Original Article

Nasal Index among Students of People's Dental College and Hospital

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ABSTRACT:

Introduction: Nasal anthropometry is a study that deals with the measurements of the proportion, size and shape of nose. Nasal index is considered as one of the major landmarks for craniofacial surgery, gender differentiation and ethnic identity. This study is aimed to provide baseline data of nasal index of Nepalese people and to assess the gender variation which will be of clinical, surgical interest in rhinology and craniofacial prosthetic purpose.

Methods: BDS students from 17 to 25 years with various ethnicity were included in the study. Total 160 students with equal number of male and female student were included. Nasal parameters were measured and nasal index was calculated for each student.

Results: The mean nasal index was 78.03 ± 7.07 suggesting Mesorrhine type of nose. The nasal width and height show statistically significant difference whereas there was no significant difference found between the nasal indices of male and female students. Hill Janajati showed highest nasal index followed by Newar, Brahmin and Chettri; and Others.

Conclusion: The study concludes the type of nose has effect on gender when compared between the sex but the nasal index calculated have little contribution in sexual dimorphism. Mesorrhine nose were found to be most frequent. Among the population, Hill Janajati showed highest nasal index. We recommend a further study to compare the nasal index of various ethnical group of Nepalese population.

Keywords: Anthropometry, Mesorrhine, Nasal Index

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INTRODUCTION

Nose is one of the most important structure in the face that has both bones and cartilages and performs major functions which has profound aesthetic value.[1] Various methods are used to study the nose such as morphometric analysis, cephalometry and photography. In addition to these, 3D scans and digitizers have also been used to study the nose.[2] Among these methods anthropometric measurements provide an important source of information for anthropologist which is an inexpensive and non-invasive technique to assess body size, shape and proportions.[3]

Anthropometric study is scientific method and technique for displaying different measurement and observation on the human being as well as skeleton which are very important area for craniofacial surgery and syndromology.[4] Nasal anthropometry is a study that deals with the measurements of the proportion, size as well as shape of nose of human being[5]. M. Broca in 1878 discovered that the nasal index is one of the best for the purpose of distinguishing the various races of mankind and Topinard described "anthropological nasal index" as the ratio of maximum breadth of the anterior orifice of the nose to its maximum length. Thus, anthropological nasal index is calculated as:

$$\text{Nasal index} = \left| \frac{\text{Width of nose (cm)}}{\text{length of nose (cm)}} \right| \times 100$$

Length of nose, i.e., distance between nasion (n) and subnasale (SN). The width/breadth of nose, i.e., the distance between right and left alae.

The nasal index is one of the clinical anthropometric parameter recognized in rhinoplasty and medical management[6]. The study of nasal anthropology is essentially important in forensics as well as physical anthropology as one of the technique used in the determination of different races, ethnicity as well as gender of an individual which has bioenvironmental, geographical as well as biological factors, ethnicity, sex and age influence.[7] Difference in facial morphometric characters especially in nose types is significant in categorization between races in population living in different geographic location.[8] Nasal index is the most common nasal parameter which may relate to regional and climatic differences, such as longer narrower noses are common in cold and dry climates while broader noses seen in warmer and moisten climate may consequence of natural selection in human evolution.[9]

A detail concept of the nasal types, size and shape is essential for plastic surgeons performing rhinoplasty, cleft lip and palate surgery, prosthodontist, forensic experts and anthropologist.[10] As nasal index is considered one of the major landmarks for craniofacial surgery, gender differentiation and ethnic identity, research in this filed is inevitable which should be conducted in Nepal as well, so required data could be easily accessible.

This study is initial step which aims to provide baseline data of nasal index of Nepalese people and to assess the gender variation which will be of clinical, surgical interest in rhinology and craniofacial prosthetic and aesthetic purpose.

MATERIALS AND METHODS

This was an observational cross-sectional study conducted at People's Dental College and Hospital (PDCH), Nayabazar, Kathmandu.

