

## MORPHOMETRIC ANALYSIS AND CLASSIFICATION OF NOSTRIL TYPE AMONG THE MUMBAI AND WESTERN MAHARASHTRA POPULATION

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### Abstract

**Background:** The human nose is a unique facial feature with critical functional roles and cultural significance. While various studies have explored nasal morphology and its implications, research on Mumbai and Western Maharashtra populations remains limited, making it a unique area of interest. **Materials and Methods:** This study involved 200 participants aged 18-25, carefully selected from the Mumbai and Western Maharashtra region. Rigorous selection criteria ensured the homogeneity of the participant group, excluding individuals with medical conditions, nasal trauma, or previous facial surgery. Nostril types were classified using the modified Topinard system, and statistical analysis was performed with SPSS software. **Result:** The analysis of nostril types revealed distinct variations within the Mumbai and Western Maharashtra population. Notably, Type III nostrils were highly prevalent, while Type II nostrils were absent in males and rare in females. The distribution of nostril types demonstrated a unique pattern influenced by factors such as gender, ethnicity, and geography. **Conclusion:** The prevalence of nostril types in this region emphasizes the influence of ethnicity, gender, and geographic location on nasal morphology.

## INTRODUCTION

The human nose, with its intricate form and function, is an indispensable feature of our facial anatomy. Beyond its physiological roles in respiration, olfaction, and thermoregulation, the human nose is a reflection of our diverse genetic heritage, environmental influences, and the cultural elements that converge to define our facial characteristics.<sup>[1]</sup> In this study, our focus is a comprehensive examination of nostril types within the bustling city of Mumbai and its surrounding regions, aiming to discern and classify nostril types in this distinctive cultural and geographical landscape. This endeavour seeks to unravel the complexities of nasal morphology, offering a unique lens through which we can better comprehend the intricate interplay of genetics, environment, and culture in shaping the human face. The exploration of nasal morphology finds its roots in anthropology, where it serves as a valuable window into the rich tapestry of human populations. Our research builds upon this tradition by delving into the specifics of nostril types and their variations

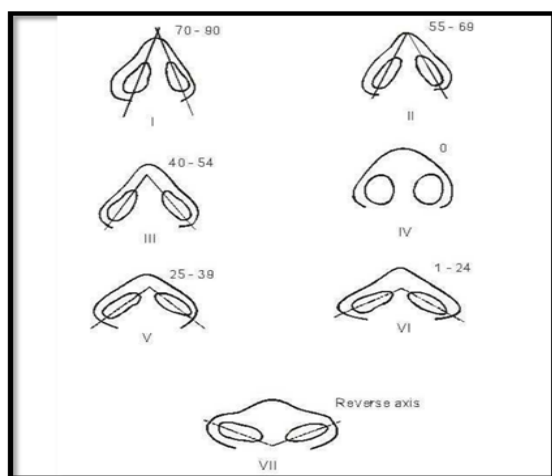
within the Mumbai metropolitan and its outlying regions. Additionally, beyond its anthropological significance, a comprehensive understanding of facial morphology, including the intricate features of the nose, holds a pivotal role in the sphere of medical practice.<sup>[2-4]</sup> Unique nasal characteristics provide vital diagnostic insights and guide the development of treatment strategies for various medical conditions, making precise morphometric analysis an indispensable tool for healthcare professionals in the region.<sup>[5,6]</sup> The human nose is far more than a mere biological organ; it holds profound cultural significance, deeply intertwined with personal identity and aesthetic ideals.<sup>[7-9]</sup> Various cultures possess their unique perceptions of nasal beauty, impacting not only individual self-esteem but also the dynamics of social interactions. Furthermore, Different geographic regions often showcase unique patterns of nasal traits, providing insights into the evolution and adaptation of populations over time,<sup>[10,11]</sup> Mumbai and its surrounding areas, with their diverse demographic composition and cultural richness, remain largely unexplored territory in terms

of nasal morphology research. we have done this extensive investigation of Inclination of medial longitudinal axis of nostril within the framework of nasal morphology, we want to fill gaps in our understanding of nostril types, particularly in the context of Mumbai and its surrounding areas. This study aims to contribute significantly to academic knowledge and practical applications.

