Section A-Research paper
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ESTIMATION OF DIFFERENT CRANIOFACIAL INDICES IN HUMAN DRIED SKULLS IN INDIAN POPULATION AND THEIR ASSOCIATED MEDICO LEGAL IMPORTANCE.

1. Dr Ankit Khandelwal, Associate Professor Department of Anatomy Saraswati Institute of Medical Sciences, Pilkhuwa, Hapur, (U.P.).
2. Dr Avinash Thawait, Assistant professor, Department of Anatomy, Late Bisahu Das Mahant Memorial Medical College, Korba, Chhattisgarh.
3. Dr Bhoj Kumar Sahu*, Assistant professor Dept. Forensic medicine and Toxicology, Late Bisahu Das Mahant Memorial Medical College, and Hospital, Korba, Chhattisgarh.
4. Dr Vasundhara Kulshreshtha, Ex Professor and (Ex Head of Department) Department of Anatomy, S. N. Medical College, Agra, (U.P.).

Corresponding Author*
Phone:9988338285
Email: drbhojsahu16@gmail.com

Abstract
Cranial indices offer a method for metrically documenting the dimensions and ratios of cranial characteristics. Understanding the cranial indices of desiccated human skulls is a crucial aspect of examining and contrasting crania across populations that exhibit fundamental distinctions such as race, geography, ethnicity, diet, and so on. Despite their notable importance, there exists limited knowledge regarding cranial morphometry within the Indian population.

Objective: The aim of this study was to determine the cranial indices and other cranial parameters within the Indian population.

Methods: The study incorporated a sample of 100 desiccated human skulls, comprising 50 male and 50 female specimens. The study involved the measurement and statistical analysis of multiple cephalometric parameters in both male and female skulls. These parameters included cranial length, cranial breadth, cranial height, palatal length, basion prosthion length, nasal breadth, orbital breadth, palatal breadth, and bi zygomatic breadth. The measurements were taken using sliding callipers and blunt end spreading callipers. The present study involved the determination and statistical evaluation of several craniofacial indices, namely the cephalic index, height index, nasal index, orbital index, palatal index, upper facial index, and gnathic index, in skulls of both male and female individuals, as well as in a combined sample.

Findings: The study revealed that the majority of the skulls analysed (73.3%) were classified as Dolichocephalic based on the cephalic index. Additionally, 74.725% of the skulls were categorised as Orthocephalic using the height index, while 53.98% were classified as Platyrrhine nose variety with the nasal index. The majority of the skulls (93.45%) were identified as Megaseme orbit variety with the orbital index, and 113.8% were categorised as Mesouranic palate with the palatal index. Furthermore, 50.48% of the skulls were classified as Mesoprosopic face variety with the upper facial index, and 93.15% were identified as Orthognathous skull variety with the gnathic index.

Conclusion: the findings of this investigation bring to light the disparities in cranial morphometry and diverse cranial indices among the Indian populace with regards to race and gender. The establishment of these dimensions will establish a fundamental standard value for all parameters within the Indian population. This will prove beneficial in the classification of the Indian population based on cranial indices, and will hold significant value in clinical, medicolegal, and anthropological scenarios.
Keywords: Cranial indices, Medico legal importance, Indian population.

1. Introduction:

The measurement of cranial indices holds significant importance in the examination of racial disparities and in clinical settings for the analysis of cranial size and shape abnormalities, along with sexual dimorphism, as noted by Williams et al. Cranial measurements are a crucial tool for assessing inter and intra population comparisons, as noted by Shah and Jadhav (2004) and Williams et al. Recent studies have centred on investigating the correlation between morphological and genetic traits and various human pathological conditions. The application of geometric analysis to different cardinal points of the face has revealed significant differences in the diameters of individuals with mental illness and criminal tendencies compared to those of normal individuals. De Quardo (year of publication not provided)

Various studies have identified a distinct racial pattern in the cranial dimensions and cephalic indices of different populations, including Caucasians, Indians, Turkman, Kosov and Albanians, Iranians, Japanese, Serbs, Greek, Bulgarians, Mapuche individuals in Chile, Nigerians, and Cauc. These studies include those conducted by Abolhasanzadeh and Farahani (2003), Rexhepi and Meka (2008), Kasai et al. (1993), Obikili and Singh (1992), del Sol (2005), and Okupe et al. (1984).

The cephalic index was developed by Anders Retzius, a Swedish anatomist, as a tool for evaluating the cranial measurements of contemporary European populations in relation to those of ancient skulls. According to Hooton's (1946) widely accepted system of classification, a skull exhibiting a cranial index exceeding 80% is categorised as brachycephalic, while a cranial index below 75% is classified as dolichocephalic. A skull with a cranial index ranging from 75% to 80% is categorised as mesocephalic. Various techniques, including anthropological and radiological methods, can be employed to estimate cranial indices for both macerated skulls and living individuals (Manjunath, K.Y. 2002).

