



Anthropometric study of nasal index of South Indian skulls

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ABSTRACT

Introduction

Nasal anthropometry is a useful clinical parameter recognized in medicine and surgical management of nasal abnormalities. Nasal index is the most common nasal parameter, and may be determined by regional and climatic differences. Understanding baseline nasal parameters could make measurements of nasal index a useful tool for researchers, clinicians, rhinoplastic and facial reconstructive surgeons, forensic experts and others in related fields. The aim of this study was to establish normative data for nasal anthropometric parameters and distribution of basic nose types in the South Indian population that could be useful in future forensic and anthropological studies.

Methods

The study was conducted on 109 skulls available in the Department of Anatomy of a medical college in Southern India. The nasal index was calculated as the percentage nasal width divided by nasal height. The results were tabulated and analyzed to determine nasal types.

Results

The mean nasal width was 49mm, the mean nasal height was 91mm and the mean nasal index was 54mm. The standard deviation of nasal index was 5mm with a standard error of 0.5mm.

Conclusion

The study was conducted using a novel anthropometric method that used routine digital photographs of South Indian skulls. Hence the results can be recommended to forensic experts, plastic surgeons and anthropologists.

Keywords: Anterior nasal aperture, Nasal anthropometry, Nasal height, Nasal index, Nasal width, Rhinoplasty

INTRODUCTION

The nose is one of the best clues to racial origin. Its proportion is determined on the same principles as those of the skull. The anthropometry of the nose is so distinct that it has become an important branch of nasal science.¹ Nasal anthropometry is a useful clinical parameter recognized in medical and surgical management of nasal abnormalities. The nasal index (the ratio of nasal breadth to nasal length) is related to regional and climatic differences, and baseline measurements can be a useful tool for researchers,

clinicians, rhinoplastic and facial reconstructive surgeons and forensic experts related to this field.² As the interest in cosmetic rhinoplasty is increasing, standard measurements of basic nose types needs to be determined for all ethnic groups. At present, such measurements are not available for all populations, but applying Caucasian concepts of facial beauty to the patients of other ethnic groups is not ideal.³ Nasal parameters may be evaluated by direct, clinical measurements (morphometry), by photography

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(photogrammetry), by lateral radiograph (cephalometry) or by a three-dimensional (3D) scan and digitizers.³ The present study aims to establish standards for nasal anthropometric parameters such as nasal length, nasal width and nasal index by photogrammetry of dry human skulls. The study aims to establish normative data for nasal anthropometric parameters and distribution of basic nose types in the South Indian population that could be useful in forensic and anthropological studies.

METHODS

The study was conducted on 109 skulls available from the Department of Anatomy in a medical college in South India. Skulls with gross deformities were excluded. The sample size was justified using mean values from previous studies.⁶ Digital photographs of the front profile of skulls, alongside a scale, were taken using a Sony digital camera. Height and width of anterior nasal aperture was measured using Image J software. The nasal index was calculated as a percentage of nasal width divided by nasal height, where nasal width is the maximum distance between the lateral margins of the anterior nasal aperture, and nasal height is the measurement between the nasion (point of intersection of the frontonasal and the internasal sutures) and nasospinale (the point on the lower margin of anterior nasal aperture in midsagittal plane), as shown in fig 1. The results were tabulated and analyzed using Microsoft Excel spreadsheet software. The nasal index values were then used to characterize nasal type.

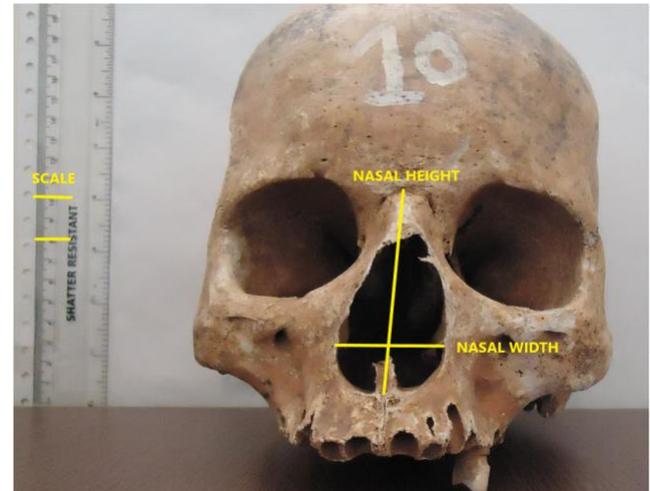


Fig 1 Measurement of nasal width and height using digital photographs

RESULTS

The obtained measurements were scrutinized, tabulated and statistically analysed using maximum and minimum values, range, mean, standard deviation and 95% confidence intervals of the mean.

