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A Cross-Sectional Study of Facial Index of Bishnoi Population Living in Bikaner District

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Abstract: ***Background: Facial index (FI) is an important craniofacial anthropometric parameter used to classify facial morphology and generate population-specific standards useful in clinical practice and forensic identification. Data on the Bishnoi community of Rajasthan are limited. Aim: To assess facial index and facial types among the Bishnoi population living in Bikaner district and evaluate gender-wise variation. Materials and Methods: An observational cross-sectional study was conducted in the Department of Anatomy, S.P. Medical College & A.G. Hospital, Bikaner (January-July 2025). A total of 100 healthy adults (50 males, 50 females), aged 18-60 years, were selected. Facial height (nasion to gnathion/menton) was measured using a sliding caliper and facial breadth (bizygomatic breadth) using a spreading caliper, following Hooten's method. Facial index was calculated and facial types were classified using standard criteria. Data were analyzed using descriptive statistics and appropriate inferential tests with significance at p<0.05. Results: Mean facial height and breadth were higher in males (12.1±0.80 cm; 13.0±0.90 cm) than females (11.5±0.70 cm; 12.7±0.80 cm), indicating sexual dimorphism. The most common facial type overall was mesoprosopic (31%), followed by leptoprosopic (28%) and euryprosopic (21%); hyperleptoprosopic and hypereuryprosopic types were each observed in 10%. Males showed a higher proportion of mesoprosopic faces (34%), whereas females showed more leptoprosopic faces (30%). Conclusion: The Bishnoi population of Bikaner demonstrates predominantly mesoprosopic and leptoprosopic facial patterns with clear gender-based differences in facial dimensions. These findings provide baseline craniofacial data valuable for anthropological comparisons, forensic profiling, and clinical applications in maxillofacial and reconstructive practice.***

Keywords: Anthropometry; Facial index; Craniofacial measurements; Bizygomatic breadth; Morphological facial height; Facial types; Sexual dimorphism; Bishnoi community; Bikaner; Rajasthan; Cross-sectional study; Forensic anthropology; Clinical anatomy

1. Introduction

l parameters, the facial index (FI) the ratio of morphological facial height to bizygomatic breadth multiplied by 100 is a key indicator used to classify facial types into hypereuryprosopic, euryprosopic, mesoprosopic, leptoprosopic, and hyperleptoprosopic categories. This classification aids in understanding population-specific facial morphology influenced by genetic, environmental, nutritional, and cultural factors.

The facial index has important clinical relevance in plastic and reconstructive surgery, maxillofacial surgery, orthodontics, and prosthodontics, where precise facial measurements are essential for diagnosis, treatment planning, and outcome evaluation. It is also widely used in forensic anthropology for biological profiling and facial reconstruction. Because craniofacial characteristics vary significantly across populations, developing population-specific anthropometric standards is essential.

India's vast ethnic diversity includes many communities that remain underrepresented in anthropometric research. The Bishnoi community of western Rajasthan particularly in the Bikaner district is a unique socio-religious group known for its strong environmental ethics, endogamy, and relatively conserved lifestyle. Despite their cultural and ecological significance, limited scientific data exist regarding their craniofacial characteristics, creating a notable research gap.

Bikaner's arid climate and substantial Bishnoi population provide an ideal setting for studying facial morphology and potential environmental adaptations. The present study aims to measure and analyze the facial index among Bishnoi individuals, assess variations across age and gender, classify facial types, and compare findings with other populations.

This research contributes to anthropological knowledge, supports clinical and forensic applications, and promotes inclusive scientific documentation of under-studied populations, thereby enhancing understanding of human biological diversity.

2. Aim and Objectives

The aim of this cross-sectional study is to analyze the facial index of the Bishnoi population residing in the Bikaner district of Rajasthan in order to establish baseline craniofacial anthropometric data. The study seeks to measure facial dimensions for calculation of the facial index, evaluate its association with demographic factors such as age, gender, and socio-economic status, and compare the findings with existing regional and global population data to identify distinctive craniofacial characteristics.

3. Materials and Methods

This observational cross-sectional study was conducted in the Department of Anatomy, S.P. Medical College & A.G. Hospital, Bikaner, from January to July 2025 after obtaining institutional ethical clearance and informed consent. A total of 100 healthy Bishnoi adults (50 males and 50 females), aged 18-60 years, were selected using simple random sampling. Facial height (nasion to menton/gnathion) and facial breadth

(bizygomatic width) were measured using sliding and spreading calipers following Hooten's method. The facial index was calculated using the standard formula and facial types were classified according to Banister's classification.

4. Results

This observational cross-sectional study was conducted from January to July 2025 in the Department of Anatomy, S.P. Medical College & A.G. Hospital, Bikaner, Rajasthan, on 100 adult individuals (50 males and 50 females) from the Bishnoi community aged 18-60 years. All participants were healthy, self-identified Bishnoi, and had no history of craniofacial trauma, surgery, or congenital anomalies.