## MATERIALS AND METHODS

The present study was conducted to investigate the morphometric variations in nostril types, and it involved a carefully selected group of 200 participants, comprising 100 males and 100 females. The study subjects were exclusively drawn from the 18-25-year age group. Our research subjects were enrolled from prominent educational institutions encompassing dental, medical, and nursing colleges located in the vibrant city of Mumbai and its surrounding regions. Before initiating any data collection, comprehensive informed consent was diligently obtained from each participant, as per the structured consent proforma.

The selection process of study subjects is guided by a set of specific criteria to ensure the homogeneity and representativeness of our participant group. Firstly, we restricted our study to individuals residing in the Western Maharashtra region to establish geographical uniformity and maintain a consistent dataset. Secondly, participants were required to be in good health with no known medical conditions that might influence their nasal structure. We also excluded individuals with a history of facial surgery, particularly plastic or reconstructive procedures, to prevent potential confounding factors. In addition, participants had to have no previous nasal trauma history, such as injuries from road traffic accidents, to keep their nasal structures free from external influences.



**Figure 1: Nostril type – Modified Topinard system showing the average inclination of medial longitudinal axis.**

Lastly, individuals with obvious nasal deformities, whether congenital or acquired through developmental discrepancies, were ineligible for participation, ensuring a dataset comprising individuals with structurally typical nasal features. These selection criteria were instrumental in shaping a study population that would yield accurate and internally valid results, contributing to the reliability of our research findings.

To maintain a consistent and objective classification of nostril types, we followed modified Topinard system of classification as shown in [Figure 1]. The methodology was executed by first placing the transparent protractor on the subject's nostrils, ensuring that the instrument aligned with the long axis of the nostrils. This careful alignment allowed us to accurately measure and record the angle formed between the right and left long nostril axes. The resulting angles were then used to categorize each subject into one of the seven Topinard system of nostril types. This thorough approach to measurement and classification assured that our findings were both precise and systematic, contributing to the overall strength and reliability of our research.

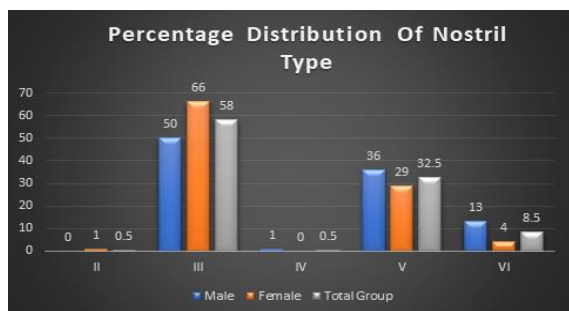
**Statistical Analysis:** All the data was collected and tabulated on excel sheet. The values in the study were expressed in terms of mean and standard deviation (SD) by using Microsoft excel software. The data was a quantitative type of data. The data was analysed by using statistical software named “SPSS Version 28”. For comparison between different values in different groups unpaired ‘t’ test was applied. P value < 0.05 was considered to be significant

## RESULTS

In our study, we conducted a meticulous examination of the inclination of the medial longitudinal axis of nostrils within a diverse study subject, thoughtfully balanced between male and female participants. The precise measurement of the degree of inclination served as the foundation for categorizing the subjects into distinct nostril types. Notably, within the male group, we did not encounter any cases that fit the description of nostril type II, while 1% of our female participants exhibited nostril type II, contributing to a 0.5% prevalence of this nostril type in the overall study group.

Type III nostrils emerged as particularly prevalent among our study subjects as shown in below table. Males displayed a significant 50% prevalence of type III nostrils, while females demonstrated an even greater frequency, with 66% showcasing this nostril type. In the context of the entire study population, a majority, specifically 58%, were categorized as having type III nostrils. Type IV nostrils, characterized by an absolute lack of inclination, were relatively uncommon within our study. Only one male participant, accounting for 0.05% of the male group, presented with type IV nostrils. Notably, no

females within our study exhibited this specific Type IV nostril type, resulting in a 0.5% frequency throughout the study participants.



