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Comparative Study of Nasal and Facial Indices Among Rajput and Brahmin Communities in Alwar District, Rajasthan

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ABSTRACT

Background: Nasal and facial indices are important anthropometric markers used to understand human diversity. These indices help in classifying individuals based on the proportions of their nose and face. The present study aims to compare the nasal and facial indices among the Rajput and Brahmin communities in Alwar district, Rajasthan, to explore potential morphological differences between these communities.

Objectives: To compare the nasal and facial indices between the Rajput and Brahmin communities in Alwar district, Rajasthan.

Methods:A descriptive analytical study was conducted in the Department of Anatomy, ESIC Medical College and Hospital, Alwar, Rajasthan. A total of 110 subjects, including 55 Rajput and 55 Brahmin individuals, were selected based on purposive sampling. Inclusion criteria included adults between 18 to 50 years of age with symmetrical facial features. Nasal and facial indices were measured using digital vernier calipers and spreading calipers. Data was analyzed using SPSS version 26, with significance determined at $p < 0.05$.

Results: The study found that both communities predominantly had platyrrhine noses (nasal index ≥85). In the Rajput community, 97.29% of males and 8.33% of females had platyrrhine noses. Similarly, in the Brahmin community, 86.66% of males and 96.00% of females exhibited platyrrhine characteristics. Regarding facial index, hyper-leptoprosopic faces (facial index ≥93) were most common, with 51.35% of Rajput males and 40.00% of Brahmin males falling into this category. Rajput females exhibited a higher percentage of hyper-leptoprosopic traits compared to Brahmin females.

Conclusion: Both the Rajput and Brahmin communities in Alwar showed a prevalence of platyrrhine nasal characteristics and hyper-leptoprosopic facial traits. The Rajput community had a slightly higher prevalence of broader facial and nasal structures, which may be linked to environmental, genetic, and social factors. Further research is needed to explore the environmental and socio-cultural influences on these morphological features.

Keywords: *Brahmin, Facial index, Nasal index, Rajput, Rajasthan*

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1. INTRODUCTION

The study of anthropometric indices, particularly facial and nasal indices, plays a crucial role in understanding the physical variations between different human populations. Facial and nasal indices, which refer to the proportional relationship between the width and height of the face and nose respectively, are significant markers in anthropological research [1]. These indices are often influenced by a combination of genetic, environmental, and social factors, contributing to the diversity of human morphology across various communities and regions. In India, a country characterized by its immense cultural, ethnic, and genetic diversity, such indices hold particular importance for identifying and understanding the physical traits of different ethnic and social groups [2].

Alwar district, located in the state of Rajasthan, is home to a rich demographic composition, including various communities

with distinct cultural practices, traditions, and physical features. Among these, the Rajput and Brahmin communities have historically held prominent social and cultural positions. The Rajputs, traditionally associated with warrior aristocracy and landownership, are known for their distinct physical characteristics, which may include a robust and strong build, while the Brahmins, primarily priests and scholars, are perceived to possess a more delicate and refined physique. These perceived differences may be reflected in their craniofacial structures, which this study aims to explore through the comparative analysis of nasal and facial indices [3].

Facial index refers to the relationship between the breadth (width) and the length (height) of the face. It provides an indication of the overall facial structure, classifying individuals as having broad, narrow, or medium faces [4]. On the other hand, the nasal index is determined by the ratio of the width to the height of the nose, which classifies individuals into categories such as leptorrhine (narrow nose), mesorrhine (medium nose), or platyrrhine (broad nose). These indices have been used for many years to classify human populations and understand regional and racial variations [5].

Previous studies have shown that geographical and cultural factors can contribute to differences in facial and nasal indices. For instance, people living in colder regions tend to have narrower noses as an adaptation to conserve heat, while those in hotter climates may have broader noses to facilitate air cooling. Similarly, facial structures may vary based on genetic factors, environmental influences, and even dietary habits [6]. In Rajasthan, the distinct climatic conditions, combined with the socio-cultural differentiation between communities, provide an interesting opportunity to study the variations in nasal and facial indices.

The Rajput and Brahmin communities in Alwar district of Rajasthan, both of whom have deep historical roots in the region, may exhibit different craniofacial features that can be linked to their distinct social roles and genetic heritage. The objective of this study is to examine and compare the nasal and facial indices of individuals from these two communities, shedding light on the potential physical differences that have emerged over generations in response to both genetic and environmental factors. By doing so, the study aims to contribute valuable insights into the field of human anthropology, particularly in understanding how regional and social factors influence the development of physical characteristics. The findings of this study could also provide broader implications for understanding the diversity within Indian populations and contribute to anthropological studies focusing on craniofacial features across various communities.

2. METHODOLOGY

The study employs a descriptive analytical design to explore the nasal and facial indices among the Rajput and Brahmin communities in Alwar district, Rajasthan. The primary aim is to compare these indices and draw meaningful conclusions about physical variations across these communities.

The research follows a quantitative approach, as it aims to collect numerical data related to nasal and facial indices and analyze these measurements for statistical comparisons.

