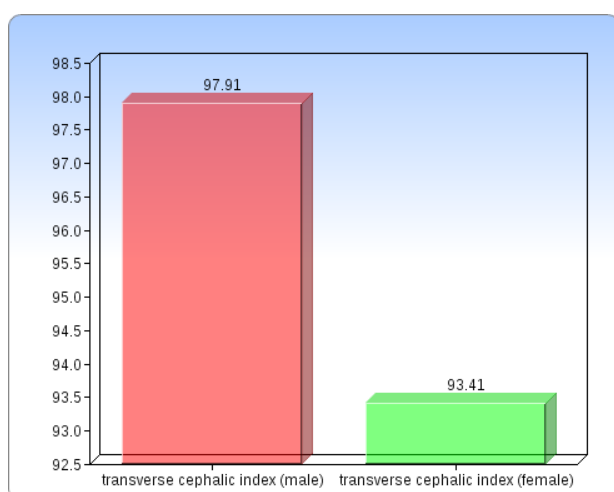
| Sex | n | . Chamaecephalic (VCI below 58) | Mesocephalic (VCI between 58-63) | Hypsicephalic (VCI above 63) | Total |
|------------------------|-----|-------------------------------------|--------------------------------------|----------------------------------|-------|
| Male | 160 | 00 | 00 | 160 | 160 |
| Female | 160 | 00 | 00 | 160 | 160 |
| Total (male & female) | 320 | 00 | 00 | 320 | 320 |

Table no 3: Showing classification of subjects based on transverse cephalic index.

| Sex | n | Tapeiocephalic (TCI below 79) | Metriocephalic (TCI between 79-85) | Acrocephalic (TCI above 85) | Total |
|------------------------|-----|-----------------------------------|--|---------------------------------|-------|
| Male | 160 | 00 | 00 | 160 | 160 |
| Female | 160 | 00 | 00 | 160 | 160 |
| Total (male & female) | 320 | 00 | 00 | 320 | 320 |



Graph no 1: Showing comparison of mean vertical cephalic index of male and female.



Graph no 2: Showing comparison of mean transverse cephalic index of male and female.

DISCUSSIONS

In this study, the mean vertical cephalic index for male was 74.08 ± 3.24 and for female was 73.03 ± 4.64 . The mean transverse cephalic index for male was 97.91 ± 3.77 and for female was 93.41 ± 5.57 . The mean transverse cephalic index for male of this study is lower than the study of Basavanagouda on Valmiki (Indian) individuals while for female it is higher than the study of

Basavanagouda on Valmiki (Indian) individuals while for female it is higher than the study of Basavanagouda. The mean vertical cephalic index for male and female of this study is higher than the study of Rexhepi and Meka on Kosova Albanian population.

Basavanagouda TT studied 400 (200 males & 200 females) Valmiki individuals from Shimoga district of Karnataka state (INDIA) of age group 20 – 50 years. In their study the mean transverse cephalic index for male was 107.02 ± 1.20 and for female was 81.74 ± 1.06 . Majority of Valmiki males come under the range of 91 to 100 whereas, the majority of females fall under the range of 81 to 90⁶. Rexhepi A, and Meka V studied 754 (561 males & 193 females) Kosova Albanian people of age group 18 – 35 years. In their study the mean vertical cephalic index for male was 64.41 and for female was 63.72. Most of their subjects belong to hypsiccephalic group. The mean transverse cephalic index for male was 77.14 and for female was 75.22. Most of their subject belongs to tapeinnocephalic group¹.

Dubey S and Sharma T found vertical cephalic index 76.80 and transverse cephalic index 71.26 in their subject. In this study they considered 25 landmarks upon frontal and lateral pose of face and head for facial recognition⁷. Sengupta S studied vertical cephalic index and transverse cephalic index in goalpara district of Assam (India). In this study mean vertical cephalic index 72.43 ± 1.36 for Koch; 64.45 ± 0.51 for Rabha; 64.31 ± 0.53 for Garo; 69.71 ± 0.56 for Kachari; 72.02 ± 0.79 for Lalung and 68.18 ± 0.56 for Mikir. In this study mean transverse cephalic index 92.39 ± 1.77 for Koch; 85.53 ± 0.71 for Rabha; 85.33 ± 0.69 for Garo; 88.01 ± 0.73 for Kachari; 91.65 ± 1.11 for Lalung and 86.78 ± 0.69 for Mikir⁸. In our study the mean vertical cephalic index and transverse cephalic index for male or female are slightly lower or higher than values of these indices found by Basavanagouda TT, Sengupta S, Rexhepi A, and Meka V.

But these studies were conducted on different racial groups which are different than racial group of our study. This may be the reason for the difference between the mean vertical cephalic index and transverse cephalic index of our study and values of these indices found by Basavanagouda TT, Sengupta S, Rexhepi A, and Meka V.

CONCLUSION

The results of present study show that all male and female of Andhra region are hypsicephalic according to classification based on vertical cephalic index. All male and female of Andhra region are acrocephalic according to classification based on transverse cephalic index. There was a significant difference ($p < 0.02$ & difference 1.05) between vertical cephalic index of male and female of Andhra region. Thus we can conclude that vertical cephalic index of the male is 1-2 point higher than the female in Andhra region population. There was a significant difference ($p < 0.001$ & difference 4.50) between transverse cephalic index of male and female of Andhra region. Thus we can conclude that transverse cephalic index of the male is 3-5 point higher than the female in Andhra region population. The data gathered from a specific patient can be compared to the normal values controlled for age and gender. The analysis of the patient's measurements can be used for planning the timing and type of aesthetic and reconstructive surgeries for congenital, developmental, traumatic or neoplastic disorders as well as cosmetic procedures³. This data can be useful for forensic medicine experts, plastic surgeons, neurosurgeons, neurologists, anatomist, anthropologist, fasciomaxillary surgeons, oral surgeons and for clinical and research purpose. This study will serve as basis for comparison of future studies on Andhra region population of India and also South Asian population.

REFERENCES

1. Rexhepi A, Meka V. Cephalofacial morphological characteristics of Albanian Kosova population. *Int. J. Morphol* 2008; 26(4):935-940.
2. Umar MBT, Singh R, Shugaba AI. Cephalometric indices among Nigerians. *Journal of Applied Sciences* 2006; 6(4):939-942.
3. Posnick JC. *Craniofacial & maxillofacial surgery in children & young adult*, 1st ed. W B Saunders Company, 2000; 55-79.
4. Williams PL, Bannister LH, Dyson M, Collin, Dussek JE and Ferguson JWM. *Gray's Anatomy*, 38th ed. Churchill Livingstone, Edinburgh, London 1995; 609-612.
5. Roy IB. *Anthropology (the study of man)*, 1st ed., S. Chand, New Delhi 2009; 250-251.
6. Sharma AA. *Contemporary studies in anthropometry*, 1st ed. Sarup & Sons, New Delhi 2007; 19-29.
7. Dubey S and Sharma T. A face recognition system through somatology. *International Journal on Computer Sciences and Engineering* 2011; 3(1):155-159.
8. Sengupta S. Anthropological studies among the Koch population of golapara district of Assam. *Bull. et. Mem. de. la. Sac. d' Antrop.* 1990; 2(2):203-212.