

ANTHROPOMETRIC STUDY OF THE FACIAL INDICES IN THE INDIAN YOUTH.

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Abstract

Background: Anthropometry refers to the scientific assessment of measurable physical characteristics. A specialized branch of anthropometry - facial anthropometry, focuses on the anatomical dimensions of the human face. The human visage has long captivated the interest of artists, anthropologists, anatomists, and reconstructive surgeons. Facial attributes are influenced by the arrangement and proportionality of facial elements. Anthropometric standards must be established for each ethnic group due to inherent anatomical variations among different populations and genders. Facial indices provide valuable insights into the proportional relationships of facial components.

Aim of the study: To calculate the facial indices and determine face type in the Indian Youth.

Material and method: A Cross-sectional study was conducted on 400 subjects (200 male and 200 female). Of known age and sex belonging to Indian youth, by using vernier calliper in millimetres. From Department of Anatomy at D.Y. Patil Medical College, Kolhapur. Observations were recorded, photographed and statically analysed.

Results: In the present study, the average age in females is (19.95±1.64) while average age in males is (19.76±1.54). The maximum participants Both males and females predominantly belonged to the 19-year age group, while the least number of participants were in the 24-year age group.

Conclusion: Understanding facial indices and predominant facial types can assist forensic experts in reconstructing facial features for unidentified individuals.

Key words: Anthropometry, Anthropometry, Facial indices, Gender.

1. Introduction

Anthropometry is a widely accepted technique for the quantitative assessment of craniofacial morphology, utilizing direct clinical measurements such as distances, angles, ratios, and proportions. It remains a cost-effective, efficient, and non-invasive method for describing craniofacial structures. Although it lacks the intricate details provided by advanced three-dimensional imaging technologies, it is particularly advantageous for population-based studies due to the availability of standardized reference databases. Anthropometric data offer valuable insights into the distribution of various measurements across human populations (1).

The facial index is a key anthropometric parameter used to define the structure of an individual's face. Limited research is available on the upper facial index, and existing studies do not conclusively indicate notable sexual dimorphism (2-6).

Human morphological features are influenced by environmental, biological, geographical, racial, gender, and age-related factors. Most research emphasizes the significance of anthropometric analysis based on these variables. The rationale behind this approach is that comparisons yield greater accuracy when an individual is evaluated against reference data that match their ethnic background, sex, and age group. (7) A distinctive feature of human diversity is the wide range of facial variations observed in everyday life. Studies on craniofacial structures and human variability aid in understanding the frequency distribution of human morphological characteristics. The scientific evaluation of the human face has a long history, employing various methodologies to assess facial morphology and monitor growth patterns of the face and jaw. These analyses help in determining the causes, diagnosis, treatment planning, and clinical outcomes of malocclusions, facial asymmetry, and congenital anomalies.

The purpose of this study is to assess the dispersion of facial characteristics within the examined group, to analyse facial indices amongst Indian youth, as well as to assess gender variation.

2. Aim & Objective

To measure total face height from Nasion to Gnathion

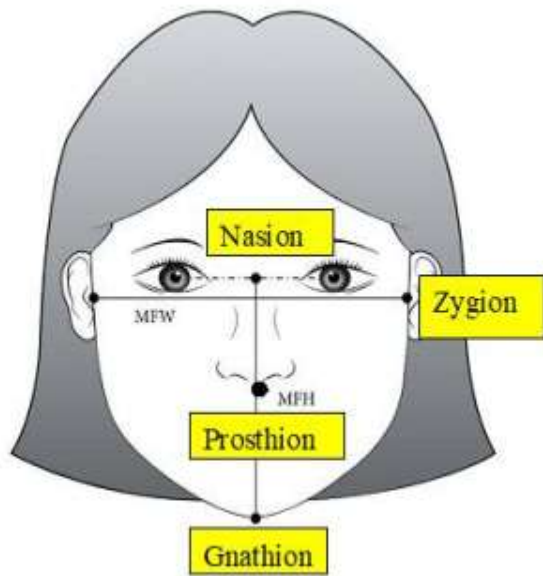
- To measure upper facial height from Nasion to Prosthion.
- To measure face width between zygion.
- To determine Total Facial Index and Upper Facial Index.
- To study gender variation in facial indices.