Age Distribution:
Among females, the highest proportion belonged to the 31-40 years age group (28%), followed by 41-50 years (22%) and 21-30 years (20%). Males were predominantly in the 21-30 years age group (32%), followed by 41-50 years (26%). Overall, the majority of participants (26%) were aged 21-30 years, while the least represented group was 18-20 years (9%). This balanced age distribution ensured reliable assessment of adult facial morphology.

Occupational, Area, and Socioeconomic Profile:
Most participants were engaged in private or government jobs, indicating a shift toward service-sector employment. A higher proportion of females were housewives and students compared to males. Slight rural predominance was observed (54%), reflecting traditional settlement patterns. Most participants belonged to the middle socioeconomic class, with females showing a higher representation in the lower middle class and males in the upper middle class.

Nasal Parameters:
Males showed significantly higher mean nose height and breadth compared to females ($p < 0.05$), while the nasal index did not differ significantly between genders, indicating proportional consistency despite size differences.

Facial Measurements and Facial Index:
Mean facial height and breadth were greater in males (12.1 ± 0.80 cm; 13.0 ± 0.90 cm) than females (11.5 ± 0.70 cm; 12.7 ± 0.80 cm). The overall mean facial height was 11.8 ± 0.78 cm and facial breadth was 12.85 ± 0.85 cm. Mesoprosopic facial type was most common (31%), followed by leptoprosopic (28%). Males predominantly showed mesoprosopic faces, while females more frequently exhibited leptoprosopic facial types, demonstrating sexual dimorphism and facial diversity within the Bishnoi community.

Table 1: Demographic Profile of Study Population (N = 100)

Variable	Category	Male n (%)	Female n (%)	Total n (%)
Age (years)	18-20	3 (6)	6 (12)	9 (9)
	21-30	16 (32)	10 (20)	26 (26)
	31-40	10 (20)	14 (28)	24 (24)
	41-50	13 (26)	11 (22)	24 (24)
	50-60	8 (16)	9 (18)	17 (17)
Residence	Urban	24 (48)	22 (44)	46 (46)
	Rural	26 (52)	28 (56)	54 (54)

Table 2: Occupational and Socioeconomic Distribution

Variable	Category	Male n (%)	Female n (%)
Occupation	Farmer	4 (8)	3 (6)
	Government job	8 (16)	10 (20)
	Private job	18 (36)	15 (30)
	Housewife/Househusband	15 (30)	12 (24)
	Student	5 (10)	10 (20)
Socioeconomic Status	Lower middle	5 (10)	20 (40)
	Middle	33 (66)	25 (50)
	Upper middle	12 (24)	5 (10)

Table 3: Facial Anthropometric Measurements (cm)

Parameter	Female Mean ± SD	Male Mean ± SD	Total Mean ± SD
Facial Height	11.5 ± 0.70	12.1 ± 0.80	11.8 ± 0.78
Facial Breadth	12.7 ± 0.80	13.0 ± 0.90	12.85 ± 0.85

Table 4: Nasal Parameters and Nasal Index

Parameter	Male Mean ± SD	Female Mean ± SD	p-value
Nose Height (cm)	5.15 ± 0.42	4.82 ± 0.36	0.04*
Nose Breadth (cm)	3.90 ± 0.38	3.52 ± 0.35	0.02*
Nasal Index	75.7 ± 6.8	73.0 ± 7.2	0.12

*Statistically significant ($p < 0.05$)

Table 5: Distribution of Facial Index (Facial Types)

Facial Type	Male n (%)	Female n (%)	Total n (%)
Hyperleptoprosopic	6 (12)	4 (8)	10 (10)
Leptoprosopic	13 (26)	15 (30)	28 (28)
Mesoprosop			

5. Discussion

The present observational, cross-sectional study evaluated the facial index and craniofacial dimensions of the Bishnoi population of Bikaner district, Rajasthan, using a balanced sample of 100 adults (50 males and 50 females) aged 18-60 years. The selected age distribution, with the majority of participants between 21 and 50 years, represents a stable adult population in which facial growth is complete, thereby ensuring reliable anthropometric measurements. Previous studies have emphasized that post-adolescent age groups provide optimal accuracy for facial morphometric analysis, supporting the validity of the present findings.

Gender-wise analysis revealed clear sexual dimorphism. Males demonstrated higher mean facial height and facial breadth compared to females, consistent with established anthropological patterns reported in North Indian and other global populations. These differences are attributed to genetic, hormonal, and skeletal growth variations between sexes. Similar trends have been reported among Haryanvi, Rajput, and Meitei populations, reinforcing the consistency of the Bishnoi data within a broader regional context.