Study Population: BDS Students of age group ranging from 17 to 25 years with various ethnicity were included.

Sample size and sampling technique: The sample size was calculated by using formula: $Z2\ \sigma2\backslash d2$, where "Z" value is 1.96 at 95% confidence interval and "σ" value was 5.1 and margin of error of 1.25 mm11 which was calculated as 157 and total 160 students were enrolled in the study. The participants were selected by stratified random sampling. Equal number of male and female student was included. The participants were stratified by sex and then chosen randomly by drawing numbers 1 to 80 using lottery method.

Data Collection: The data for this study was collected for the duration of one month (from 30th April to 29th May 2019). Students with no prior rhinoplasty or craniofacial anomalies were selected for this study. Also, the students with mixed ethnicity were excluded. Written consent was taken from the participants and measurement were taken. Measurements were taken in Frankfort's plane with subjects in comfortably sitting position.12The measurements were recorded with the help of Vernier caliper, considering permissible error 0.02mm (Fig 1and 2). All the measurements were taken by single observer, for each individual three consecutive measurements were taken and the highest were recorded.

Data Analysis: The obtained data was analyzed using standard data analyzing software SPSS version 16. The statistical analysis was done by using independent

Student's t-test. P value <0.05 was considered to be statistically significant. Nasal parameters and indices were compared between various ethnical groups using ANOVA test.

Fig 1.Depicting method of measurement of nasal height.

Fig 2.Depicting method of measurement of nasal width

RESULTS

Participant Characteristics: In total, 160 students with equal number of male and female were selected from age group of 17 to 25 years with a mean age of 21.40 ± 2.16. In the present study, the total number of participants were found to be distributed in four ethnical groups[13], their numbers and frequencies are being depicted in Table 1.

The mean nasal width was calculated as 3.59 ± 0.36 cm, mean nasal height as 4.61 ± 0.39 cm. The mean nasal index is calculated as 78.03 ± 7.07 (Table 2). According to the nasal index, the nose types were classified into 5 types[14] (Table 1). The Mesorrhine type of nose was found be most frequent in present study with 70.6% followed by Platyrrhine and Leptorrhine (Table 1)

Table 1: Study participant characteristics (n=160)

Characteristic	Frequency (%)
Sex	
Male	80 (50)
Female	80 (50)
Ethnicity[13]	
Brahmin/Chettri	104 (65)
Mongoloid/Janajati	13 (8.1)
Newar	39 (24.4)
Others	4 (2.5)
Nose categories based on Martin & Sallar[14]	
Hyperleptorrhine	1 (0.6)
Leptorrhine	22 (13.8)
Mesorrhine	113 (70.6)
Platyrrhine	24 (15)
Hyperplatyrrhine	0 (0)

Table 2. Nasal measurements of the study participants (n=160)

Characteristic	Mean	SD
Nasal width	3.59	0.36
Nasal height	4.61	0.39
Nasal index	78.03	7.07

Sex variations in Nasal measurements: In male students, the mean nasal width and height were measured as 3.77 ± 0.32 cm and 4.39 ± 0.33 respectively. The mean Nasal index for male is calculated as 78.12 ± 6.91. In female students, the mean nasal width and height were measured as 3.41 ± 0.29 cm and 4.83 ± 0.33 respectively. The mean Nasal index for female is calculated as 77.92 ± 7.28. The nasal width and height show statistically significant difference with $p<0.001$ whereas there was no significant difference found between the nasal indices of male and female (Table 2). When compared with nose type, the Mesorrhine type of nose found be more prevalent in both sexes (Table 4).