The current investigation was therefore devised to provide a dataset comprising diverse craniofacial indices and cranial parameters that may serve as a diagnostic aid in various cranial pathologies, while also being a valuable resource in medico-legal, anthropological, and archaeological contexts among the Indian populace.

2. MATERIALS AND METHODS:

In this section, we will discuss the experimental design.

The current investigation was carried out on a sample of 100 desiccated human crania, comprising 50 specimens of the male sex and 50 specimens of the female sex. The individual in question is of Indian descent and is currently affiliated with the Department of Anatomy at S.N. Medical College in Agra.

2.1. The materials utilised.

The inventory comprises of a total of 100 desiccated human craniums, with an equal distribution of 50 specimens each for male and female. Additionally, the equipment available for measurement includes a blunt end spreading calliper and a sliding calliper.

2.1.2 The Exclusion Criterion:

The present study excluded dry human skulls that exhibited gross deformity, asymmetry, or partial fractures.

2.1.3 Approval of the study's ethical considerations:

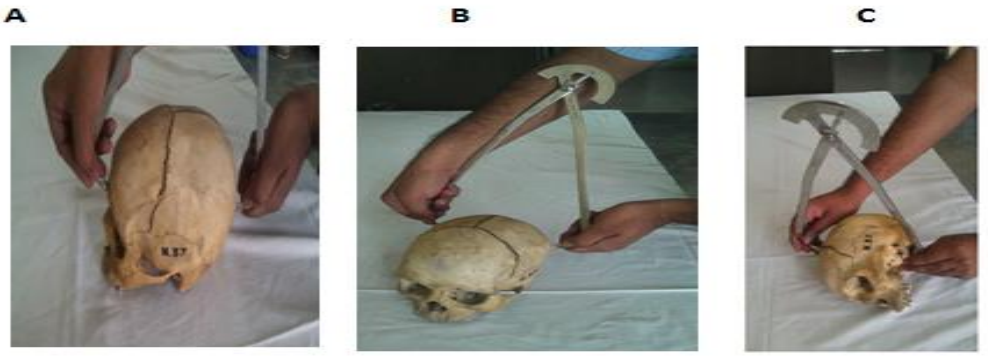
The study involving dry human skull was conducted in compliance with the ethical standards of the institutional research committee. The research was granted approval by the Bioethics committee of S.N. The educational institution in question is the Medical College located in Agra, India.

Section 2.2 presents the methodology used in this study.

The measurements were acquired using sliding and spreading callipers, and were recorded thrice to obtain an average value for subsequent calculations. To obtain measurements, the instrument's two arms were grasped at their respective ends, positioning the curved portions between the middle finger and thumb.

2.3Measurements:

Photograph depicting the method and the instruments used in A, B and C



Several measurements were obtained:

1. The cranial length is determined by measuring the distance between the glabella, which is the area between the two superciliary ridges, and the inion, which is the most prominent point of the occipital bone located at the base of the skull.

2. The maximum cranial breadth is determined by measuring the distance between the two most lateral points on the parietal bones.

3. The maximum cranial height can be determined by measuring the distance between the basion, which is the midpoint of the anterior margin of the rim of foramen magnum, and the bregma, which is the junction of the coronal and sagittal sutures.

4. The Nasion Prosthion length is determined by measuring the distance between the nasion, which is the point of intersection between the frontal and two nasal bones, and the prosthion, which is the foremost point located in the midline on the alveolar process of the maxilla.

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5. The bizygomatic breadth refers to the external measurement of the greatest distance between the zygomatic arches.

6. Nasal breadth refers to the maximum horizontal measurement across the nasal aperture.

7. The measurement of nasal height is obtained by determining the distance between the nasion and the mean of the two lowest points on the lower border of the aperture.

8. The measurement of orbital breadth involves determining the distance between the dacryon, which is the point of convergence of the maxillary bone, lacrimal bone, and frontal bone, and the furthest point on the opposite border of the orbit.

9. The altitude of an orbit is determined by measuring the distance along a line that is perpendicular to the width of the orbit.

10. Palatal breadth refers to the distance between the borders of the alveolar arch, located just above the middle of the second molar tooth.

