

Nasal Parameters, Nostrils Shapes and Philtral Column Shape: A Morphometric Analysis in Nepalese Medical Undergraduate Students

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ABSTRACT

Background: The nose is a pyramidal shaped structure situated in the midline of midface being attached to the facial skeleton. The shape, size and spatial location of the nose-philtrum-upper lip complex are important from aesthetic point of view. Hence, to study the nasal parameters, shape of nostril and philtrum among the undergraduate students remained as the main aim of this study.

Methods: This was a cross-sectional study enrolling 250 students of age 18-25 years. Nasal height, nasal width was measured and the shape of the nostrils and philtrum was recorded separately for each participant.

Results: Out of 250 participants 113 were males and 137 were females. The mean nasal index of male was 75.36 while that of female was 71.72 suggesting that both genders had mesorrhine nasal type. The rectangular shaped nostrils and triangular type of philtrum was the most common types found in the study

Conclusions: The study concluded that, the nasal index was mesorrhine type, the nostril was rectangular and the philtrum column was triangular in this study population.

Keywords: Anthropometric; nasal index; nostrils; philtrum column shape.

INTRODUCTION

The fronto-nasal prominences, nasal prominences and maxillary and mandibular prominences play vital role in development of face and nose.¹

Studies on morphometry of external nose have shown high variability in measurements depending on the age, sex, ethnic group²⁻⁵ and even in the different environmental conditions.^{6,7} Any congenital and acquired abnormalities affecting philtrum column and nostrils lead to emotional distress.⁸

A thorough understanding of the nasal types, nostril shape and philtrum column shape is essential for plastic surgeons performing rhinoplasty, cleft lip and palate surgery, prosthodontist, forensic experts and anthropologists.^{9,10}

In Nepal only one study has been performed on nasal index of Tharu and Mongol communities.¹¹ In addition, analysis of nostrils and philtral column has not been performed in Nepal.

The purpose of the study was to classify nasal types, identify the nostril shapes and philtral column shape among the medical undergraduate students of Nepal

Medical College, Kathmandu.

METHODS

A cross-sectional study was conducted among the undergraduate students of Nepal Medical College. Prior to starting the study, an ethical approval was obtained from Institutional review committee of Nepal Medical College and Teaching Hospital (IRC Ref. No.: 51-074/075). All the participants were informed regarding the aims and objectives of the study and at the meantime interested participants signed formal informed consent. The list of students was obtained from the academic section of the college and the samples were chosen using a lottery method. Based on the study of Mehta N. et al,¹² sample size was calculated using formula $n = Z^2 \sigma^2 / d^2$ (n = sample size, $Z = 1.96$ at 95% confidence limit, standard deviation of 7.29 and margin of error of 1 mm). The sample size was calculated as 204 and a total of 250 students were included.

Exclusion criteria for participants included individual with mixed racial parents, individual that have any facial trauma and operation performed on them such as septoplasty or septorhinoplasty, craniofacial abnormalities and other minor anomalies. In addition to

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these participants with genetic disorders were also not included in the study.

Nasal height (NH) measured the distance between Nasion and Subnasale whereas the Nasal width (NW) measured the distance between right and left alae. All the measurements were recorded in mm by using electronic sliding vernier caliper. All the measurements were taken with the participants in sitting position and head kept in anatomical position. Measurement was carried out by one investigator to prevent interobserver error and each measurement was taken thrice and their average was calculated.

On the basis of NH and NW the Nasal Index (NI) was calculated using following formula: Nasal Index = Nasal width/ Nasal height × 100

Based on the study performed by Abdurashed and Eneye⁸ and Mori et al,¹³ the Philtral column shape was observed as flat, parallel, triangular and concave while the Nostril shape as triangular, rectangular, tear drop and round respectively.

All collected data were entered in Microsoft Excel and then transferred into SPSS version 16. Then the datas were analyzed using descriptive statistics and Chi-square test was also interpreted.