Table 4: Showing the frequency of type of nose in male and female

Gender	Hyperleptorrhine	Leptorrhine	Mesorrhine	Platyrrhine
Male	-	12	54	14
	-	15.0%	67.5%	17.5%
Female	1	10	59	10
	1.2%	12.5%	73.8%	12.5%

Ethnic variations in nasal measurement: The mean nasal parameters and nasal index were compared between four ethnical groups those were participated in this study, statistical analysis showed variation in nasal height and width between various ethnical groups, but there was no statistical difference in nasal index between the groups (Table 5). Mesorrhine type of nose is found to be most prevalent in all the ethnical groups (Table 6). The mean values for male and female from ethnical groups are depicted in Table 7.

Table 3. Comparison of sex variations in nasal measurements among study participants

Parameters	Mean (standard deviation) n = 160	Calculated	t-value	p-value
	Male (n=80)	Female (n=80)		
Nasal width	3.77 (±.32)	3.41(±.29)	7.22	<0.001
Nasal height	4.83(±.33)	4.39(±.30)	8.66	<0.001
Nasal Index	78.12(±6.91)	77.94(±7.28)	0.16	0.869

Table 5. Ethnic variations in nasal measurement (ANOVA-test)

Ethnicity	Nasal width			Nasal height			Nasal index		
	Mean ± SD	F-value	p-value	Mean±SD	F-value	p-value	Mean±SD	F	p
Brahmin/Chettri	3.55 ± 0.34	7.045	<0.001	4.61 ±0.37	4.270	0.006	77.33 ± 7.35	2.591	0.055
Hill Janajati	3.79 ± 0.22			4.61 ± 0.4			82.63 ± 6.63		
Newar	3.68 ± 0.35			4.69 ± 0.4			78.67 ±5.73		
Others	2.99 ± 0.43			3.98 ± 0.2			75.01 ± 8.97		

Table 6. Ethnical variation in type of nose.

Ethnicity	Hyperleptorrhine n (%)	Leptorrhine n (%)	Mesorrhine n (%)	Platyrrhine n (%)	Total n (%)
Brahmin/Chettri	1(1.0)	18(17.3)	70(67.3)	15(14.4)	104(100)
Hill Janajati	0(0.0)	1(7.7)	9(69.2)	3(23.1)	13(100)
Newar	0 (0.0)	2 (5.1)	31 (79.5)	6 (15.4)	39 (100)
Others	0 (0.0)	1 (25.0)	3 (75.0)	0 (0.0)	4 (100)

Table 7. Descriptive analysis of nasal parameters in male and female among the ethnicity

Ethnicity	Parameters	Male		Female		t-value	p-value
		Number	Mean ± SD	Number	Mean ± SD		
Brahmin/Chettri n=104	Nasal width		3.77±0.25		3.37±0.30	7.187	<0.001
	Nasal height	47	4.87±0.27	57	4.39±0.29	8.605	<0.001
	Nasal index		77.67±6.91		77.06±7.74	.419	.676
Hill Janajati n=13	Nasal width		3.90±0.18		3.65±0.19	2.411	.035
	Nasal height	7	4.84±0.34	6	4.33±0.27	2.935	.014
	Nasal index		80.99±6.92		84.55±6.31	-.963	.356
Newar n=39	Nasal width		3.78±0.37		3.52±0.24	2.348	.024
	Nasal height	25	4.80±0.39	14	4.49±0.34	2.386	.022
	Nasal index		78.80±6.36		78.44±4.61	.191	.850
Others n=4	Nasal width		2.40±0.00		3.18±0.22	-	-
	Nasal height	1	3.83±0.00	3	4.03±0.25	-	-
	Nasal index		62.61±0.0		79.15±4.26	-	-

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DISCUSSION

Human nose, an important component of the facial complex playing a vital role on facial aesthetics.[15,16] Various methods have been reported such as by morphometric analysis, cephalometry, and photography along with 3D scans and digitizers to study the nose.[17] Among these methods anthropometric measurements plays a vital role being reasonable and non-invasive.[18]

Anthropometric study of Nasal index is considered to be valuable assets in the field of anthropology, forensic science, prosthodontists and reconstructive surgery.[19]

