

Sexual dimorphism among medical students of north India assessed by interorbital circumference index



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Submission: 05-09-2023

Revision: 28-10-2023

Publication: 01-12-2023

ABSTRACT

Background: The human body dimensions are affected by ecological, geographical, racial, gender, and age factors. Craniofacial anthropometry has become an important tool used in genetic counseling, reconstructive surgery, and forensic medicine. Orbital measurements are important in the evaluation of several systemic syndrome, craniofacial abnormalities, and also surgical treatment of post-traumatic telecanthus. Among these measurements, normal interpupillary distance, inner canthal distance (ICD), and outer intercanthal distance are the vital features to be known. **Aims and Objectives:** The aims and objectives of the present study were to assess the ICD, head circumference (HC), and circumference orbital index of male and female medical students of North India and find out gender differences in the respective parameters and thus to contribute the present finding to the available literature. **Materials and Methods:** This was an observational descriptive study conducted in the department of anatomy at a fixed time in 150 MBBS course students in the age group 18–22 years. The ICD and HC were measured using round end digital spreading Vernier caliper. Then, circumference interorbital index (CII) was calculated and analyzed. **Results:** The mean ICD in males was 3.44 ± 0.33 mm and in females was 3.21 ± 0.32 mm; mean HC in males was 56.03 ± 1.55 mm and in females was 53.88 ± 1.38 mm; and mean CII in males was 6.15 ± 0.54 and in females was 5.95 ± 0.51 . **Conclusion:** The result of this study will help to establish the mean values for of craniofacial anthropometric parameters for medical students of North India, and the results are showing that craniofacial anthropometric parameters are sexually dimorphic.

Key words: Anthropometry; Inner canthal distance; Head circumference; Circumference interorbital index

Access this article online

Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v14i12.58366

E-ISSN: 2091-0576

P-ISSN: 2467-9100

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INTRODUCTION

The branch of anthropology concerned with the measurements of the human body is anthropometry. The evaluation and measurement of the human body dimensions are achieved by physical anthropometry.¹ The human body dimensions are affected by ecological, geographical, racial, gender, and age factors.² Craniofacial anthropometry has become an important tool used in genetic counseling, reconstructive surgery, and forensic medicine.³ Orbital measurements are important in the evaluation of several systemic syndrome, craniofacial abnormalities, and also

surgical treatment of post-traumatic telecanthus.⁴ Among these measurements, normal interpupillary distance (IPD), inner canthal distance (ICD), and outer intercanthal distance (OICD) are the vital features to be known.

To diagnose patients with hypotelorism/hypertelorism or telecanthus, we require standard baseline values of abovementioned parameters in normal Indian population. Previously, these conditions were assessed on the basis of clinical evaluation without any standard measurements, which create a significant source of error in establishing a final diagnosis.⁵

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However, facial proportions change with age and sex in a given race as a result of variations in skeletal dimensions, muscle development and are dependent on environmental factors such as diet health and climatic influences which are important determinants of growth and development.⁶

The data of facial parameters are scarce and insufficiently available for people residing in the sub-Himalayan region of India. Determination of facial parameters is of great importance to evaluate facial trauma, congenital and traumatic deformities.⁷ Hence, data from the sub-Himalayan region will be helpful to establish a final diagnosis and guide the management of such cases.

The aims and objective of the present study were to assess the ICD, head circumference (HC), and circumference orbital index of male and female medical students of North India and find out gender differences in the respective parameters and thus to contribute the present finding to the available literature.

Aims and objectives

The aims and objective of the present study were to assess the Inner canthal distance, Head circumference and Circumference Orbital Index of Male and female medical students of North India and find out gender differences in the respective parameters and thus to contribute the present finding to the available literature.

MATERIALS AND METHODS

The approval of the institutional ethical board was obtained vide letter no HFW-H (DRRPGMC)/Protocol/2018/-51 dated 01/12/18.

This was an observational descriptive study conducted in the department of anatomy at a fixed time between 9 am and 4:30 pm to eliminate the discrepancies due to diurnal variation in 150 MBBS course students in the age group of 18–22 years.⁸ Students who were operated cases of head diseases and anomalies (craniofacial surgeries), all the forms of syndromic disorders, subjects with craniofacial abnormalities such as microcephaly, macrocephaly, telecanthus, epicanthus, and hypertelorism were excluded from the study.