RESULTS

The results for the nasal index, nostril shapes and philtrum column shape for both males and females are shown in Tables 1-5. Out of 250 students, the study population comprised of 113 (45.2%) males and 137 (54.8%) females with the mean age of 19.96±1.38. The mean nasal width was 35.14 mm while the mean nasal height was 48.10 mm (Table 1 and 2). The mean nasal index of male was 75.36 while that of female was 71.72 (Table 3).

Table 3 shows the nasal types between male and female students. A significant difference in regards to the nasal types was observed between male and female students (<0.001). A total of 56.4% students had mesorrhine nasal type followed by 37.2% leptorrhine and 6.4% platyrrhine nasal type.

Table 1. Descriptive statistics in relation to age, nasal width, nasal height and nasal index.

	Mean	Std. Deviation
Age	19.964	1.3865
Nasal width	35.1432	3.09205
Nasal height	48.1086	3.41747
Nasal index	73.3664	7.97058

Table 2. Descriptive analysis of nasal index between male and female.

Sex	Total (250)	Mean	Std. Deviation	t-value	p-value
Male	113 (45.2%)	75.3608	8.94341	3.582	<0.001
Female	137 (54.8%)	71.7215	6.66452		

Table 3. Frequency of nose types.

Nasal types	Sex		Total (250)	Chi-Square test	p-value
	Male (113)	Female (137)			
Leptorrhine	34 (30.1%)	59 (43.1%)	93 (37.2%)	8.845	0.012
Mesorrhine	67 (59.3%)	74 (54%)	141 (56.4%)		
Platyrrhine	12 (10.6%)	4 (2.9%)	16 (6.4%)		

Table 4. The distribution of participants related to their sex and shape of the nostrils.

Nostril shape	Sex		Total (250)	Chi-Square test	p-value*
	Male (113)	Female (137)			
Triangular	5 (4.40%)	4 (2.90%)	9 (3.60%)	1.477	0.724
Rectangular	94 (83.2%)	111 (81%)	205 (82%)		
Tear drop	11 (9.70%)	19 (13.9%)	30 (12%)		
Round	3 (2.70%)	3 (2.20%)	6 (2.40%)		

*calculated using Fisher's Exact Test

Table 5. The distribution of participants related to their sex and shape of the nostrils.

Philtrum Column Shape	Sex		Total (250)	Chi-Square test	p-value*
	Male (113)	Female (137)			
Flat	1 (0.9%)	0	1 (0.40%)	1.656	0.81
Parallel	9 (8%)	9 (6.6%)	18 (7.2%)		
Triangular	102 (90.3%)	127 (92.7%)	229 (91.6%)		
Concave	1 (0.9%)	1 (0.7%)	2 (0.8%)		

*calculated using Fisher's Exact Test

There was no significant difference between the nostril shapes between both sexes. The rectangular shaped nostrils were recorded as the most common type (82%)

followed by tear drop shaped nostril (12%). The round and triangular type of nostril shapes were observed as the least common types (Table 4). The triangular type of philtrum was the most common type (91.6%) in both males and females while the parallel type was the second common type (7.2%). However, there was no statistically significant difference between the philtrum column shape between males and females (Table 5).

DISCUSSION

The human nose is an important component of the facial complex. It plays a vital role on facial aesthetics by enhancing the personality of the individual.^{14,15} The nasal cavities filters and conditions the inspired air, it is also an organ for smell perception.¹⁶ Various methods have been reported to study the nose such as by morphometric analysis, cephalometry, and photography. In addition to these, 3D scans and digitizers have also been used to study the nose.¹⁷ Among these methods anthropometric measurements provide an important source of information for anthropologist. Anthropometry is an inexpensive and non-invasive technique to assess body size, shape and proportions.¹⁸ Anthropometric measurement of Nasal index is useful parameter in anthropology, forensic science, prosthodontists and reconstructive surgery.¹⁰ In addition to nasal parameters morphology of nostrils and philtrum has also been focus of many investigators.^{8,15,16,19} In the present study, analysis of nasal parameters, nostril shapes and philtrum column shapes among the undergraduate students of Nepal Medical College, Kathmandu were performed.