**Figure 2: Percentage distribution of nostril type**

**Table 1: Inclination of medial longitudinal axis of nostril in 200 subjects**

Nostril type	Inclination (Degrees)	Male		Female		Total group	
		No.	%	No.	%	No.	%
II	55 - 69	00	00	01	01	01	0.5
III	40 - 54	50	50	66	66	116	58
IV	0	01	01	00	00	01	0.5
V	25 - 39	36	36	29	29	65	32.5
VI	1 - 24	13	13	04	04	17	8.5

## DISCUSSION

In comparing our study with Farkas et al,<sup>[12]</sup> study we have discovered intriguing variations in nostril types among different populations. Our investigation, focusing on individuals in the Mumbai and Western Maharashtra region, revealed a distinctive distribution of nostril types. Notably, we found that Nostril Type III was the most prevalent, accounting for 58% of the total group. However, it's worth noting the absence of Nostril Type II in males and its scarcity among females, as well as the rarity of Nostril Type IV among females, indicating the influence of both gender and ethnicity.

Contrasting these findings with those of Farkas et al. among young adult North American Caucasians, Asians, and Blacks, significant differences emerge. Among Caucasians, Nostril Type II was highly prevalent at 52.8%, a stark contrast to our findings where it was absent in males and rare in females. In their Asian participants, Nostril Type III was prominent at 52.8%, similar to our study, albeit with a higher male-female ratio. Additionally, Nostril Type IV was observed in a small percentage of Asians (5.7%) and Blacks (6.3%) in their study. These comparisons underscore the fact that nostril type distributions vary not only between different ethnic groups but also between genders within those groups, highlighting the complex interplay of population-specific factors in determining the prevalence of specific nostril types.

Furthermore, when we consider Hwang et al,<sup>[13]</sup> study, we find even more significant differences in the distribution of nostril types. Notably, Nostril Type II was prevalent at 32.1% in Hwang's study, while it was observed in just 0.5% of our population. Similarly, Nostril Type III, a common category in

Conversely, type V nostrils were prevalent, especially among male individuals, constituting 36% of the total study population. A significantly smaller, though still substantial, number of females, 29%, possessed type V nostrils as shown in figure 2. In the context of the entire study population, 32.5% of participants featured type V nostrils. Type VI nostrils, characterized by a mild inclination, were identified in 13% of male participants and 4% of female participants. In total, 8.5% of the overall study population exhibited type VI nostrils.

both studies, showed a slightly higher prevalence of 58% in our research compared to 48.8% in Hwang et al.'s study. Remarkably, Nostril Type IV was virtually absent in both studies, appearing in only 0.5% of the populations. In contrast, Nostril Type V exhibited variations, with a prevalence of 13.0% in Hwang's study and 32.5% in our research study. Lastly, Nostril Type VI was identified in 8.5% of our population, while Hwang et al. reported 4.7%. These distinctions emphasize the potential influence of demographic factors, such as ethnicity and geography, on the prevalence of nostril types in different study populations.

In addition, our study, when compared to Garandawa HI et al,<sup>[14]</sup> reveals wide variations in the prevalence of nostril types. Notably, Nostril Type II was entirely absent in males in our study, but 1% of females exhibited it, resulting in an overall prevalence of 0.5%. Nostril Type III was common in both studies, but our prevalence was substantially higher at 58% compared to the 12.6% reported by Garandawa HI et al. Type IV nostrils were rare in both studies at 0.5%. Type V nostrils were more common in our study at 32.5% compared to Garandawa HI et al.'s 25%. Similarly, Type VI nostrils were less prevalent in our study at 8.5% compared to 41.3% in Garandawa HI et al.'s research, which underlines the remarkable diversity in nostril types among different populations. These comparisons across various studies clearly demonstrate the significant impact of factors such as ethnicity, gender, and geography on the distribution of nostril types.

## CONCLUSION

While Nostril Type III prevalent in our region (Mumbai), there are differences in Type II, IV, V, and

VI prevalence compared to other research, and this prevalence is impacted by ethnicity, gender, and location. Understanding these variances is critical for medical and anthropological study, and it may have impact for a variety of applications, ranging from surgical treatments to forensic identification. Further research into the underlying genetic and environmental causes of nostril type distribution is needed to acquire a more knowledge of this complex phenomena.

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