



# Anthropometric Study of Nasal Parameters of South Indian Population

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## ABSTRACT

### Introduction

The shape of the nose is a signature indicating the ethnicity, age, and sex of the person. Our aim is to map the range of various anthropometric parameters of nose in South Indians.

### Materials and Methods

This study includes measurement and statistical analysis of different parameters of nose among 61 South Indian medical students (34 females; 27 males) using digital Vernier calipers.

### Results

The means of various parameters were- 1) Nasal Breadth -2.9cm (males) and 2.5 cm (females). 2) Nasal height-5 cm (males) and 4.9cm (females). 3) The nasofacial angle-37.9 degree (males) and 36.7 degree (females). 4) The nasolabial angle 115.2 degree (males) and 116.5 degree (females). 5) The nasofrontal angle 127.1 degree (males) and 134.7 degree (females). 6) The most common type of nose is leptorrhine in both males and females.

### Conclusion

All the measurements can be used for evaluation of nasal deformity, treatment planning and post-surgical evaluation of the correction achieved during rhinoplasty.

### Keywords

Anthropometry; Nasal Index; Nasofrontal Angle; Leptorrhine; Mesorrhine

The word “aesthetics” means to sense. It is derived from the Greek word “aesthesthai”. Various techniques have been devised for the beautification of the nose but the nose has to be evaluated in relation to anthropometric consideration. Good facial aesthetics is one of the factors that influences the judgement of beauty which is related to individual’s relationship with society.

There are differences in nasal parameters of different sexes as well races. The nose has both dynamic and static components. The static component is the osseo-cartilaginous pyramid that doesn’t change in shape.

The face is divided into three equal portions by four horizontal lines.<sup>1</sup> From above downwards there are various reference points viz.

- a. Glabella-Bony triangular area on frontal bone between the supraorbital ridges.<sup>1</sup>
- b. Nasion-Junction of upper end of suture between nasal bones with frontal bones.<sup>1</sup>
- c. Rhinion-The lower end of suture between the nasal bones.<sup>1</sup>
- d. Subnasal-Point at the nasal spine where the nasal septum merges with upper lip in the mid saggital plane.<sup>1</sup>
- e. Frankfort line-A line along infraorbital border and tragus.<sup>1</sup>
- f. Gnathion-Lowest point in the midline of chin.<sup>1</sup>

Studying variations of nose gives us an idea about the variations of anthropometric aspects of nose between males and females.

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Table I: Nasal parameters in males

NASAL PARAMETERS	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
Nasal breadth (cm)	2.9	0.41	2.49	3.31
Nasal height(cm)	5	0.33	4.67	5.33
Nasofacial angle(degree)	37.9	4.63	33.27	42.53
Nasolabial angle(degree)	115.2	7.25	107.95	122.45
Nasofrontal angle(degree)	127.1	10.56	116.54	137.66

## Materials and Methods

After obtaining clearance from the Institutional ethics committee and consent from 61 South Indian Medical students (34 females and 27 males) aged between 21 and 25 years, procedure was explained to them. Pictures of basal view, frontal view, profile view of nose of the students were taken methodically by single observer to prevent inter-observer error. Measurements were taken using digital Vernier calipers and statistically analyzed. Students who have undergone previous nasal surgeries or having any deformities of the nose or nasal injuries were not included in the study. These procedures could have potentially changed the native anthropometry of the noses.

The photographic set up consisted of a digital camera with effective pixels of approx. 20.2 megapixels. Aspect ratio 4:3. Focal length of lens:18x zoom:4.5(w)-81.0(T) mm,35 mm film equivalent 25(W)-450(T)mm. All images were taken under uniform illumination. The subjects were asked to sit against a dark background and were asked to look straight into the camera in natural head position with facial muscles relaxed. Photographs were taken according to each view. The photographs were analysed using Digimiser® software. All the photographs were taken at a distance of 5 feet for a sharp image. Analysis was done using Pearson's Chi Square test.

