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NASAL INDEX IN NORTH INDIAN LATE ADOLESCENTS - A DIMORPHIC STUDY

Anatomy

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ABSTRACT

The shape of the nose is a signature indicating the ethnicity, race, religion and sex. The nasal index proportion (length/width) is important in aesthetic and reconstructive surgery. The nasal index values are known to vary with age. Adolescence is divided into three phases out of which the late phase (17-19) is the most crucial phase of development. The present study carried out in 400 healthy (200 males; 200 females) medical students (age group 17-19) provides the morphometric criterion and investigates the dimorphic potential for the nasal index. The results indicate that the nasal dimensions have a dimorphic predisposition('p'<0.001) which should be considered to achieve better surgical outcomes. The mean value of nasal index for males and females came out to be 71.15+6.51. This value is very near to the leptorrhine range.Indians are generally considered Caucasians and hence the proximity to the leptorrhine range. While it is an established fact that Indians are closer to Caucasians compared to other groups there is no doubt that Indians are one of the most divergent Caucasoid groups in circulation.

KEYWORDS

Nasal index, Dimorphic, Leptorrhine, Caucasians.

INTRODUCTION

The external nose is the defining characteristic of the face and serves the cosmetic function by enhancing the personality and beauty of an individual[1]The shape of the nose is a signature indicating the ethnicity, race, religion and sex[2]. The white race has a narrow, long and high nose (Leptorrhine) blacks have wide flat nose with intermediate measurements (Platyrrhine) and the orientals have nose with intermediate measurements (Mesorrhine)[3].

Adolescence is divided into three phases out of which the late phase (17-19) is the most crucial phase of development. The present study provides the morphometric criterion and ascertains the dimorphic potential of the external form of nose in North Indians late adolescent males and females. The age range was selected to reduce the effect of aging on nasal morphology. Children generally have noses that are still growing while elderly have noses that have atrophied[4].

Anthropometric parameters of nose vary with age, sex race and ethnic background[5]. Nasal proportions, together with other physical characteristics, such as skin colour and hair texture are used to identify different "races". Not only race. but also the sex of an individual or group whose identity is unknown, might be determined using the nasal index[6]. Moreover, the nasal proportions are important in aesthetic and reconstructive surgery[7].

Knowledge of the unique shape , anatomy and dimensions of nose is very useful for surgeons undertaking its repair and reconstruction[8]. The rhinoplasty surgeon should be able to define the ethnic background and should have the knowledge of the specific anatomy and the appropriate techniques to obtain a satisfying result. A good surgical result also means that the "new" nose blends in harmoniously with the ethnic facial features[9]. Normative data are indispensable for precise determination of the degree of congenital or post traumatic facial deviations from the normal. The establishment of morphometric norms is expected to aid syndrome and abnormality identification and subsequent treatment. The importance of nasal index in anthropological studies has been recognized for a long time. Being based on both bony and cartilaginous landmarks, this index differs from most other anthropological indices[10].

The present study also takes into account the impact of sexual dimorphism on nasal morphometry. The male and female growth patterns are different and so it is but natural that the metric criterion should be different in sexes. The current study in North Indian late adolescent males and females is envisaged to provide vital data which will define the anthropometric profile and influence clinical outcomes in the nasal region for the subgroup.

MATERIALS AND METHODS

The present study was carried out in 200 healthy male and 200 healthy female medical students (age group 17-19) of Government Medical College, Amritsar,Punjab,India. The measurements were taken on the subjects in upright and relaxed mood with head in the anatomical position. It was also ensured that the subject did not change the facial expressions while taking measurements. The nose length, nose width and nasal index was determined for each subject. The measured parametres have been depicted in Figure 1 and Figure 2. The measurement techniques are as previously described in literature.[11,12,13]

Length of the nose – it was measured as the distance between the nasion (the point in the midline of both the nasal root and the nasofrontal suture) and the subnasale (the midpoint of the columella base). It is shown in Figure 1by points "a" and "b".

