

Unrevealing Craniofacial Index: A Study On Western Uttar Pradesh Population Of India

Ayushi Arora¹

Available online at: www.xournals.com

Received 26th September 2024 | Revised 29th September 2024 | Accepted 1st October 2024

Abstract:

As a fundamental aspect of anthropology, anthropometrics examines the complex dimensions of human existence including the physical, emotional, social and cultural domains. Within this vast field, forensic anthropology is a key discipline, particularly in the context of crime scene investigations and mass disaster scenarios. Cephalometry, a subset of anthropometry, specializes in the measurement of craniofacial dimensions and provides invaluable insight into population characteristics and variation. This paper delves into a comprehensive investigation of anthropometric parameters in the population of Western Uttar Pradesh, sheds light on craniofacial morphologies and their correlation with demographic factors. Through careful data collection and analysis, the study reveals interesting patterns in cranial and facial indices and elucidates prevailing trends in head and face shapes among individuals from the region. Key findings reveal a prevalent presence of brachycephaly among both males and females, underscoring regional influences on head shape characteristics in northern India. In addition, mesocephaly emerges as a notable feature, highlighting the diverse morphological spectrum inherent in the population of western Uttar Pradesh. Analysis of facial morphology reveals a predominance of hyperleptoprosopic faces in women, challenging conventional trends and prompting further investigation into the underlying genetic and environmental determinants shaping facial proportions in this demographic. The significant positive correlations between head dimensions and facial parameters underscore the inherent interrelationships governing craniofacial development and enrich our understanding of patterns of coordinated growth in the study population. This research not only contributes to anthropological understanding of craniofacial diversity, but also has implications for forensic investigations, medical diagnosis, and population studies. By elucidating the anthropometric nuances specific to the population of western Uttar Pradesh, this work offers valuable insights into the complex interplay of genetics, environment and cultural influences shaping human morphology.

Keywords: Anthropometric Landmarks, Cephalometry, Cephalic Index, Facial Index

Authors:

1. Intern, Sherlock Institute of Forensic Science, INDIA.

Introduction

Anthropometry is the study of measurements of physical dimensions, mass of the human body such as bone, muscle, adipose tissue, or fat tissue (Ogot, 2021). Individuals are unique in terms of their quantifiable characteristics. Anthropologists have long been interested in studying morphological variations within and across populations (Prasanna, 2020). The word anthropometry is derived from the Greek word in which anthropo means human and metry means measurement (Attwood *et al.*, 2004). Anthropometry used various techniques to measure and to get standard values for skeletal and soft tissue structure for different human populations (Krishan, 2008). Cephalometry is the morphological examination of all the structures in the human head (Zacharopoulos *et al.*, 2015). Craniofacial structures are the consequence of a complex interplay between genes and environment, with cumulative effects (Kumar and Sabarigirinathan, 2019; Sarkodie *et al.*, 2022). The cephalic index measures and evaluates the size of the skull (Pandey and Atreya, 2018). Cephalic and facial parameters are important in identification and racial morphological classification (Kuijpers and Marie, 2016). Every aspect of the body has a clear and proportionate relationship with others. Facial esthetics standards are not universally applicable to different racial and ethnic groupings (Majeed *et al.*, 2018). Research on the craniofacial characteristics of many ethnic groups is underway to produce anthropometric data for diverse populations. Here this study is conducted to find out various craniofacial indices and to create standard baseline data on cephalofacial anthropometry in 151 Western Uttar Pradesh adults.

Methodology and materials: -

The present study was conducted on 151 adults of Western Uttar Pradesh. Prior informed consent both in English & verbal were obtained from subjects. The subjects of age group 18 years to 40 years were included in the study. The subjects were apparently healthy and without any craniofacial deformity. Subjects are selected from Amity University that belongs to Western Uttar Pradesh. Methodology for cephalo-facial measurements was adopted from Anthropometry. Subjects of any physical deformities of head & face and subjects below 18 years & above 40 years are excluded. The anthropological landmarks were selected i.e., for cephalic index head length was taken from glabella to inion and head breadth from euryon to euryon for facial index face length was measured from gnathion to nasion and face breadth from zygion to zygion.



Figure No. 1: Spreading and Sliding Caliper



Figure No. 2: Western Uttar Pradesh Region Of India

Result: -

81 data for males and 70 data for females of Western Uttar Pradesh origin, within the age group of 18-49 years was analyzed.

Table -1 displays the mean values with their respective standard deviations of the head length and head breadth parameters of Western Uttar Pradesh adult males. It is seen that the mean head length of the Western Uttar Pradesh males is 21.96 ± 0.74 .