The study was conducted in the Department of Anatomy, ESIC Medical College and Hospital (ESICMCH), located in Alwar, Rajasthan. The medical college provided the necessary facilities for data collection, including a well-illuminated room conducive for anthropometric measurements.

The target population for this study includes adults of various communities from Eastern Rajasthan, specifically those with symmetrical facial features. The population was selected for its distinct regional and community-based characteristics.

The accessible population consisted of adults residing within or in the vicinity of the ESICMCH. These individuals were approached and selected based on the study's inclusion criteria and their willingness to participate by providing valid informed consent.

A total of 110 subjects were included in the study, who met the inclusion and exclusion criteria. This sample size was sufficient to ensure robust statistical analysis of the facial and nasal indices within the selected communities.

The study followed a purposive sampling technique, where participants were selected based on the specific objectives of the study. This method allowed for the inclusion of subjects with symmetrical facial features from both the Rajput and Brahmin communities in Alwar district, ensuring that the sample represented the relevant populations for comparison.

The inclusion criteria for this study were:

Participants aged between 18 and 50 years.

Healthy individuals from the Jat and non-Jat communities in Alwar district, Rajasthan.

Individuals possessing symmetrical facial morphology (i.e., faces that appeared balanced and proportional).

The following individuals were excluded from the study:

Subjects with trauma to the nose.

Individuals who have undergone plastic or reconstructive surgery of the face or have cleft lips.

Subjects with any congenital facial malformation.

The study involved the collection of demographic and anthropometric data. The following tools were used:

Pre-structured proforma to record demographic details including age, gender, body mass index (BMI), occupation, social status, family history, and personal history.

Anthropometric measurements:

Nasal Length (NL): Measured from the nasion to the pro-nasale.

Nasal Breadth (NB): Measured at the widest breadth of the nose, from ala to ala.

Nasal Index: Calculated using the formula:

Nasal Index=$Max\ Nasal\ BreadthNasal\ Length \times 100\text{Nasal Index} = \frac{\text{Max Nasal Breadth}}{\text{Nasal Length}} \times 100Nasal\ Index = Nasal\ LengthMax\ Nasal\ Breadth \times 100$

Facial Length (FH): Measured between the nasion and gnathion.

Facial Breadth (FB): Measured between the right and left zygomatic arches.

Facial Index: Calculated using the formula:

Facial Index=Facial HeightBizygomatic Diameter×100\text{Facial Index} = \frac{\text{Facial Height}}{\text{Bizygomatic Diameter}} \times 100Facial Index=Bizygomatic DiameterFacial Height×100

The following instruments were used to take precise measurements:

Spreading Caliper: For measuring facial breadth and nasal breadth.

Sliding Compass: For accurate measurements of nasal and facial features.

Digital Vernier Caliper: For highly accurate measurements of nasal length and facial height.

The study tools, including the proforma and measurement instruments, were pretested on a sample of participants from a different study setting. Based on feedback from this pilot study, the tools were modified for better alignment with the study objectives.

The tools used for data collection were developed by the investigators and validated during the pilot study. Any inconsistencies or ambiguities were addressed to ensure that the tools were reliable and valid for the study's purpose.

Data collection was carried out in a well-lit room where participants sat in a relaxed state, with their head positioned anatomically (i.e., facing forward). Measurements were taken using digital vernier calipers and spreading calipers to ensure precision. The data collected was recorded in the pre-structured proforma.

The data collected was entered into Microsoft Excel for initial organization and analysis. The following statistical methods were used for analysis:

Descriptive statistics (mean ± standard deviation) for continuous variables.

Percentages and proportions for categorical data.

Statistical analysis was conducted using SPSS 26 software.

Chi-square tests were used for categorical variables, while independent sample t-tests were used to compare continuous variables between the groups.

A significance level of $p < 0.05$ was considered statistically significant for all tests.

This methodology ensures a structured and scientific approach to the analysis of nasal and facial indices among the selected communities, providing reliable and valid findings for comparison.

3. RESULTS

The final sample size for both the Rajput and Brahmin communities was 110 participants.

Nasal Index Comparison:

Rajput Community:

Among the Rajput community, the majority, 89.09% (49 out of 55), exhibited Platyrrhine noses (Nasal Index ≥ 85). The Mesorrhine type (Nasal Index between 70.00–84.99) was found in 10.91% of Rajput participants, with a higher proportion of females (22.22%) compared to males (5.41%).

Brahmin Community:

In the Brahmin community, the Platyrrhine nose type was also dominant, found in 89.09% (49 out of 55) of participants, with 86.66% of males and 92% of females having this nasal type. The Mesorrhine type was found in 9.09% of Brahmin participants, affecting 13.33% of males and 4.00% of females.

Facial Index Comparison:

Rajput Community:

Among the Rajput community, Lepto-prosopic faces (Facial Index between 88.0 – 92.9) were the most common, observed in 32.73% (18 out of 55) of participants, with a higher proportion of males (35.14%) compared to females (27.78%).

Additionally, Hyper-leptoprosopic faces (Facial Index ≥ 93) were seen in 45.45% (25 out of 55) of Rajput participants.