The nasal width ranged from 39mm to 65mm, the nasal height from 76mm to 112mm and the nasal index from 43mm to 71mm. The mean nasal width was 49mm, the mean nasal height was 91mm and the mean nasal index was 54mm, shown in table 1.

The standard deviation for the nasal index was 5mm with a standard error of 0.5mm.

Table 1 Statistical analysis of nasal parameters

N=109	Range		Mean (mm)
	Minimum (mm)	Maximum (mm)	
Nasal Width	39	65	49
Nasal Height	76	112	91.2
Nasal Index	43	71	56 ± 5

Table 2 Brief methodology of calculation of nasal index by various researchers

S. No	Measurement done on	Details of measurement
1	Live individuals	Length and breadth of external nose
2	Dry skull	Length and breadth of anterior nasal aperture
3	Dry skull (our study)	Nasion to nasospinale

Table 3 Classification of skull based on nasal index

Nasal index	Type of skull	Size of nose	Number/percentage of skulls in this study
Up to 47mm	Leptorrhine	Moderately narrow nose	10 (8%)
47 – 51mm	Mesorrhine	Moderate or medium size	17 (16%)
51 – 58mm	Chamaerrhine/ platyrrhine	Moderately wide nose	65 (60%)
≥ 58.0mm	Hyperchamaerrhine/hyperplatyrrhine	Very wide nose	17 (16%)

DISCUSSION

Facial anthropometry has become an important tool used in genetic counselling, reconstructive surgeries and forensic investigations.⁵ Previous researchers have measured nasal index in three different ways, shown in table 2.¹⁻¹⁶

In this study, we measured the nasal parameters in dry skulls extending from the nasion, as the margins of anterior nasal apertures tended to be broken or distorted due to frequent handling of the skulls. Previous studies have classified the skulls and described the shape of the nose, as shown in table 2.^{8,10,15} As shown in table 3, 60% of skulls in our study fall under the chamaerrhine/platyrrhine variety (moderately wide nose), 16% under the mesorrhine and hyperplatyrrhine variety (very wide nose), and only 10% under the leptorrhine (moderately narrow nose) variety of skull.

These results are similar to those from a 2017 study conducted by Samata and Nausheen who also concluded that the majority (52%) of South Indian skulls in their study belonged to the chamaerrhine type.¹⁰ However, other studies have recorded most of the Indian population falling into the platyrhinian and hyperplatyrhinian types.¹² This can be explained as an adaptation to extreme climates of different regions of India, which can be very hot in some regions and cold in others, requiring more surface area and volume of nasal passage, along with more turbulency by soft tissue changes for appropriate climatic conditions. Excess soft tissue changes need wider and more circular nasal aperture.¹² Any variation in nasal index with respect to age or sex was not assessed in our study, though such difference might exist due to genetic, hormonal, nutrition and other related factors.

Nasal analysis is the first step a cosmetic surgeon takes prior performing rhinoplasty to change the shape or size of the nose. Appreciating the details of nasal analysis for any particular ethnic group will enable the surgeon to offer a better cosmetic result without compromising the patient's desire to maintain his or her cosmetic ethos.¹

CONCLUSION

The study used a novel anthropometric method that used standard digital photographs of dry South Indian skulls from the Department of Anatomy in a medical college to determine a baseline nasal index for the South Indian population. The results can be recommended to forensic experts, plastic surgeons and anthropologists to serve as a future framework for estimating other craniofacial variables in same population. We conclude that the most common presentation of nose type in the south Indian population is the chamaerrhine/platyrrhine variety, with moderately wide nose, This type had 60% (n=65) representation across the study.

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