11. Palatal length refers to the distance between the alveolar point and the midpoint of the palate. A transverse line that intersects with the posterior borders of two maxillae.
12. Basion prosthion length refers to the measurement taken between the midpoint of the basion, which is the anterior point of the foramen magnum, and the most anterior point of the prosthion. The anterior margin of the rim of the foramen magnum and the prosthion are the most prominent landmarks in the craniofacial region. The anterior point located in the midline on the alveolar process of the maxilla.
13. Basion-nasion length refers to the distance between two anatomical landmarks: basion, which is the midpoint of the anterior margin of the rim of the foramen magnum, and nasion, which is the intersection of the frontonasal suture and the midline of the skull.The craniofacial structure comprises the frontal bone and a pair of nasal bones.

Utilising the aforementioned measurements, the subsequent indices and parameters were computed in accordance with the craniometric indices outlined in El-Najjar Classification.

1. The cephalic index is defined as the multiplication of the ratio of cranial breadth to cranial length by 100.
2. The upper facial index is a metric that is calculated by multiplying the ratio of the length between the nasion and prosthion landmarks to the breadth between the two zygomatic bones by a factor of 100.
3. The nasal index is a metric that is calculated by multiplying the ratio of nasal breadth to nasal height by 100.
4. The orbital index is defined as the product of the ratio between the height and breadth of an orbit, multiplied by 100.
5. The palatal index is defined as the product of the ratio between the breadth and length of the palate, multiplied by 100.
6. The gnathic index is a metric that is obtained by multiplying the ratio of the length between basion prosthion and basion nasion by 100.

7. The height index is a metric that is obtained by multiplying the ratio of cranial height to cranial length by 100.

2.4 Statistical analysis.

The findings were presented as the mean value with standard deviation and were subjected to statistical analysis using the 15th version of the Statistical Package for Social Sciences (SPSS). The study conducted a statistical analysis to compare the mean values and proportions between genders, utilising the t-test and Z-test for these respective measures.

3 Results and Discussion

The results of the present study are summarized in the tables below:

Table 1. Presents a statistical analysis of cranial parameters measured in centimetres.
The variables S.S. and S.D. are commonly used in statistical analysis

		S.S.*	Min.	Max.	Sum	Mean	S.D.**
CRANIAL LENGTH(CL)	Males	50	15.1	19.4	884.9	17.698	0.788
	Females	50	15	18	849.4	16.988	0.726
	Total	100	15	19.4	1734.3	17.343	0.8367
CRANIAL BREADTH(CB)	Males	50	11.8	14	637.3	12.746	0.563
	Females	50	11.8	13.9	631.3	12.626	0.537
	Total	100	11.8	13.9	1268.6	12.686	0.5537
CRANIAL HEIGHT(CH)	Males	50	11.4	14	660.8	13.216	0.57
	Females	50	11.4	13.7	633.7	12.674	0.489
	Total	100	11.4	14	1294.6	12.95	0.5945

Table 2. Presents the statistical analysis of the cephalic index (%) data.

CEPHALIC INDEX(CI)		S.S.*	Min.	Max.	Sum	Mean	S.D.**
	Males	50	62.89	81.82	3604.7	72.1	3.69
	Females	50	67	90.1	3724.6	74.5	5.1
	Total	100	62.89	90.1	7330.3	73.3	4.59

The cephalic index can be calculated by dividing the cranial breadth by the cranial length and then multiplying the result by 100.

Anders Retzius (1796-1860) categorised the cephalic index into various types.

The classification of cephalic index:

1. Dolichocephalic skulls are defined as those with a cephalic index that is equal to or less than 74.9. This trait is frequently observed among individuals of Kaffir and Native Australian descent.

2. Mesocephalic skulls are defined as those with a cephalic index falling within the range of 75 to 79.9. Prevalent among individuals of European and Chinese descent.

3. Brachycephalic skulls are characterised by a cephalic index falling within the range of 80 to 84.9. Prevalent among the populations of Mongolians and Andaman islanders.

4. Hyper brachycephalic skulls are defined as skulls with a cephalic index that falls within the range of 85 to 89.9.

Based on the aforementioned classification, Table 02 presents the average cephalic index of male and female skulls, which are categorised as Dolichocephalic skulls. The mean cephalic index of female skulls is slightly higher than that of male skulls.

Types	Male(n=50)	Female(n=50)
Dolichocephalic	78%	66%
Mesocephalic	20%	20%
Brachycephalic	02%	10%
Hyperbrachycephalic	00%	04%

Table 3. Presents a comparison of the Cephalic Index observed in the current study with that reported in other studies.