3. Material and method: A Cross-sectional study was conducted on 400 subjects (200 male and 200 female). Of known age and sex belonging to Indian youth, by using vernier calliper in millimetres. From Department of Anatomy at D.Y. Patil Medical College, Kolhapur.

The protocol was approved by the institutional Ethical committee. (protocol Number 13/2024) Date of approval - 14/02/2024

Inclusion criteria Indian Youth of both genders between age 18 to 25 Years. **Exclusion criteria** Individuals with history of oculofacial trauma, face disfigurement due to trauma, undergone facial plastic surgery, skin infection or congenital anomalies were excluded.

1. Total face height (TFH) from Nasion to Gnathion.
2. Upper Facial Height (UFH) from Nasion to Prosthion.
3. Face Width (FW) between zygion.



Nasion: Midpoint of the nasofrontal suture.

Gnathion: Midpoint on the lower border of the mandible.

Zygion: Most lateral point of the zygomatic arch.

Prosthion: Most anterior point in the midline of the alveolar process.

Table 1. Age distribution according to Gender.

Sex	Age (years)		P-value
	Mean	SD	
Female	19.95	1.64	0.123
Male	19.76	1.54	

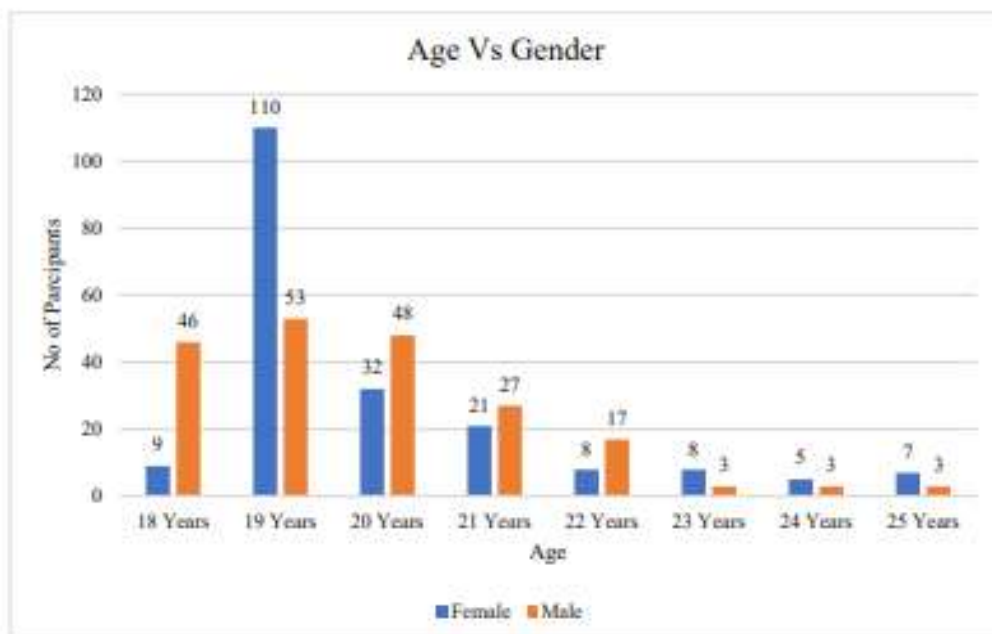


Table 2. Gender Comparison in Total Facial Height (TFH)

Sex	Sr. No	TFH (mm)			P-value
		Range	Mean	SD	
Female	200	85.57-116.4	100.06	5.86	<0.00001
Male	200	91.16-193.09	107.92	8.85	
Combine	400	85.57-193.09	103.99	8.46	-