Table No. 1: Descriptive statistics in Male study group of cephalic indices: n= 81

Male	Mean	Standard Deviation
Head length	21.96	0.74
Head breadth	17.88	1.01

Table No. 2: Pearson correlation coeff, Significance in male study group

Male	Pearson correlation coefficient, r	Significance, p
Head	0.8398	< .01
Face	0.7687	< .01

Table No. 3: Descriptive statistics in Female study group of cephalic indices: n= 70

Female	Mean	Standard Deviation
Head length	21.45	0.84
Head breadth	16.92	1.27

Table -3 displays the mean values with their respective standard deviations of the head length and head breadth parameters of Western Uttar Pradesh adult females. It is seen that the mean head length of the

Western Uttar Pradesh males is 21.45 ± 0.84 and head breadth is 16.92 ± 1.27 .

Table No. 4: Pearson correlation coeff, Significance in female study group

Female	Pearson correlation coefficient, r	Significance, p
Head	0.8491	< .01
Face	0.8093	< .01

Table No. 5: Descriptive statistics in Female study group of facial indices: n= 70

Female	Mean	Standard Deviation
Face length	10.90	0.72
Face breadth	11.83	0.85

Table No. 6: Descriptive statistics in male study group of facial indices: n= 81

Male	Mean	Standard Deviation
Face length	11.58	0.71
Face breadth	12.41	1.11

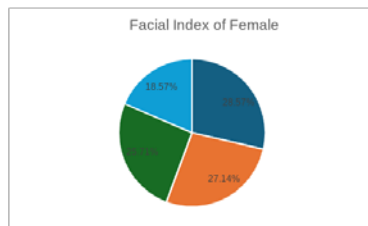


Figure No. 3: Facial Index of Female

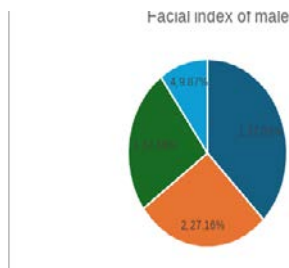


Figure No. 4: Facial Index of Male

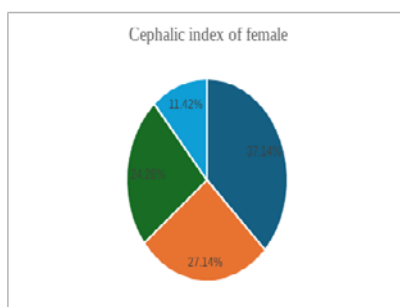


Figure No. 5: Cephalic Index of Female

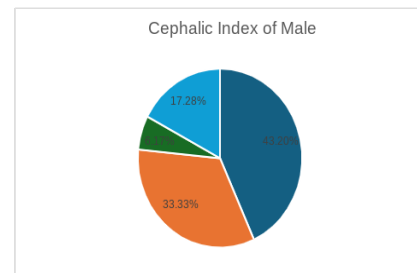


Figure No. 6: Cephalic Index of Male

Discussion

This study investigated the craniofacial characteristics of a Western Uttar Pradesh population aged 18-49 years. The analysis of head and facial measurements revealed interesting insights into the predominant craniofacial morphologies within this specific demographic. However, to strengthen the understanding and generalizability of these findings, it is crucial to consider them in the context of existing literature and acknowledge potential areas for future exploration.

The observed prevalence of brachycephaly (broad head compared to length) in both males (43.20%) and females (37.14%) aligns with findings from some studies conducted in nearby Indian populations. Singh and Benerjee (1989) reported a dominance of brachycephaly in Bengali Hindus of West Bengal, while Sharma et al. (2009) saw a similar trend among Marwari subjects in Rajasthan. This suggests a potential regional influence on head shape characteristics in North India. However, our findings deviate from other Indian studies, such as the work of Basu (1981) on Bengalis, which showed a higher prevalence of dolichocephaly (long and narrow heads). These discrepancies highlight the population heterogeneity within India and emphasize the need for further studies encompassing broader geographic regions.

The current study also identified a notable presence of mesocephalic (balanced head proportions) in both genders (males: 33.33%, females: 27.14%). This finding aligns with phenotypic variations reported in other populations worldwide. For instance, Rakus-Jurkowska et al. (2017) observed a significant proportion of mesocephalic individuals in a Polish population. The coexistence of brachycephaly, mesocephalic, and dolichocephaly within the Western Uttar Pradesh population underscores the morphological diversity present in this region.

The current study also identified a notable presence of mesocephalic (balanced head proportions) in both

genders (males: 33.33%, females: 27.14%). This finding aligns with phenotypic variations reported in other populations worldwide. For instance, Rakus-Jurkowska et al. (2017) observed a significant proportion of mesocephalic individuals in a Polish population. The coexistence of brachycephaly, mesocephalic, and dolichocephaly within the Western Uttar Pradesh population underscores the morphological diversity present in this region.