Width of the nose - it was measured between the two ala. Ala is the point where the nasal blade extends farthest. It is depicted in figure 1.2 by points "a and "b

Nasal index - this is defined as hundred times the width of the nose divided by the total

$$\text{nose length i.e. Nasal index} = \frac{\text{Width of the nose} \times 100}{\text{Total nose length}}$$

Figure 1. Measurement of length of nose . Distance ab is the measured length(Ln)

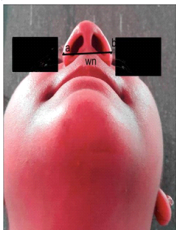

Figure 2.Width of the nose. Distance ab is the measured width(wn)

Results
The results are depicted in tables 1-4

Table 1 The Nasal length, Width and Index values for Late Adolescents of North India

Parameter	Group	Mean+ Std Deviation	95% Confidence Interval for Mean	
Length of the Nose	Males	4.74 + .34	4.68	4.81
	Females	4.55 + .28	4.49	4.60
	Total	4.65 + .32	4.60	4.69
Width of the Nose	Males	3.51 + .21	3.47	3.55
	Females	3.10 + .22	3.05	3.14
	Total	3.30 + .30	3.26	3.34
Nasal Index	Males	74.01 + 5.58	72.90	75.11
	Females	68.30 + 6.13	67.08	69.51
	Total	71.15 + 6.51	70.24	72.06

The study provides baseline data for above parameters in North Indian late adolescent males and females. The 95% confidence interval values indicate that if the same study is repeated under the same conditions then chances are that 95% of the values will fall within the upper and lower bound value range.

Table 2. Showing statistical significance of Nasal length, Width and Index values amongst sexes for Late Adholescents of North India

Parameter	t-test for Equality of Means					95% Confidence Interval of the difference	
	t	df	Significance(2 tailed)	Mean Difference	Std.Error Difference	Lower	Upper
Length of the Nose	4.50	198	.000	.20	.04	.11	.28
Width of the Nose	13.58	198	.000	.41	.03	.35	.47
Nasal Index	6.88	198	.000	5.71	.82	4.07	7.34

When the mean values as determined for each of the parameters were compared in males and females, they came out to be statistically highly significant. ('p'<0.001).This indicates that there exists a statistically highly significant sexual dimorphism for Length of nose, Width of nose and Nasal Index in North Indian late adolescent males and females.

DISCUSSION

The parameters evaluated in this study provide vital data for use in forensic medicine, physical anthropometry and to guide surgeons in rhinoplasty and nasal reconstruction procedures on North Indian late adolescent males and females. The factors responsible for the variations in the size, shape and length of the nose could include genetic factors, 1 race, tribe and environmental climatic conditions 14. Narrower noses are favored in cold and dry climates and broader noses in warm and moist environment as a consequence of natural selection in human evolution [15].

The length and breadth of the nose have been measured by many authors in different populations choosing a suitable age group. The present study defines the morphometric criterion for nasal length and breadth in late adolescent North Indians. The Nasal index is the ratio of nasal width to total nasal length multiplied by 100[16]. This index is important as it describes a ratio between two quantitative measures and hence the value is specific for the North Indian population. The importance of nasal index in anthropological studies has been recognized for a long time. Being based on both bony and cartilaginous landmarks, this index differs from most other anthropological indices[17].

A comparison of the nasal index values determined for North Indian late adolescent males and females with other populations is depicted in table 3.There are three main nasal types; leptorrhine(fine nose, nasal index of 69.9 or less) mesorrhine(medium nose, nasal index of 70.0–84.9) and platyrrhine(broad nose, nasal index 85.0 or more) are typically associated with Caucasian, Asian and African races respectively. This type of classification is still used in the demographics section of many clinical trials18. Table 3 presents the average nasal indices for sexes in different populationsThe mean value of Nasal Index in north Indian adolescent females in present study is