The distribution of facial types showed that mesoprosopic (medium face) was the most prevalent facial form overall, followed by leptoprosopic (long face). Males predominantly exhibited mesoprosopic faces, while females showed a higher frequency of leptoprosopic types. The presence of hyperleptoprosopic facial forms in both sexes suggests a tendency toward elongated facial morphology, which has also been reported in other desert-adapted North Indian

communities. This pattern may reflect genetic endogamy, climatic adaptation, and shared ancestry.

Socioeconomic and residential factors further contextualize these findings. The predominance of rural residence and middle socioeconomic status aligns with the traditional lifestyle of the Bishnoi community and may contribute to the preservation of population-specific craniofacial traits due to limited admixture.

Overall, the mean facial index placed the Bishnoi population predominantly in the mesoprosopic category, comparable with several Indian populations studied previously. The results establish baseline craniofacial data for this underrepresented community and hold significance for anthropological research, forensic identification, and clinical applications such as maxillofacial and reconstructive surgery.

6. Conclusion

The methodology adopted in this study is rigorous, ethically grounded, and methodically standardized to assess facial anthropometry in a culturally and demographically defined group the Bishnoi community of Rajasthan. By using reliable tools and well-defined anatomical landmarks, the study ensures precision in measurement. The use of Hooten's classification allows for a consistent comparison with national and international standards. Additionally, by integrating both demographic and anthropometric variables, the design enables meaningful correlations between age, gender, occupation, socioeconomic status, and facial morphology. The study's structured approach makes it a strong foundation for evaluating sexual dimorphism, population-level variation, and evolutionary implications in craniofacial traits among endogamous Indian communities.

References

[1] Khosa, A. D., & Khosa, S. K. (2017). Craniofacial Morphology of Nomadic Tribes of Rajasthan, India. International Journal of Morphology, 35(1), 23-28.
[2] Smith, K. F., Smith, M. S., & Jones, D. R. (2018). Nutritional Influence on Craniofacial Development: A Study of Vegetarian and Non-Vegetarian Diets. Journal of Nutrition and Human Health, 6*(1), 20-29
[3] Farkas, L. G., Munro, I. R., & Kolar, J. C. (2005). Anthropometric Facial Proportions in Medicine. American Journal of Orthodontics and Dentofacial Orthopedics, 78 (5), 591-608.
[4] Singh, P., & Purkait, R. (2006). Craniofacial Anthropometry in North Indian Population: A Study on Juveniles and Adults. Journal of Forensic Sciences, 51 (3), 638-642.
[5] Golalipour, M. J., Haidari, K., Jahanshahi, M., & Farahani, R. M. (2007). The Shape of Head and Face in Turkman Males in Gorgan-North of Iran. International Journal of Morphology, 21 (4), 321-324.
[6] Oladipo, G. S., Fawehinmi, H. B., & Okoh, P. D. (2010). Anthropometric Study of the Facial and Nasal Lengths of Adult Ijaws of Southern Nigeria. International Journal of Morphology, 28 (3), 1-5.
[7] Saini, V., Srivastava, R., Rai, R. K., Shamal, S. N., & Tripathi, S. K. (2011). Facial Index: A Tool for Gender Determination in the North Indian Population. Journal of Forensic Sciences, 56 (2), 457-461.
[8] Rajesh, R., Ravichandran, C., & Kannan, K. (2013). Craniofacial Morphology in South Indian Population: A Study of Facial Index. International Journal of Oral and Maxillofacial Surgery, 42 (4), 400-404.
[9] Rastogi, P., Kumar, A., & Choudhary, R. (2014). Anthropometric Study of Facial Index among the Assamese Population of India. Journal of Evolution of Medical and Dental Sciences, 3 (2), 370-373.
[10] Zarbo, C., Fabbri, E., & Gatti, G. (2014). Craniofacial Anthropometry in a Central European Population: Analysis of Facial Indices and Measurements. European Journal of Orthodontics, 36 (2), 168-173.
[11] Khamis, M. F., Al-Shamlan, M., & Ali, A. A. (2015). Craniofacial Anthropometry in Sudanese and Egyptian Adults. Journal of Craniofacial Surgery, 26 (7), 2744-2749.
[12] Shah, G. V., & Jadhav, H. R. (2015). The Study of Facial Index in Gujarati Population. International Journal of Anatomy and Research, 3 (2), 1068-1071.
[13] Mahajan, S., Tuli, A., & Kaur, R. (2019). Anthropometric Study of Facial Index in Himachali Population. Journal of Clinical and Diagnostic Research, 13 (2), 42-45.
[14] Rastogi S, Agarwal KN, Agarwal DK. Morphological distance between Rastogis and certain other caste groups of Uttar Pradesh, India. Anthropologischer Anzeiger. 1982;40(4):269-76.
[15] Jahanshahi M, Golalipour MJ, Haidari K. The effect of ethnicity on facial anthropometry in Northern Iran. Singapore Med J. 2008;49(11):940-3.