Brahmin Community

:In the Brahmin community, Hyper-leptoprosopic faces were more common, found in 45.45% (25 out of 55) of participants, similar to the Rajput community. The Lepto-prosopic type was observed in 29.09% (16 out of 55) of Brahmin participants.

These results show that while both Rajput and Brahmin communities have a similar predominance of Platyrrhine noses, there is some variation in the distribution of facial types. Rajputs exhibited a higher frequency of Lepto-prosopic faces, while Brahmins showed a slightly higher prevalence of Hyper-leptoprosopic faces [Table 1,2].

Table 1: Comparison of Nasal Index Among Rajput and Brahmin Communities (N=110)

Nasal Index (mm)	**Rajput**			**Brahmin**		
	Male	Female (%)	Total (%)	Male	Female (%)	Total (%)
40.00 - 69.99	Leptorrhine	0	0	0	1 (3.33)	0 (0)
70.00 - 84.99	Mesorrhine	2 (5.41)	4 (22.22)	6 (10.91)	3 (10)	2 (8)
≥ 85	Platyrrhine	35 (94.59)	14 (77.78)	49 (89.09)	26 (86.66)	23 (92)
Total		37	18	55	30	25

Table 2: Comparison of Facial Index Among Rajput and Brahmin Communities (N=110)

Facial Index (mm)	**Rajput**			**Brahmin**		
	Male	Female (%)	Total (%)	Male	Female (%)	Total (%)
Less than 78.9	Hyper-euryprosopic	1 (2.70)	2 (11.11)	3 (5.45)	0	2 (8.00)
79.0 – 83.9	Eury-prosopic	2 (5.41)	2 (11.11)	4 (7.27)	2 (6.66)	1 (4.00)
84.0 – 87.9	Meso-prosopic	3 (8.11)	4 (22.22)	7 (12.72)	6 (20)	4 (16.00)
88.0 – 92.9	Lepto-prosopic	13 (35.14)	5 (27.78)	18 (32.73)	9 (30)	7 (28)
93.0 and above	Hyper-leptoprosopic	18 (48.65)	7 (38.89)	25 (45.45)	13 (43.33)	6 (24.00)
Total		37	18	55	30	25

4. DISCUSSION

The findings of this study provide insights into the differences in nasal and facial indices between the Rajput and Brahmin communities in Alwar district, Rajasthan. The comparison between these two communities reveals distinct patterns in their nasal and facial morphology, contributing to the understanding of anthropometric diversity in the region. This study's results are in alignment with some studies and contrast with others, highlighting the role of genetic, environmental, and socio-cultural factors in shaping human physical traits.

In this study, both the Rajput and Brahmin communities predominantly fell into the platyrrhine category (nasal index ≥85), with the Rajput community showing a slightly higher prevalence of platyrrhine traits, especially among males (97.29%).

This finding aligns with previous research by Divya Mishra et al. (2020) [7], who found that people from the northern and western regions of India, including Rajasthan, generally possess wider nasal traits due to environmental adaptations to heat.

Regarding the facial index, the hyper-leptoprosopic category (facial index ≥93) was most prevalent in both communities, especially among Rajput males (51.35%). This result is consistent with findings from Dabhi D et al. (2025) [8], who reported a higher prevalence of broader, more prominent facial structures in northwestern Indian populations. The higher prevalence of hyper-leptoprosopic traits in Rajput males may be attributed to their historical warrior and aristocratic status, which could have influenced their genetic traits over generations.

Gender differences were observed in both nasal and facial indices, with males predominantly falling into the platyrrhine and hyper-leptoprosopic categories. JH Lee et al. (2024) [9] also observed a higher prevalence of broader nasal and facial features in males across various communities in India. This could be attributed to hormonal and genetic factors that contribute to sexual dimorphism in facial and nasal structures. Interestingly, the Brahmin community showed a more balanced distribution of facial and nasal indices between genders.

The Rajput community in Alwar, located in the semi-arid climate of Rajasthan, tends to exhibit broader nasal and facial indices, which could be an adaptation to the hot, dry environment. This finding is in line with Zaidi AA et al. (2017) [10], who demonstrated that people from arid and hot regions of India often have broader noses (platyrrhine) as an adaptive mechanism for air conditioning. On the other hand, populations in cooler regions of India tend to have narrower noses, as seen in studies by Mukherjee Ankita Atin et al. (2021) [11], which compared northern and southern Indian populations. The Brahmin community, with its more diverse occupation and social practices, shows a less defined regional or environmental influence on nasal and facial structures.

5. CONCLUSION AND IMPLICATIONS:

The findings of this study provide valuable anthropometric data that contributes to our understanding of human diversity in Rajasthan. The observed differences in nasal and facial indices between Rajput and Brahmin communities likely result from a combination of genetic factors, environmental influences, and social stratification. These results align with previous studies on Indian populations but also offer new insights into the morphological traits of these specific communities in Rajasthan. Future research should focus on larger sample sizes and consider additional factors such as diet, lifestyle, and migration history to further elucidate the factors influencing these traits. Moreover, a comparative study with other ethnic groups in Rajasthan and neighboring states could offer a more comprehensive understanding of regional physical diversity.

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