The parameters measured were-

1. Nasal Breadth- The maximum distance between two ala.<sup>2</sup>
2. Nasal height- Height of the nose (NH) from nasion (midpoint of nasofrontal suture) to subnasale (junction between lower border of the nasal septum and the

cutaneous portion of the upper lip).<sup>2</sup>

3. Nasofacial angle-The angle between a line touching the nasion and chin and the dorsal plane of the nose. It is between 30 degree and 40 degrees.<sup>1</sup>

4. Nasolabial angle-The angle between columella and plane of the upper lip with its apex at subnasale. It is between 90 -95 degrees for males and 100-110 degrees for females.<sup>1</sup>

5. Nasofrontal angle-The angle between dorsum of nose and glabellar part of the forehead. It is about 125 degrees.<sup>1</sup>

Nasal Index (Nasal Breadth/ Nasal Height x100) was calculated and noses were classified into Leptorrhine, Mesorrhine or Platyrrhine. Leptorrhine has Nasal index of 69.90 or less, Mesorrhine has Nasal index between 70 & 84.90 and Platyrrhine has nasal index of 85 & above.<sup>2</sup>

## Results

Analysis of the measurement of different nose dimensions in the study population were analysed. (Table I & II)

Here, range of each of the nasal parameters are mentioned. (Range=Mean ±Standard deviation)

1.Nasal breadth-

a) Among males, the mean nasal breadth was 2.9cm and it varied from 2.49 cm to 3.31 cm. Out of 27, 20(74.07%) lied in the range, 5(18.52%) more than the range and 2(7.41%) less than the range.

b) The mean nasal breadth among females was 2.5 cm and it varied from 2.3 cm to 2.7 cm. Out of 34, 26(76.47%) lied within the range, 4(11.76%) more than the range and 4(11.76%) less than the range.

Table II: Nasal parameters in females

NASAL PARAMETERS	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
Nasal breadth (cm)	2.5	0.2	2.3	2.7
Nasal height(cm)	4.9	0.33	4.57	5.23
Nasofacial angle(degree)	36.7	3.61	33.09	40.31
Nasolabial angle(degree)	116.5	8.12	108.38	124.62
Nasofrontal angle(degree)	134.7	6.94	127.76	141.64

## 2. Nasal Height-

a) Among males, the mean nasal height was 5cm and it varied from 4.67 cm to 5.33 cm. Out of 27, 21 (77.77%) lied in the range, 3 (11.11%) more than the range and 3 (11.11%) less than the range.

b) The mean nasal height among females was 4.9 cm and it varied from 4.57 cm to 5.23cm. Out of 34, 22 (64.7%) lied within the range, 6 (17.65%) more than the range and 6 (17.65%) less than the range.

## 3. Nasofacial angle-

a) Among males, the mean nasofacial angle was 37.9 degree and it varied from 33.27 to 42.53 degree. Out of 27, 17 (62.96%) lied in the range, 5 (18.52%) more than the range and 5 (18.52%) less than the range.

b) The mean nasofacial angle among females was 36.7 degree and it varied from 33.09 to 40.31degree. Out of 34, 25 (73.53%) lied within the range, 5 (14.70%) more than the range and 4 (11.76%) less than the range.

## 4. Nasolabial angle-

a) Among males, the mean nasolabial angle was 115.2 degree and it varied from 107.95 to 122.45 degree. Out of 27, 18 (66.66%) lied in the range, 4 (14.81%) more than the range and 5 (18.52%) less than the range.

b) The mean nasolabial angle among females was 116.5

degree and it varied from 108.38 to 124.62 degree. Out of 34 , 25 (73.53%) lied within the range, 3 (8.82%) more than the range and 6 (17.65%) less than the range.

## 5. Nasofrontal angle-

a) Among males, the mean nasofrontal angle was 127.1degree and it varied from 116.54 to 137.66 degree. Out of 27, 17 (62.96%) lied in the range, 5 (18.52%) more than the range and 5 (18.52%) less than the range.

b) The mean nasofrontal angle among females was 134.7 degree and it varied from 127.76 to 141.64 degree. Out of 34, 22 (64.7%) lied within the range, 6 (17.65%) more than the range and 6 (17.65%) less than the range.

## 6. Type of nose-

The most common type of nose was found to be leptorrhine followed by mesorrhine and platyrrhine in both males and females (Table III). In males, out of 27, 18(66.66%) had leptorrhine type, 8 (29.63%) had mesorrhine type and 1 (3.70%) platyrrhine type. In females, out of 34, 32 (94.12%) had leptorrhine type, 2 (5.88%) had mesorrhine type and none had platyrrhine type. Nasal Index of different populations is given in Table IV.