The current study also identified a notable presence of mesocephalic (balanced head proportions) in both genders (males: 33.33%, females: 27.14%). This finding aligns with phenotypic variations reported in other populations worldwide. For instance, Rakus-Jurkowska et al. (2017) observed a significant proportion of mesocephalic individuals in a Polish population. The coexistence of brachycephaly, mesocephalic, and dolichocephaly within the Western Uttar Pradesh population underscores the morphological diversity present in this region. The observed pattern in males, with a majority having hyperleptoprosopic faces (37.03%) followed by a sequential decrease in prevalence of other facial shapes, aligns somewhat with the female distribution. The rarity of hypereuryprosopic faces in both males (1.23%) and females (0%) suggests a general preference for narrower facial structures in this population segment. This finding is noteworthy and warrants further investigation, particularly regarding potential evolutionary or social-cultural factors that might influence facial morphology in Western Uttar Pradesh.

The statistically significant positive correlations between head length and head breadth for both males ($r = 0.8598$, $p < 0.01$) and females ($r = 0.8491$, $p < 0.01$) suggest a degree of proportionality in craniofacial development. This aligns with expectations, as head dimensions are inherently interrelated during growth and development. Similarly, the positive correlation observed between facial length and facial breadth in females ($r = 0.8093$, $p < 0.01$) suggests a proportional relationship between these facial features. While the correlation coefficient for males was not provided, it is likely that a similar trend exists within the male population as well. These findings contribute to the understanding of coordinated craniofacial growth patterns within the studied population.

Limitations and Future Directions:

The current study acknowledges certain limitations. The sample size (males: 81, females: 70) might restrict the generalizability of the findings to the entire

Western Uttar Pradesh population. Future research should aim to include larger and more diverse samples, encompassing various ethnicities and socioeconomic backgrounds within the region. Additionally, focusing solely on the 18–49-year age range limits the understanding of craniofacial variations across the lifespan. Expanding the age range in future studies would provide a more comprehensive picture of developmental trajectories in craniofacial morphology. Furthermore, this study design did not explore potentially influencing factors such as ethnicity, socioeconomic background, or genetic makeup. Investigating these factors through surveys, genetic analysis, or comparisons with other populations would offer a more holistic understanding of the observed craniofacial variations within the Western Uttar Pradesh population.

Conclusion

This study investigated the craniofacial characteristics of a Western Uttar Pradesh population aged 18–40 years. The analysis of head and facial measurements revealed interesting insights into the predominant craniofacial morphologies within this specific demographic.

We found from this study that the majority of female's have Brachycephalic type of head and Hyperleptoprosopic type of facial index. Majority of male's have Brachycephalic type of head and Hyperleptoprosopic type of facial index.



References:

Attwood, Dennis A., et al. "Personal Factors." Elsevier eBooks, 2004, pp. 29–63, doi:10.1016/b978-075067704-2/50004-0.

Krishan, Kewal. "Estimation of stature from cephalo-facial anthropometry in north Indian population." *Forensic Science International*, vol. 181, no. 1–3, Oct. 2008, p. 52.e1-52.e6, doi:10.1016/j.forsciint.2008.08.001.

Kuijpers-Jagtman, Anne Marie. "Handbook of Orthodontics (2016)." *European Journal of Orthodontics*, vol. 38, no. 3, Apr. 2016, p. 339.2-340, doi:10.1093/ejo/cjw032.

Kumar, Karthikeyan, and C. Sabarigirinathan. "Cephalic index -A review." *International Journal of Medical Reviews and Case Reports*, no. 0, Jan. 2019, p. 1, doi:10.5455/ijmrcr.cephalic-index

Majeed, Muhammed Irfan, et al. "An Anthropometric Study of Cranio-Facial Measurements and Their Correlation with Vertical Dimension of Occlusion among Saudi Arabian Subpopulations." *Open Access Macedonian Journal of Medical Sciences*, vol. 6, no. 4, Mar. 2018, pp. 680–86, doi:10.3889/oamjms.2018.082.

Ogot, Nicholas. "Metrics for Identifying Food Security Status." Elsevier eBooks, 2021, pp. 147–79, doi:10.1016/b978-0-12-820521-1.00007-1..

Pandey, Anup, and Alok Atreya. "Variations in the Facial Dimensions and Face Types among the Students of a Medical College." *Journal of Nepal Medical Association*, vol. 56, no. 209, Feb. 2018, pp. 531–34, doi:10.31729/jnma.3470.

Prasanna, Palagiri Lakshmi. "Anthropometric Study of the Facial (Prosopic) Indices: A Proof for Gender Dimorphism." *Indian Journal of Dental Education*, vol. 13, no. 2, Apr. 2020, pp. 53–59, doi:10.21088/ijde.0974.6099.13220.2.

Sarkodie, Francis Kofi, et al. "Facial indices and morphology: A study among Bono and Ewe adult population in the Bono region, Ghana." *Scientific African*, vol. 15, Mar. 2022, p. e01092, doi:10.1016/j.sciaf.2022.e01092.

Zacharopoulos, Georgios V., et al. "Anthropometric Analysis of the Face." *Journal of Craniofacial Surgery*, vol. 27, no. 1, Dec. 2015, pp. e71–75, doi:10.1097/scs.0000000000002231.