STUDIES	MEAN CEPHALIC INDEX
Jordaan (1976)	80.29 ± 0.89
Mibodi and Frahani (1996)	87.5 ± 6.4
Rajlakshmi et al (2001)	88.4 ± 1.1
Golalipour, M.J. Haidari, K. Jahanshahi, M. Farahani, R.M.(2003)	77.97 ± 5.35
Shah GV et al (2004)	80.81 ± 5.41
M.B.T. Umar, A.S. Ojo, S.A. Asala and J.O. Hambolu (2011)	79.52 ± 5.21
Present study	**73.3 ± 4.59**

The cephalic indices observed in this study were comparatively lower than those reported in previous studies conducted by Jordaan in South Africa (80.29 + 0.89) (Jordaan, 1976) and Rajlakshmi et al. in India (88.4 + 1.1) (Rajlakshmi et al., 2001). However, the cephalic indices in this study were found to be similar to those reported by Imami in Quzvin-North-West in IRAN (87.5 + 6.4) (Mibodi and Frahani, 1996). Anthropological research has identified that individuals from Africa, India, and Australia are integral to the populations of Europe and North America. Furthermore, individuals in the Pacific Ocean region exhibit a brachycephalic head shape, while those in the Middle East, Russia, and central Europe display a mesocephalic head shape. Additionally, the majority of individuals residing along the Atlantic Ocean border exhibit a mesocephalic head shape (Chamella, 1997). According to Nakishima's (1986) report in Japan, the shape of the head is influenced by the factor of time. It was observed that the head shape had undergone changes over a period of 30 years.

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According to the findings of Shah GV et al's (2004) study on a sample of 500 medical students, the minimum cephalic index was 71.10 and the maximum cephalic index was 89.77. The study revealed that the average cephalic index for both genders was 80.81, which differs from the current research results indicating an average cephalic index of 73.3 + 4.59, with a range spanning from 62.89 to 90.1.

In a study conducted by Mishra AK et al (2005) on a sample of 100 skulls, it was determined that a significant proportion of the skulls were of the Dolichocranic type (80-82%). Our current study yielded similar findings, with 72% of the sample falling under this category. Greetings, V.M. Bhoir M. (2007) conducted research at Topiwala National Medical College in Mumbai, India, utilising a sample of 90 adult human skulls. The study revealed that 10% of the skulls were brachycephalic, 33.5% were mesocephalic, and 54.44% were dolichocephalic. The present study's findings, which indicate that 72% of the skulls examined were dolichocephalic, closely align with the results of a previous study in which more than 50% of the skulls were also dolichocephalic.

The cephalometric indices of the Hausa and Yoruba ethnic groups of Nigeria were established and compared by Umar et al. (2011). .The present study has revealed that the dolichocephalic group displays cranial characteristics that differ from the mesocephalic heads observed in both Hausa and Yoruba populations.

Table 4. Presents a statistical analysis of the height index expressed as a percentage.

		S.S.*	**Min.**	**Max.**	**Sum**	**Mean**	**S.D.****
HEIGHT INDEX(HI)	**Males**	50	68.2	84.1	3737.4	74.748	3.045
	Females	50	67.9	86	3735.1	74.702	3.73
	Total	100	67.9	86	7472.5	74.725	3.405

The variables S.S. and S.D. are commonly used in statistical analysis.

According to Cunningham's Textbook of Anatomy, the height index can be calculated by dividing the cranial height by the cranial length and then multiplying the result by 100.

The El-Najjar classification is a method of categorising individuals based on their height index.

1. Chaincephalic skulls are defined as skulls with a height index that falls below the threshold of 70.1. This trait is frequently observed among individuals of Kaffir and Native Australian descent.

2. Orthocephalic skulls are defined as skulls with a height index that falls within the range of 70.1 to 75. Prevalent among individuals of European and Chinese descent.

3. Hypsicephalic skulls are defined as those with a height index exceeding 75. Prevalent among the populations of Mongolians and Andaman islanders.

As per the aforementioned classification, it can be observed from Table 04 that the average height index of male and female skulls is situated within the higher range of the Orthocephalic skulls category.

	Male(n=50)	Female(n=50)
Chainmcephalic	04%	08%
Orthocephalic	54%	52%
Hypsicephalic	42%	40%

The cephalometric indices of the Hausa and Yoruba ethnic groups of Nigeria were established and compared by **Umar et al. (2011).** The cephalic length height index, cephalic breadth height index, mean height index, and mean basion height are comparatively higher among the Hausa population than the Yoruba population. All of these factors indicate the pronounced cranial features of individuals of African descent. The analysis of the mean height index indicates that the Hausa population exhibits a higher value in comparison to the Yoruba population, with values of 60.60% and 58.07%, respectively. However, these values are lower than the value obtained in the current study, which is 74.725 + 3.405.

Table 05. Presents a statistical analysis of the nasal index (%) data.