This data contains the information about a “normal” nose in the South Indian population. Based on these

Table III: Types of nose in our study

GENDER	LEPTORRHINE	MESORRHINE	PLATYRRHINE
Males	18 (66.66%)	8 (29.63%)	1 (3.70%)
Females	32 (94.12%)	2 (5.88%)	0

Table IV: Nasal Indices of different populations

ETHNICITY	NASAL INDEX	PREDOMINANT TYPE OF NOSE	STUDIED BY	YEAR
Chinese			Aung et al <sup>3</sup>	2000
Male	81	Mesorrhine		
Female	79	Mesorrhine		
Greeks	68.49	Leptorrhine	Daniel <sup>4</sup>	2002
Arabic	74.48	Mesorrhine	Daniel <sup>4</sup>	2002
African American females	79.7	Mesorrhine	Porter <sup>5</sup>	2003
Caucasian			Farkas et al <sup>6</sup>	2005
Male	65.5	Leptorrhine		
Female	64.2	Leptorrhine		
Turkish males	59.4	Leptorrhine	Uzun et al <sup>7</sup>	2006
Nigerian Ogonis	98.5	Platyrrhine	Oladipo et al <sup>8</sup>	2007
Ukwuani			Eboh and John <sup>9</sup>	2011
Male	97.47	Platyrrhine		
Female	98.08	Platyrrhine		
Gujrati Population in India			Kannan et al <sup>10</sup>	2012
Male	80	Mesorrhine		
Female	76	Mesorrhine		
South Indian Population			Patil et al <sup>11</sup>	2014
Male	84.99	Mesorrhine		
Female	67.75	Leptorrhine		

values we can evaluate the deviation from normal for a given subject. This will give us an idea about the amount of correction needed for return to “normalcy” or beautification. A fair idea about the extent of manipulation possible can be begot in cases of corrective rhinoplasty. Thus these data may help us prognosticate the results in rhinoplasty in south Indian population.

## Discussion

The nasal pyramid plays a notable role in the cosmetic appearance of the face. The shape of the nose is a feature indicative of ethnicity, age and sex. Anthropometric

parameters vary with age, sex, and ethnic background, and several authors have attempted to document normative values which may serve as references.<sup>12</sup> This study is aimed to establish such values of nasal anthropometric measurements among south Indian population.

The mean nasal breadth for males was  $2.9 \pm 0.41$  cm which is more than that of females ( $2.5 \pm 0.2$  cm). The mean nasal height for males was  $5 \pm 0.33$  cm which is again higher than that of females ( $4.9 \pm 0.33$  cm). The mean nasal breadth and nasal height were lower than that found by Patil et al,<sup>11</sup> Jagadish Chandra et al<sup>13</sup> and Khanderkar et al.<sup>14</sup> but higher than that reported by

Ray et al.<sup>15</sup> This is due to geographical and regional variations and difference in techniques of study.

The mean Nasofacial angle in males was  $37.9 \pm 4.63$  degrees that was greater than females ( $36.7 \pm 3.61$  degrees). According to Farhad et al,<sup>16</sup> the ideal nasofacial angle was 30 degrees with range from 27 to 36 degrees; above which it was considered unattractive.

The mean Nasolabial angle in males was  $115.2 \pm 7.25$  degrees that was lesser than females ( $116.5 \pm 8.12$  degrees). The nasolabial angle was greater in different studies, viz., Dua et al<sup>17</sup> in Indian population, Ahmet Uzgun et al<sup>18</sup> in Turkish population and by Jay Fitzgerald et al<sup>19</sup> in white population in US.

The mean Nasofrontal angle in males was  $127.1 \pm 10.56$  degrees that was lesser than females ( $134.7 \pm 6.94$  degrees). This result is lesser than that found by Reddy et al<sup>20</sup> but greater than what Ahmet Uzun et al<sup>18</sup> found in the Turkish population.

Both males and females most commonly had leptorrhine followed by mesorrhine type of nose. Males were mostly leptorrhine followed by mesorrhine and platyrrhine. This was similar to the study by Radha et al<sup>2</sup> and opposite to the findings of Patil et al<sup>11</sup> who stated that the common type of nose in South Indian population was Mesorrhine in males and leptorrhine in females. Kannan et al<sup>10</sup> and Gangrade et al<sup>21</sup> found the predominant type was mesorrhine in North Indian population.

There are few limitations of this study-

1. Small study sample.
2. Medical students do not always represent the entire population.

## Conclusion

There are variations between males and females from same geographical locations and similar ethnic backgrounds. But to give a cosmetic facelift by surgeries like Rhinoplasty we need an established landmark of nasal measurements inherent to a certain population so that they can be used as a ready reference.

This study envisages to put forward such a reference for evaluation of nasal deformity, treatment planning

and post-surgical evaluation of the correction achieved during rhinoplasty.

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