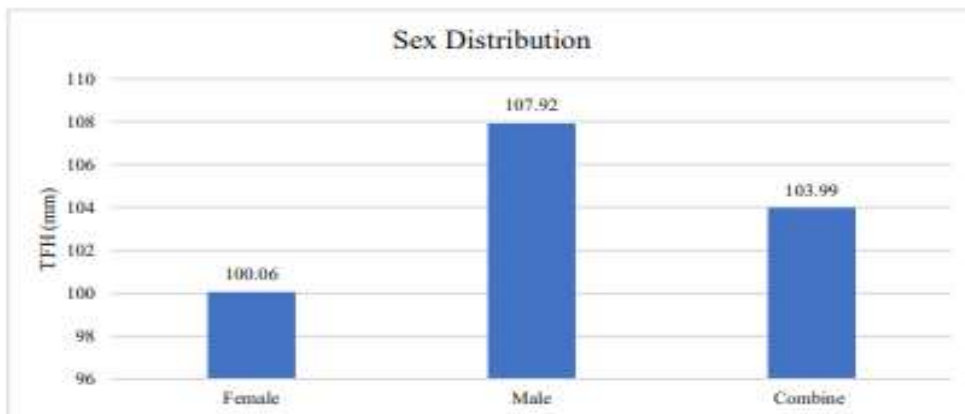


Table 3. Gender Comparison in Upper Facial Height (UFH)

Sex	Sr. No	UFH (mm)			P-value
		Range	Mean	SD	
Female	200	33.13 -60.52	46.09	5.11	0.009
Male	200	34.12 - 66.20	47.25	4.64	
Combine	400	33.13 - 66.20	46.66	4.9	-

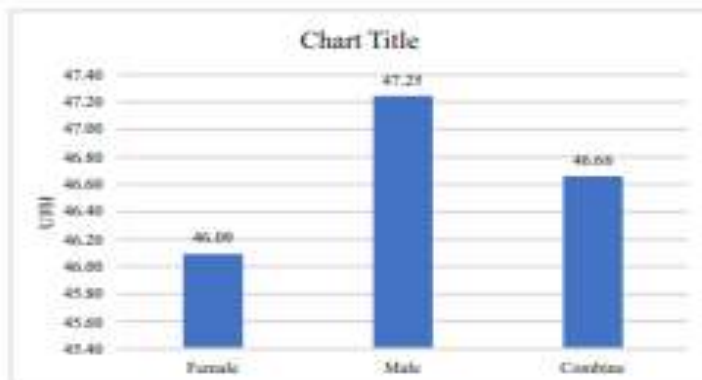


Table 4. Gender Comparison in Facial Width (FW)

Sex	Sr. No	Facial Width (mm)			P-value
		Range	Mean	SD	
Female	200	96.8 - 233.05	200.53	14.46	< 0.0001
Male	200	181.38 - 258.1	213.68	14.31	
Combine	400	96.8 - 258.1	207.11	15.8	-

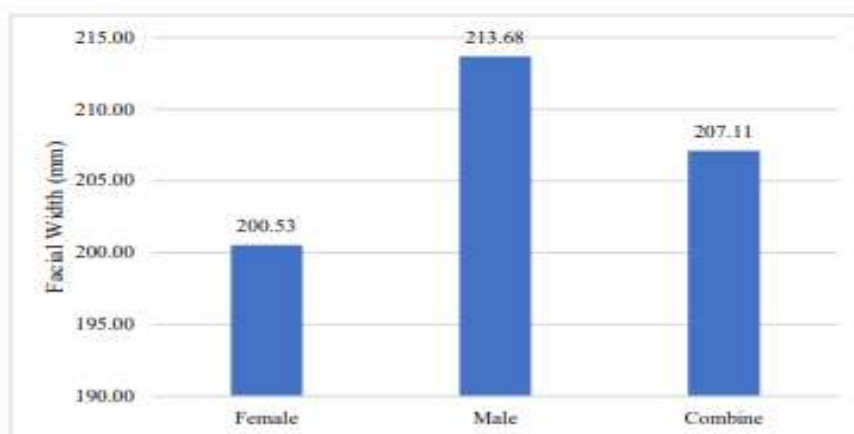


Table 5. Gender Comparison in Total Facial Index (TFI)

Sex	Sr. No	Total Facial Index			P-value
		Range	Mean	SD	
Female	200	41.89 - 97.51	50.12	4.50	0.125
Male	200	42.98 - 99.86	50.57	4.94	
Combine	400	41.89 - 99.86	50.39	4.72	-