		S.S.*	Min.	Max.	Sum	Mean	S.D.**
NASAL INDEX(NI)	**Males**	50	44.3	64.5	2655.8	53.12	4.16
	Females	50	43.7	63.9	2742	54.84	4.58
	Total	100	43.7	64.5	5397.8	53.98	4.46

The variables S.S. and S.D. are commonly used in statistical analysis.

According to Gray's Anatomy, the nasal index can be calculated by dividing the nasal breadth by the nasal height and multiplying the result by 100.

The El-Najjar classification is a system used to classify nasal index.

1. Leptorrhine skulls are characterised by a nasal index that is below 48. Prevalent among individuals of European descent.

2. Skulls exhibiting a nasal index within the range of 48 to 53 are classified as mesorrhine. This phenomenon is frequently observed in the Japanese and Chinese contexts.

3. Skulls exhibiting a nasal index exceeding 53 are classified as Platyrrhine skulls. Frequently observed among individuals of African descent and indigenous Australians.

Based on the aforementioned categorization, Table 05 illustrates that the average nasal index of male and female craniums belongs to the Platyrrhine skulls category.

Types	Male(n=50)	Female(n=50)
Leptorrhine	08%	06%
Mesorrhine	48%	30%
Platyrrhine	44%	64%

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The authors **Oladipo et al.** A study conducted by (2010) aimed to compare the nasal indices of the Ekpeye and Ikwerre ethnic groups of Rivers State in Nigeria. The study involved 500 subjects and was conducted in the Department of Human Anatomy, Faculty of Basic Medical Sciences, University of Portharcourt. The results indicated that there were statistically significant differences in the nasal indices between the two groups, with a p-value of less than 0.05.

The cephalometric indices of the Hausa and Yoruba ethnic groups of Nigeria were established and compared by **Umar et al. (2011).** The Yoruba population exhibits a nasal index value of 94.26%, while the Hausa population exhibits a nasal index value of 90.05%. The present study findings indicate that the Platyrrhine group is applicable to the Hausa, in contrast to the typical leptorrhine values associated with this group. The measured value was 53.98 + 4.46.

Saxena and colleagues, In a study conducted on 500 male medical students of the S.N., a noteworthy association was discovered between the nasal index and both the upper facial index and the total facial index. The institution in question is the Medical College located in Agra, India.

Table 06. Presents the statistical analysis of the orbital index (%) data.

		S.S.*	**Min.**	**Max.**	**Sum**	**Mean**	**S.D.****
ORBITAL INDEX(OI)	**Males**	50	82.9	107	4699	94	5.5
	Females	50	67.9	104	4646	92.92	5.63
	Total	100	67.9	107	9345	93.45	5.59

The variables S.S. and S.D. are commonly used in statistical analysis.

The formula for calculating the orbital index, as stated in Gray's Anatomy, involves dividing the orbital height by the orbital breadth and then multiplying the result by 100.

The El-Najjar classification, also known as the orbital index classification, is a system used for categorising the shape and size of the human orbit.

1. Microseme skulls are defined as skulls that possess an orbital index of less than 84. This particular trait is frequently observed among individuals of Tasmanian and Native Australian descent.

2. The skulls categorised as Mesoseme exhibit an orbital index falling within the numerical range of 84 to 89. Prevalent among individuals of European descent.

3. Megaseme skulls are characterised by having an orbital index exceeding 89. This phenomenon is frequently observed among individuals of Chinese and Polynesian descent.

Based on the aforementioned categorization, Table 06 indicates that the average orbital index of male and female crania is classified as Megaseme skulls.

Types	Male(n=50)	Female(n=50)
Microseme	02%	04%
Mesoseme	20%	14%
Megaseme	78%	82%

In a study conducted by **Mishra AK et al (2005)** on a sample of 100 skulls, it was determined that the majority of the skulls had an orbital index belonging to the Mesoseme type (67-72%). In contrast, the current study found that 80% of the skulls belonged to the Megaseme variety.

In 1978, Masniari Novita conducted a study on the facial index, upper facial index, and orbital index of three distinct student populations at Jember University, namely Batak, Klaten, and Flores students. The present study has classified the orbital index as mesoseme in all subjects, in contrast to the megaseme group.

Table 07. Presents a statistical analysis of the palatal index (%) data.

		S.S.*	Min.	Max.	Sum	Mean	S.D.**
PALATAL INDEX(PI)	**Males**	50	101.3	121.9	5655.1	113.1	11.84
	Females	50	99.8	143.7	5730.2	114.6	12.57
	Total	100	99.8	143.7	11385.3	113.8	11.78

The variables S.S. and S.D. were utilised in the study.