Anthropometric examination

The respective anthropometric measurements were taken after having the subject to look straight in an anatomical position at the examiner, and a round end digital spreading Vernier caliper graduated in millimeter was used for the measurements, at the examiner closing his right eye noted the distance.

The ICD was measured as the medial angle of the left eye to the medial angle of the right eye between the two inner canthi (ICD).⁹

HC was determined using tape rule from the occipital prominence to the supraorbital bridge. In the case of some fashionable hairstyles, the tape was drawn tightly and compressed against the hair as much as possible.⁹ In cases of braids in female subjects, the tape was allowed to come in contact with the skin and not over the lump of the hairs.

In addition to basic measurements, we also measured the circumference interorbital index (CII)⁹— $ICD/HC \times 100$.

Statistical analysis

Anthropometric measurements means and standard deviations were computed for all. The student unpaired t-test or Mann–Whitney test were applied for parametric and non-parametric data depending on the nature of data obtained to assess the extent of gender differences.

RESULTS

The results have been depicted under headings of demographic profile, ICD, HC, and circumference inter orbital index (CII) of the medical students in Table 1 and Figures 1-3.

The P value for ICD was 0.00, for HC was 0.001, and for CII was 0.00. It was significant in all three parameters.

DISCUSSION

Mean values of craniofacial anthropometric parameters of North Indian medical students were measured in the present study. The presence of sexual dimorphism in this study agreed with other studies and also showed a significant difference in the craniofacial parameters of North Indian male and female medical students at a significant level of $P < 0.005$. There is rapid growth rate of the craniofacial region during childhood and adolescent age, but the growth rate is reduced from early to mid-twenties. Hence, craniofacial parameters can be affected by age even within same ethnic group, increase in age leads to increase in craniofacial dimensions¹⁰. Therefore, in our study, we

Table 1: Demographic profile

Demographic profile			
Parameters	Male	Female	Total
Sex of medical student	75 (50%)	75 (50%)	150
Age			
Mean age (years)	18.84	18.80	18.82
Back ground			
Urban background	42 (61%)	27 (39%)	69 (100%)
Rural background	33 (41%)	48 (59%)	81 (100%)
Place of living			
Hilly area residents	32 (37%)	54 (63%)	86 (100%)
Plains area residents	43 (67%)	21 (33%)	64 (100%)