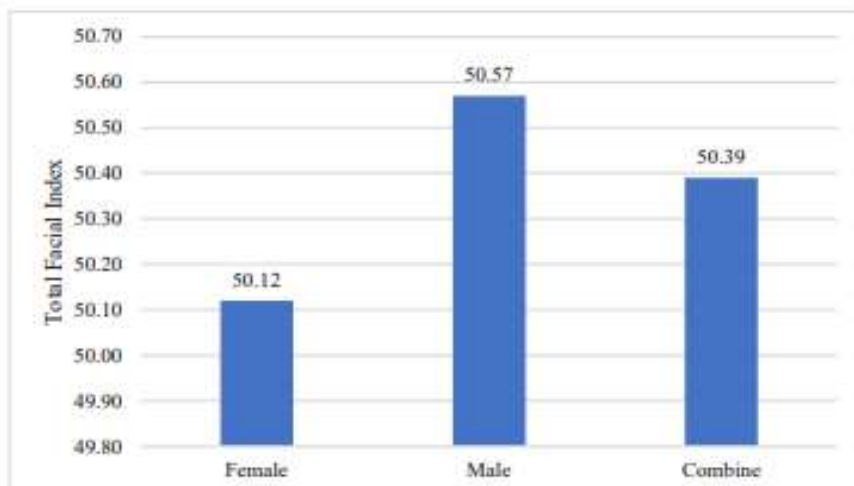


Table 6. Gender Comparison in Upper Facial Index (UFI)

Sex	Sr. No	Upper Facial Index			P-value
		Range	Mean	SD	
Female	200	16.63 - 44.82	23.06	2.76	0.001
Male	200	16.55 - 38.44	22.25	2.38	
Combine	400	16.63 - 44.82	22.6	2.48	-

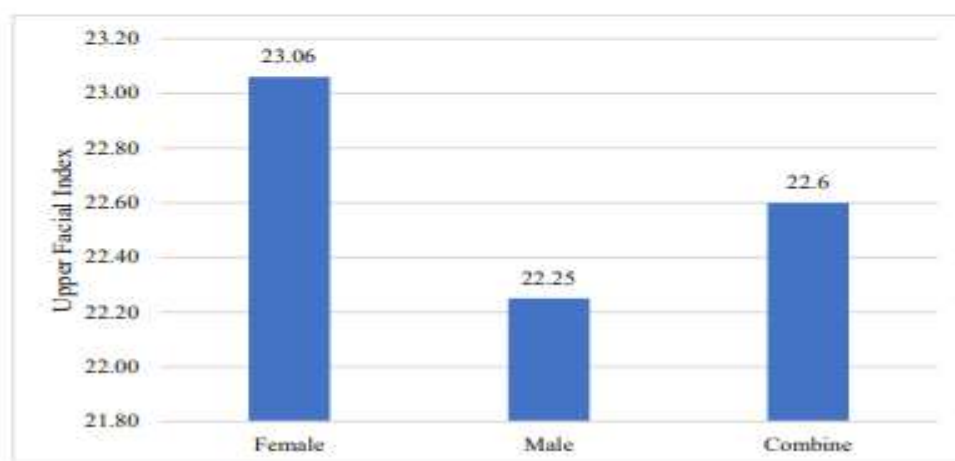


Table 7. Face type according to Banister's classification based on Total Facial Index (TFI)

Face Classification (TFI)	Banister Total Facial Index Range	All Subject		Mean Total Facial Index	Male		Mean Total Facial Index	Female		Mean Total Facial Index	P-value
		N	%		N	%		N	%		
Hypereuryprosopic (very broad face)	< 79.9	398	99.50%	50.39	199	99.50%	50.57	199	99.50%	50.12	1
Euryprosopic (Broad face)	80 - 84.9	0	0.00%	0	0	0.00	0	0	0.00%	0	
Mesoprosopic (Round face)	85 - 89.9	0	0.00%	0	0	0.00	0	0	0.00%	0	
Leptoprosopic (Long face)	90 - 94.9	0	0.00%	0	0	0.00	0	0	0.00%	0	
Hyperleptoprosopic (Very long Face)	> 95	2	0.50%	0	1	0.50	0	1	0.50%	0	

Table 8 Face type according to Banister’s classification based on Upper Facial Index (UFI)