According to Cunningham's Textbook of Anatomy, the palatal index can be calculated by dividing the palatal breadth by the palatal length and multiplying the result by 100.

The El-Najjar classification, also known as the palatal index classification, is a method used for categorising palatal morphology.

1. Dolichouranic skulls are characterised by having a palatal index that is below 110. This trait is frequently observed among individuals of Kaffir and Native Australian descent.

2. The Mesouranic skulls are characterised by a palatal index falling within the range of 110 to 115. Prevalent among individuals of European and Chinese descent.

3. Brachyuranic skulls are characterised by having a palatal index that exceeds 115. Prevalent among the population of Mongolians and Andaman islanders.

Based on the aforementioned categorization, it can be observed from Table 7. that the average palatal index of male and female crania is classified as Mesouranic.

Types	Male(n=50)	Female(n=50)
Dolichouranic	22%	26%
Mesouranic	52%	44%
Brachyuranic	26%	30%

M.F. In a study conducted by Ashley Montagu in 1934, casts of the palates of 90 newborn Caucasian children with an average age of 3.70 weeks ± 2.8 days were examined in the Department of Anatomy and Division of Child Research at the College of Dentistry at New York University. The results indicated that the frequency of the types of palate were as follows: dolichouranic (8), mesouranic (36), brachyuranic (37), and hyperbrachyuranic (2). The mean palatal index of the sample was found to be 119.9 ± 6.7, indicating a brachyuranic palate type. This finding contrasts with the results of the current study, which found a mean palatal index of 113.8 + 11.78, indicating a mesouranic palate type.

Table 8. Presents the statistical analysis of the upper facial index (%) measurement.

		S.S.*	Min.	Max.	Sum	Mean	S.D.**
UPPER FACIAL INDEX(UFI)	**Males**	50	43	60.9	2559	51.18	3.74
	Females	50	38.2	55.7	2488.7	49.77	3.02
	Total	100	38.2	60.9	5047.7	50.48	3.47

The variables S.S. and S.D. are commonly used in statistical analysis.

According to Cunningham's Textbook of Anatomy, the upper facial index can be calculated by dividing the nasion prosthion length by the bizygomatic breadth and multiplying the result by 100.

The El-Najjar classification is a method of categorising individuals based on their upper facial index.

1. Euriprosopic skulls are characterised by an upper facial index that is below 48. This trait is frequently observed among individuals of Tasmanian and Native Australian descent.
2. Mesoprosopic skulls are characterised by an upper facial index that falls within the range of 48 to 53. This trait is frequently observed among individuals of European and Chinese descent.
3. Leptoprosopic skulls are characterised by an upper facial index that exceeds 53. This trait is frequently observed among individuals of Chinese and Polynesian descent.

Based on the aforementioned categorization, it can be observed from Table 8 that the average upper facial index of male and female skulls is classified as Mesoprosopic skulls.

Types	Male(n=50)	Female(n=50)
Euryprosopic	20%	26%
Mesoprosopic	52%	60%
Leptoprosopic	28%	14%

Saxena and colleagues (1984). In a study conducted on 500 male medical students of the S.N., a noteworthy correlation was discovered between the nasal index and both the upper facial index and the total facial index. A descriptive and cross-sectional study was conducted by **Golalipour et al. (2003)** at Medical College in Agra, India. The study aimed to determine the range of head and face dimensions in Fars (203) and Turkman (217) races using a sample of 420 normal one-day old newborns. The present study found that the Fars group exhibited a predominance of hypereuryprosopic (71.9%) and hyperleptoprosopic (2.5%) facial types, while the Turkman group exhibited a predominance of hypereuryprosopic (34.6%) and hyperleptoprosopic (0.9%) facial types. These findings differ from the euryprosopic (23%), mesoprosopic (56%), and leptoprosopic (21%) facial types observed in the study.

In a study conducted **by Mishra AK et al (2005)** on a sample of 100 skulls, consisting of 50 male and 50 female specimens, it was observed that the upper facial index was predominantly of the Leptoprosopic type (44-52%). However, in the present study, a higher proportion of the Mesoprosopic variety (56%) was observed.

In 1978, **Masniari Novita** conducted a study on the facial index, upper facial index, and orbital index of students from three distinct ethnic groups: Batak, Klaten, and Flores. The study was conducted on students enrolled at Jember University. The study revealed that the facial index was classified as hypereuryprosopic, with a mean range of 78.05 to 79.184, in contrast to the Mesoprosopic type of upper facial index identified in the current investigation.