In Nepal, only scanty studies had been conducted regarding nasal parameters and index. Nepal, a country with various ethnicity with their own cultural value. This might be the first study where four different ethnical groups are included although the sample size was small, it tried to cover the diversity of Nepalese population. A study conducted on Tharu and Mongoloid population aged between 25-45 years Eastern Nepal, supposed to be the only study that included two different ethnical groups; concluded that the nasal index among the Mongoloid male and female were 74.6 and 75.9 respectively with Mesorrhine (medium nose) type whereas the nasal index of Tharu male and female were 83.8 and 82.4 respectively also fall under the mesorrhine type but have the broader nose.[11] In the present study, the mean nasal index for Hill Janajati male and female were found to be 80.99 and 84.55 respectively, showing higher value than the previous study but having nose type to be Mesorrhine.

Similarly, the study conducted in Nepalese medical students, calculated the mean nasal index to be 73.37±7.97 suggesting the nasal type to be mesorrhine with total of 56.4% students had mesorrhine nasal type followed by 37.2% leptorrhine and 6.4% platyrrhine nasal type[20] supporting the present study in which the mean nasal index is calcuted as 78.03±7.07 with 70.6% students having mesorrhine followed by 15% platyrrhine; 13.8% Leptorrhine and 0.6% Hyperleptorrhine type of nose. The present study also shows the mean nasal indices for others group of population of Nepal (Table 5) suggesting Hill Janajati have higher nasal index of 82.63±6.63, followed by Newar with 78.67±5.73; Brahmin and Chettri with 77.33±7.35 and others with 75.01±8.97.

The study of Franciscus and Long found the nasal height and width are higher in South Nigerian males than females[21], in the present study, these parameters were found to be statistically significant difference between males and females (Table 3) of total sample also found significantly different in different ethnical groups (Table 7).

Nasal index is related to regional and climatic differences22. Various studies have indicated racial and ethnic differences in nasal index amongst different populations.[23] In the present study, the nasal index for various ethnical group were calculated (Table 5), nasal parameters showed racial difference but there was no statistical difference in nasal index.

Abroad studies also showed the type of nose, as mentioned in their studies, most Caucasians are leptorrhine having long and narrow nose with nasal index of 69.9 or less. The Indo-Aryan is also similar to the Europian, possessing a fine nose.[24] In a study conducted in Itsekiri and Urhobo people, the results showed the Urhobos had a mean nasal index of 89.63 and the Itsekiri's had a mean nasal index of 90.74 (p<0.05), and the two ethnic groups fall within the platyrrhine (short, broad nosed).[25] In the present study, the population sample representing Nepalese population with the mean nasal index of 78.03 fall within Mesorrhine type with moderate or medium size nose, even in four different ethnical groups that were included in this study showed to have Mesorrhine type of nose.

Various studies by authors[5,23,26] have proved the racial as well as gender differences in nasal index among different populations, but the present study showed no statistical significant difference in the nasal indices between male and female while there was sexual dimorphism found with nasal index in different population groups.

The study conducted by Hegazy[27] found to have no statistically significant difference in nasal index between male and female Egyptian population except after 20 years of age. In the present study, subjects of the age group of 17 to 25 years with a mean age of 21.40±2.16 were included where no significant difference found between nasal indices of male and female.

The present study is conducted in a small population, bigger sample size with adequate number of sample size representing ethnical population is recommended for better result.

CONCLUSION

The nasal width and height were found larger in males compare to females. The study concludes the type of nose has effect on gender but the index calculated have little contribution in sexual dimorphism. Mesorrhine representing moderate or medium size nose were found to be most frequent in the total sample also its was found to be most prevalent in various ethnical groups. Among the population, Hill Janajati showed highest nasal index followed by Newar, Brahmin and Chhetri and Others subsequently. The nasal parameters calculated for various race may play a vital role in providing a baseline information for reconstructive nasal surgery, rhinoplasty and for nose prosthesis while treating various population group of Nepal.

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