Face Classification (UFI)	Banister Upper Facial Index Range	All Subject		Mean Upper Facial Index	Male		Mean Upper Facial Index	Female		Mean Upper Facial Index
		N	%		N	%		N	%	
Hypereuryene (very broad face)	< 44.9	400	100.00%	22.6	200	100.00%	22.25	200	100.00%	23.06
Euryene (Broad face)	45 - 49.9	0	0.00%	0	0	0.00	0	0	0.00%	0
Mesene (Round face)	50 - 54.9	0	0.00%	0	0	0.00	0	0	0.00%	0
Leptene (Long face)	55 - 59.9	0	0.00%	0	0	0.00	0	0	0.00%	0
Hyperleptene (Very long Face)	> 60	0	0.00%	0	0	0.00	0	0	0.00%	0

Table 9. Distribution of face type according to age and Gender

Age (years)	Male		Female	
	Hypereuryprosopic (Very Broad)	Hyperleptoprosopic (Very Long)	Hypereuryprosopic (Very board)	Hyperleptoprosopic (Very Long)
18	46	0	9	0
19	52	1	110	0
20	48	0	32	0
21	27	0	20	1
22	17	0	8	0
23	3	0	8	0
24	3	0	5	0
25	3	0	7	0
Total	199	1	199	1

4.DISCUSSION

This study aimed to calculate facial indices and classify facial types amongst Indian youth using anthropometric measurements. It was conducted on 200 males and 200 females, aged 18 to 25 years and it is highlighting the predominance of the hypereuryprosopic (very broad face) type among the study population. The study found that males exhibited significantly greater values than females for facial dimension -Total face height (TFH): males (107.92mm); females (100.06mm), upper facial height (UFH): males (47.25mm); females (46.09mm) and facial width (FW): males (213.68mm); females (200.53mm). Comparing facial indices, the study shows that Upper facial index (UFI) in females (23.06) is significantly higher than in the males (22.25). The highly significant p-values for TFH (<0.00001), UFH (0.009), FW (<0.0001) and UFI (0.001) confirm the presence of gender-based differences in facial features dimensions

The comparison of the Total Facial Index (TFI) and Upper Facial Index (UFI) between the sexes revealed interesting findings. While the difference in TFI was not statistically significant (p=0.125), UFI was statistically higher in females than in males (p=0.001). This suggests that although the overall facial proportions between sexes were similar, females had a relatively higher upper facial height in relation to facial width. This might be attributed to differences in craniofacial growth patterns between sexes, influenced by factors such as hormonal levels and genetic determinants.

Table No 10 Comparison of Facial dimension and Facial indices of present study with previous researchers.

Sr. No.	Author	Parameters									
		Total Face Height (TFH)		Upper Facial Height (UFH)		Facial Width (FW)		Total Facial Index (TFI)		Upper Facial Index (UFI)	
1	Debnath et.al	M	124.18±4.61	M	---	M	106.41±8.08	M	126.26±8.80	M	---
		F	113.41±5.75	F	---	F	91.41±5.72	F	116.71±7.28	F	---
2	Rathod HB et.al	M	---	M	63.4±4.8	M	127.1±5.0	M	---	M	49.9±3.1
		F	---	F	60.6±4.3	F	118.3±6.6	F	---	F	51.3±4.0
3	Sinchal Datta et.al	M	11.19±0.87	M	---	M	12.90±0.74	M	---	M	---
		F	10.34±0.92	F	---	F	12.09±0.65	F	---	F	---
4	Pokhrel C et.al	M	12.14±5.7	M	---	M	12.04±0.68	M	---	M	---
		F	11.53±0.59	F	---	F	11.36±0.84	F	---	F	---
5	Dodangheh M et.al	M	11.918±0.583	M	7.33±0.38	M	11.79±0.62	M	101.26±6.05	M	62.31±4.25
		F	10.392±0.650	F	6.77±0.56	F	11.56±0.78	F	90.24±7.60	F	58.80±6.20
Present Study		M	107.92±8.85	M	47.25±4.64	M	213.13±16.01	M	50.67±4.94	M	22.25±2.38
		F	100.06±5.86	F	46.09±5.11	F	200.53±14.46	F	50.12±4.50	F	23.06±2.76

The above table shows that TFH in males and females in the present study is less than Debnath et.al,(8) Sinchal Datta et.al,(9) Pokhrel C et.al, Dodangheh M et.al.(10) UFI in

males and females in the present study is much less than Rathod HB et.al(11), Dodangheh M et.al. Facial width in males and females in the present study is much more than study of Debnath et.al, Rathod HB et.al, Sinchal Datta et.al, Pokhrel C et.al,(12) Dodangheh M et.al. TFI in males and females in the present study is less than Debnath et.al, Dodangheh M et.al. while UFI is much less than Rathod HB et.al, Dodangheh M et.al.