The cephalometric indices of the Hausa and Yoruba ethnic groups of Nigeria were established and compared by **Umar et al. (2011).** The findings of the present study are consistent with the upper facial height measurements obtained from the Hausa and Yoruba tribes, which revealed that the Hausa exhibited a higher value of 64.92% compared to the Yoruba with a value of 51.65%.

Table 09 presents the statistical analysis of the gnathic index (%) data.

		S.S.*	**Min.**	**Max.**	**Sum**	**Mean**	**S.D.****
GNATHIC INDEX(GI)	**Males**	50	85.6	100	4678	93.56	3.95
	Females	50	85.3	100	4637	92.74	4.6
	Total	100	85.3	100	9315	93.15	4.3

The variables S.S. and S.D. are commonly used in statistical analysis.

The formula for calculating the gnathic index, as stated in Cunningham's Textbook of Anatomy, involves dividing the distance between the basion and prosthion by the distance between the basion and nasion, and then multiplying the result by 100.

This statement denotes the extent of protrusion of the maxilla or the upper jaw.

The El-Najjar classification, also known as the Gnathic index classification, is a method of categorising the human skull based on the relationship between the length and width of the mandible.

1. Orthognathous skulls are characterised by a gnathic index that is below 98. This trait is frequently observed among individuals of European descent.

2. Mesognathous skulls are characterised by a gnathic index that falls within the range of 98 to 103. This phenomenon is frequently encountered in both Chinese and Japanese contexts.

3. Prognathous skulls are characterised by a gnathic index exceeding 103. Frequently encountered among the Indigenous population of Australia.

Based on the aforementioned categorization, it can be observed from Table 9. that the average gnathic index of male and female craniums belongs to the Orthognathous skulls category.

Types	Male(n=50)	Female(n=50)
Orthognathous	84%	92%
Mesognathous	16%	08%
Prognathous	00%	00%

Chaturvedi and Harneja (1962) conducted a study on 150 human skulls from the Sawai Man Singh Medical College in Jaipur, India. Their findings indicated that 59.2% of the skulls belonged to the orthognathic group. In contrast, the present study found that 88% of the skulls belonged to this group.

4 Conclusion

The findings suggest that further research is needed to fully understand the implications of the data. Additionally, The significance of craniometric data with respect to particular gender, age, and population cannot be overstated. The comprehension of diverse cranio-facial indices, in conjunction with the corresponding benchmarks for age, race, and gender, can be advantageous in the fields of plastic and oral surgery that deal with craniofacial deformities (Williams et al.). Furthermore, it can furnish crucial evidence in forensic cranio-facial reconstruction, as well as in endeavours to restore the physical appearance of the cranium during an individual's lifetime, based solely on cranial remains in anthropological research, or in the identification of gender in skeletal remains that are missing or damaged in forensic medicine. In conclusion, it is imperative to acknowledge the significance of population, gender, and age-specific data concerning craniofacial indices.

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The presence of conflicts of interests.

None

References

Abolhasanzadeh, A. Farahani, M. R. conducted a study on the standardised international classification of head shapes among individuals aged 22-24 years in Tehran. J. The article titled "Research in Medicine" was published in volume 26 and spans pages 281-5 in the year 2003.

Chaturvedi and Harneja (1962) conducted a study on adult human skulls, examining their cranial capacity, facial angle, and gnathic index. 1962.

Chamella, M specialises in the field of biological anthropology. Translated into Persian (Farsi) by Nadri A. First Edition. The publisher in question is Gostar. Tehran. pp : 75 (1997).

El-Najjar and McWilliams (1978) conducted research on forensic anthropology. The publication titled "Illinois USA" was released by Charles C Thomas Publishers in the year 1978. p. 15–143.

The authors of the aforementioned work are Golalipour, M.J. and Haidari, K. Jahanshahi and Farahani (2003) conducted a study on the craniofacial morphology of healthy male neonates in the southeastern region of the Caspian Sea in Iran, specifically in Gorgan. J. Anat. Soc. The publication titled "India" was released in the year 2003 and has a reference number of 52:2831.

The 38th edition of Gray's Anatomy provides information on the Skeletal System, Sexual and Racial Differences, specifically on pages 609-612.

G.S. The authors of the aforementioned work are Oladipo, M.O., Oyakhire, and A.A. In his 2010 publication, Ugboma Henry conducted anthropometric studies on the nasal indices of the Ekpeye and Ikwerre ethnic groups in Nigeria. The research was published in the Asian Journal of Medical Sciences and can be found in volume 2, issue 4, on pages 167-169.

The author's name is Hooton, E.A. In 1926, a technique for examining racial characteristics was developed. The publication titled "Science 44: 256" is available.