There are many studies related to the nasal morphometry in the literature. These studies show variations in nasal parameters between men and women.^{9,10,12,14,15,17,19-21} Nose shape can give information about race ethnicity, age and sex.^{22,23}

On analyzing the nose in our study, it was observed that the mean nasal index was greater in males than in females. Similar to our study, Ozdemir et al. has shown the nasal parameters of male to be greater than female suggesting that the sex of an individual could be estimated from morphometric measurements of the nose.¹⁵ In similar type of study utilizing 3D stereo photogrammetry system, Dong et al. concluded that male nose was larger than female nose.¹⁷ In a systematic review carried out by Leong et al had shown varying nasal parameters between ethnic groups.⁹

Nose has been classified into Hyperleptorrhine (≤ 54.9), Leptorrhine (55.0-69.9), Mesorrhine (70.0-84.9), Platyrrhine (85.0-99.9) and Hyperplatyrrhine (≥ 100.0) by Martin and Saller.^{1,12} The mean nasal index of present study was 73.37 ± 7.97 suggesting the nasal type to be

mesorrhine. Present study results are in consistent with the study carried out by Mehta et al on Indian Population.¹² Nasofacial anthropometric study among the university students in Malaysia by Wai et al also showed that Chinese participants also had mesorrhine nose type similar to the findings of the present study.¹ A study conducted on Tharu and Mongoloid population of Nepal, concluded that the nasal index among the Mongoloid male and female were 74.6 and 75.9 respectively whereas the nasal index of Tharu male and female were 83.8 and 82.4 respectively indicating that the nose type in these ethnic group falls under mesorrhine.¹¹ In contrast to present findings, a study conducted on Turkish males demonstrated leptorrhine nose.²²

In present study, the rectangular type of nostril was the most common followed by tear drop, triangular and round types respectively. However, round type of nostril was the most common in Japanese children.¹³ In another study carried out by Cam et al showed tear drop type of nostril was the commonest followed by round type in Turkey.¹⁹ In a study conducted in Nigeria, tear drop shaped nostril was found to be the most common type.⁸

In a study conducted in Nigeria, it was demonstrated that in both genders triangular type of philtrum was the most common and the parallel type was the second most common type,⁸ which was in consistent to our findings. In sharp contrast to present findings, parallel type was the most common followed by the triangular type the second most common in another study performed in Japan,¹³ suggesting that there are distinct differences in facial morphology in different race.

A study on the Age and Sex related changes in the normal human external nose studied by Sforza et al. documented that the nasal parameter show changes according to the age and sex.¹⁰ It is now known that each racial group and ethnic population has their own nasal character and anatomic structure. Therefore it explains that the nasal anthropometry for each group is different.^{10,24} Cosmetic procedures such as rhinoplasties have increased in the last decades in both men and women. Hence, any cosmetic surgeon who attempts to perform the nasal surgeries must be aware of the morphological differences between men and women of different ethnic groups.^{5,10}

The analysis obtained in this study was based on measurement taken by digital vernier caliper for the nasal parameters and basal views and photographs for the nostril and philtral column shape. The later methods were so chosen as they were economical and convenient. To avoid interobserver error, the measurements were taken by principal investigator. The basal view method

was used most often for the nostril shape and philtral column shape. However the investigator had difficulty in taking the data of nostril and philtral column shape as the participants smiled most often which led to decreased accuracy in assessment. To avoid such limitations the participants were asked not to smile and observation was made with both basal views and photographs in such cases. Later on the first observation was verified by another investigator. Other limitation of the study was that the study was conducted only among the students of Nepal Medical College, Kathmandu, therefore, the results thus obtained cannot be generalized. Hence the authors suggest that a further elaborated study is desirable.

CONCLUSIONS

Anthropometry is an inexpensive and non-invasive technique to assess body size, shape and proportions. Anthropometric measurement of nasal index is useful parameter in anthropology, forensic science, prosthodontists and reconstructive surgery. The nasal index is very useful in anthropology in distinguishing racial and ethnic differences. From this study, it becomes clear that the both male and female had mesorrhine nasal type. Apart from this, present study concludes rectangular shaped nostrils and triangular type of philtrum in study sample.

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