This might be attributed to differences in craniofacial growth patterns influenced by factors such as geography, environmental factors, dietary variation, hormonal levels and genetic determinants.

Table No 11 Comparison of Total Facial Index (TFI) in present study with previous researchers.

Sr. No	Author	Sample Size	Parameters									
			Hypereuryprosopic (Very Broad) (N)		Euryprosopic (Broad face) (N)		Mesoprosopic (Round face) (N)		Leptoprosopic (Long face) (N)		Hyperleptoprosopic (Very long Face) (N)	
1	Dodangheh M et.al	100	M	0	M	1	M	0	M	13	M	86
		100	F	9	F	12	F	29	F	28	F	22
2	Pandeya A et.al	72	M	6	M	5	M	21	M	33	M	7
		83	F	6	F	29	F	38	F	10	F	0
3	Jahanshahi M et.al	100	M	4	M	16	M	44	M	32	M	4
		100	F	4	F	16	F	44	F	32	F	4
4	Kumar M et.al	300	M	33	M	72	M	149	M	37	M	9
		300	F	75	F	58	F	105	F	57	F	5
5	Present study	200	M	199	M	0	M	0	M	0	M	1
		200	F	199	F	0	F	0	F	0	F	1

The present study indicates that the dominant face type in both males and females is Hypereuryprosopic (very broad face). Among the male participants, 199 out of 200 exhibited a Hypereuryprosopic face type, with only one case of Hyperleptoprosopic (very long face). Similarly, among females, 199 out of 200 had a Hypereuryprosopic face type, with just one case of Hyperleptoprosopic.

The previous studies, reported a more diverse distribution of facial types, The, studies by Kumar M et al. and Jahanshahi M et al. observed a significant presence of Mesoprosopic (round face) and Leptoprosopic (long face) types. The variations in upper facial height (UFH) and total face height (TFH) between genders may be contributing to the observed facial diversity.

Table No 12 Comparison of Face type based on Upper Facial Index (UFI) in present study with previous researchers.

Sr. No	Author	Sample Size	Parameters									
			Hypereuryene (Very Broad Face) (N)		Euryene (Broad Face) (N)		Mesene (Round Face) (N)		Leptene (Long Face) (N)		Hyperleptene (Very long Face) (N)	
1	Dodangheh M et.al	100	M	0	M	0	M	5	M	24	M	71
		100	F	0	F	5	F	25	F	33	F	37
2	Rathod HB et.al	40	M	2	M	16	M	27	M	1	M	0
		40	F	2	F	9	F	18	F	5	F	0
3	Present study	200	M	200	M	0	M	0	M	0	M	0
		200	F	200	F	0	F	0	F	0	F	0

In the present study, 100 % males and 100 % females showed Hypereuryene (very broad) face type. Dodangheh M et al. found Hyperleptene (very long) face type in 71% males and 37% females, and Leptene (long) face type in 24 % males and 33% females and mesene (round) face type in 5% males and 25% females. while Rathod HB et al. [66] observed a mix of face types with a higher frequency of Mesene (round) followed by Euryene (broad) type followed by Hypereuryene.

Mittal S. et al. conducted a study in Himachal Pradesh, reported that mesoprosopic facial type was more common in females, while the leptoprosopic facial type was predominant in males. However, the difference was statistically non-significant ($p < 0.001$).

5.CONCLUSION

This study provides in depth evaluation of facial indices among Indian youth, confirming significant sexual dimorphism in facial dimensions while establishing the dominance of the hypereuryprosopic facial type (very broad face). Males exhibited significantly greater total facial height (TFH), upper facial height (UFH), and facial width (FW) compared to females. Upper facial height and the Upper Facial Index (UFI) are valuable parameters for assessing gender differences. Precise facial measurements, including height, width, and indices, are crucial for studying normal and abnormal growth and morphometric investigations. Understanding facial indices and predominant facial types can assist forensic experts in reconstructing facial features for unidentified individuals.

6. References

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