The article titled "Evaluation of Cephalic Indices: A Clue for Racial and Gender Diversity" by Ilayperuma explores the use of cephalic indices as a means of identifying and understanding racial and gender diversity. Int. The article titled "J. Morphol., 29(1):112-117, 2011" was published in a scholarly journal.

Jordaan,H.V. The study conducted in 1976 focused on the cranial form of neonates and mothers. The publication titled "South Africa Medical Journal" is a scholarly journal that pertains to the field of medicine. 50 : 2064 - 2068.

Kasai and Richards (year not provided) Brown, T. conducted a comparative analysis of craniofacial morphology between Japanese and Australian Aboriginal populations. Hum. Biol., 65:821-34, 1993

The author's name is Obikili, E. N. Singh and Singh (year not provided) conducted a study on the secular growth trend in the adult stature of Nigerians. The article titled "Orient J. Med." was published in 1992 and covers pages 44-47.

Okupe and Coker are the authors of the text. Gbajumo, S. A. conducted an evaluation of biparietal diameter in the course of typical pregnancy among women in Nigeria. Br. Journal of Obstetrics. The publication titled "Gynaecol., 99:629-632, 1984" was released in 1984.

The authors of the aforementioned work are Oladipo, G. S. and Olotu, J. E. Suleiman, Y. conducted anthropometric research on the cephalic indices of the Ogonis in Nigeria. The publication titled "Asian Journal of Medicine" is a scholarly source. Sci., 1:15-7, 2009.

The authors of the aforementioned work are M.B.T. Umar, A.S. Ojo, S.A. Asala, and J.O. The study conducted by Hambolu (2011) aimed to compare the cephalometric indices of the Hausa and Yoruba ethnic groups in Nigeria. The publication titled "Research Journal of Medical Sciences" presents findings in the field of medical sciences and includes an article with the reference number 5, which spans from page 83 to page 89.

M.F. The article titled "International Journal of Orthodontia and Oral Surgery Volume 22, Issue 10, October 1936, Pages 1018-1024" was authored by Ashley Montagu in 1934.

The study conducted by Manjunath KY in 2002 aimed to estimate the cranial volume of cadavers in a dissecting room. The article titled "J Anat Soc India 2002;51(2):168-172" was published in a scholarly journal.

The study conducted by Masniari Novita in 1978 examined the facial, upper facial, and orbital index of Batak, Klaten, and Flores students enrolled in Jember University's Faculty of Dentistry. Jln. The address provided is located in Kalimantan, Indonesia with a postal code of 68121 and specifically in the Jember region.

Mibodi, I.M.A. and Frahani, M.R. conducted a study in 1996 on the normal range of anatomical dimensions of one-day old newborns using cephalometry. The Journal of Medical Council of Islamic Republic of Iran. 14 (1) : 1-8

Mishra and Chinara (2005) conducted a study on cranial indices in the skulls of individuals from western Orisa. The publication titled "J Anat Soc" from June 2005, Volume 54, Issue 1.

The authors of this text are Rajlakshmi Ch., Shyamo Singh M., and Bidhumukhi Devi Th. Singh, C. L. (2001) conducted a baseline study on the cephalic index of foetuses from the Manipuri population, which was published in the Journal of the Anatomical Society of India, Volume 50. 50, No. 1 (2001-01 - 2001-06)

S. The authors of the aforementioned work are K. Saxena, P. Jeyasingh, M. L. Ajmani, A. K. Srivastava, and C. In the year 1984, D. Gupta published an article in the Anthropologischer Anzeiger journal. 42, H. On March 1st, 1984, a cephalometric investigation was conducted on a sample of 500 male medical students from Uttar Pradesh.

Greetings, V.M. In 2007, Bhoir M. published an article in the Journal of the Anatomical Society of India regarding the 54th National Conference of The Anatomical Society of India, which took place in 2006. The article was included in Volume [insert number]. 56, No. 1 (2007-01 - 2007-06)

Shah and Jadhav (2004) conducted a study on the cephalic index among students in Gujarat. The aforementioned publication is the Journal of the Anatomical Society of India. The publication from June 2004 is of significant academic value. 53, No.1.

In 1899, William Ripley conducted a research study on the variation and correlation of the human skull, with a particular focus on English crania. Biometrika. 3: 191-244.

The academic reference for the book "Gray's Anatomy" is Williams, P., Bannister, L.H., Berry, M.M., Collins, P. Dyson, M., Dussak, J.E., and Ferguson, M.W.J. The topic of discussion is the skeletal system. The 38th edition of the publication was released by Churchill Livingston. The source cited is a publication titled "London" with page numbers ranging from 607 to 612. (1995).