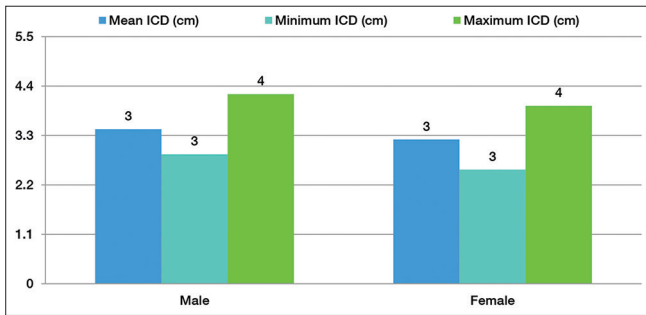


Figure 1: Inner canthal distance of North Indian medical students

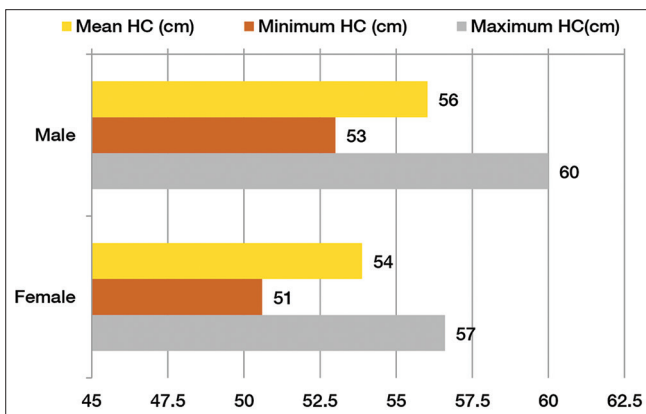


Figure 2: Head circumference of north Indian medical students

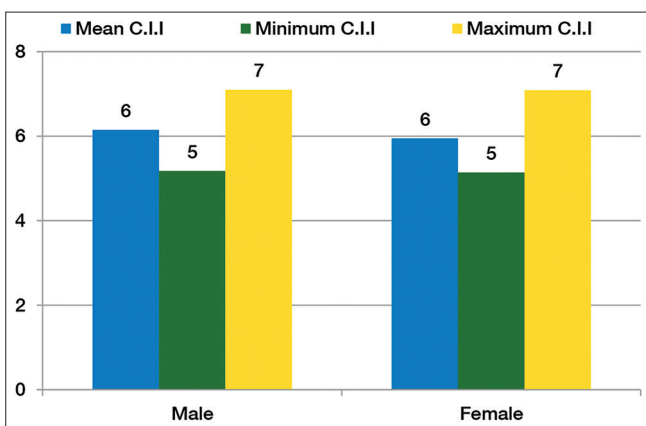


Figure 3: Circumference interorbital index of North Indian medical students

chose subject's age range between 18 and 22 years because measurements become stable in the mid to late twenties.¹¹

The reason behind the existence of sexual dimorphism seen in male and female is due to the predominant role played by X/Y-linked genes which codes for sexually dimorphic traits such as body size and organ development¹¹ and another influence on the distinguishing feature can be as a result of the male sex hormone, testosterone which causes an increase in the dimension and mass of muscles and bones.¹² The retrieved data of this study will be of immense role in forensic science and anthropology and will also serve as future framework for estimating the craniofacial dimensions among other Indian population. Furthermore, the application of facial anthropometric data will be of immense use to reduce road traffic accident-related deaths by designing more appropriate and comfortable safety equipments such as helmets.

A comparison of circumference interorbital index in male and female North Indian with previous studies has been shown in Table 2.

In this comparative analysis, the difference in the circumference interorbital index was quite prominent in case of study being done by Chukwujekwu et al.,¹³ on Igbos population of Nigeria and our study, and this further emphasizes the fact that facial anthropometric features are influenced by the growth pattern, climatic and genetic factors.⁶ Furthermore, most of these studies have been done on specific population and in that too on specific ethnic groups; therefore, it is being required that more and more latest facial anthropometric data be collected.

Group membership of male and female craniofacial parameters was predicted using discriminant function analysis of Wilks, Lambda test. It made us aware that all the predictors do add certain predictive power to the discriminate functions showed a significant difference at $P < 0.001$, which confirms accurateness and predictability of the statistical significant difference of male and female measured variables. The strength of our study over other

Table 2: A comparison of circumference interorbital index in male and female North Indians with previous studies

Authors	Population	Circumference interorbital index (mean±SD)	
		Male	Female
Eboh et al. ⁹ (2015)	Urhobo	7.15±0.74	7.12±0.68
Chukwujekwu et al. ¹³ (2014)	Igbos	10.62±0.61	10.49±0.74
Anibor et al. ¹⁴ (2014)	Isoko	6.62±0.38	6.58±0.10
Oladipo et al. ⁷ (2008)	Ijaw	7.80±2.20	8.10±0.60
	Igbos	6.20±0.50	6.50±0.20
Oladipo et al. ¹⁵ (2010)	Ibibos	6.26±0.46	5.93±0.57
Oladipo et al. ¹⁶ (2018)	Ogonis	6.31±0.44	6.09±0.40
Juberg et al. ¹⁷ (1975)	African-American	5.89±0.48	5.98±0.39
Evereklioglu et al. ¹⁸ (2002)	Turkish	5.58±0.40	5.64±0.4
Present study	North-Indian	6.15±0.54	5.95±0.51

similar study was that this kind of the study has not been done before in this region of Indian population.

Limitations of the study

The parameters measured in the study, varied with age, could be influenced by nutrition, growth pattern, climate and genetic factors.

CONCLUSION

The result of this study will help to establish the mean values for of Craniofacial Anthropometric Parameters for medical students of North India and the results are showing that craniofacial anthropometric parameters are sexually dimorphic. These results could be of importance in age, sex and racial differentiation as well as for clinical and forensic purpose.

ACKNOWLEDGMENTS

The authors would like to acknowledge the help of the Department of Anatomy for carrying out the present study.

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Author's Contribution:

VK- Definition of intellectual content, Literature survey, Prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation, and manuscript revision; **RKS** - Concept, design, data collection, data analysis, manuscript preparation, and manuscript revision; **KC** - Review manuscript; **GS** - Review manuscript, submission of article; **PS** - Concept, design, implementation of study protocol, manuscript preparation, and manuscript revision.

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Source of Support: Nil, **Conflicts of Interest:** None declared.