Table 3. A comparison of Average Nasal Indices according to Gender and Ethnicity

Author	Year	Ethnicity	Female Nasal Index	Male Nasal Index
Aung et al[8]	2000	Chinese	81	79
Farkas et al[19]	2005	Caucasian	64.2	65.5
Uzun et al[5]	2006	Turkish males	-	59.4
Oladipo et al[20]	2007	Nigeria – igbo	90.8	95.9
		Nigeria – Yoruba	88.1	90
		Nigeria - Ijaw	94.2	98.6
Oladipo et al[21]	2008	Nigeria- Yourbas	83.66	89.85
Oladipo et al[6]	2009	Nigeria - adonis	83.77	79.83
		Nigeria – okrikas	86.46	86.23
Heidari et al[4]	2009	Iran- Sistan	69.7	-
		Iran- Baluchestan	59.2	-
Staka et al[22]	2012	Kosovo- Albanian	63.87	67.07
Gangrade and Babel[23]	2012	India- Southern rajasthan	79.73	83
Esomonu et al[24]	2013	Nigeria- Cross river state	91.7	99.77
Jovanovic et al[25]	2014	Serbia	66.01	67.56
Koirala[26]	2014	Nepal Mongolid	75.9	74.6
		Nepal Tharu	82.4	83.8
Hegazy[27]	2014	Egypt- East delta	64.56	71.46
Present study	2018	North India	74.01	68.30

68.3 which is indicative of the leptorrhine nose pattern. The value for males and females is 71.15+6.51. This value is very near to the leptorrhine range (nasal index of 69.9 or less) .Indians are generally considered Caucasians and hence the proximity to the leptorrhine range. For males the mean value is 74+5.58. This value is in the early mesorrhine range and probably indicates that bigger studies with larger sample size are needed to ascertain the exact Index value categorization in adolescent North Indian sample. While it is an established fact that Indians are closer to Caucasians compared to other groups there is no doubt that Indians are one of the most divergent Caucasoid groups in circulation28. This explanation perhaps justifies the early mesorrhine categorization obtained for total sample in the present study. Further studies with larger sample size in due course of time in the North Indian late adolescent group will add to the categorization. The present study provides pioneer baseline database for nasal index in North Indian late adolescent males and females.

The Statistical significance of Nasal index values in different populations is depicted in table 4.

In the present study, nasal index in males was significantly higher than those of females .When the nasal index values as determined for late adolescent males and females were compared they were found to be statistically highly significant('p'<0.001).Similar statistically significant values have been observed in other populations. Sexual dimorphism was observed in the Itsekiri and Urhobo ethnic groups of

Nigeria with males having significantly higher nasal index values than the females[21]. Sexual dimorphism, with significantly higher values of all the nasal parameters in males compared to the females was also seen with the Omoku indigenes of Nigeria[29]. Other authors also reported sexual dimorphism in the nasal height, nasal width and nasal index including tribal populations like the Ijaws of Nigeria[20].

Table 4:, Statistical significance of Nasal Index values in different populations

Author(Population)	Year	Significance
Hegazy[27] (Egyptians)	2014	Significant
Oladipo et al [21] (Urhobo and Itsekiri)	2008	Significant
Oladipo et al [29] (Omoku indigenes)	2011	Significant
Oladipo et al [20] (Ijaws)	2007	Significant
Nigerians[13]	2008	Not Significant
Oladipo et al [20] (Igbo)	2007	Significant(p<0.005)
North Indians	2016	0.000

Hall[30] detected a strong correlation between nasal dimensions and oxygen consumption. She stated that natural selection has fine tuned the size of the fleshy nose to support the amount of air that needs to be processed. Going by this males, who consume relatively more oxygen during their hard activities, would be expected to have relatively broader noses than females of the same population[31]. So, this provides plausible explanation for higher nasal index values for males in most populations including the present study. However, among the Ukwuanis of Nigeria, only nasal height exhibited statistically significant higher values in males compared to females; no significant differences were observed in nasal width and nasal index between genders[32]. Also in a study by Garandawa et al[13] in Adult Nigerians it was observed that that most nasal parameters including nasal index were statistically insignificant when male and female values were compared. So it can be concluded that the statistical significance of nasal parameters including nasal index is population specific. The present study provides population specific nasal index value and its statistical significance in late adolescents.

The nasal index has been found to vary in different stages of life like childhood, adolescence and young adulthood, and even after young adulthood into the sixth decade of life[27]. Previous cross-sectional anthropometric studies have observed that modifications went on with reduced speed after the 20 years of age[33]. In the first year of life in the nose was classified as platyrrhine which is round and wide[34]. In the Egyptian and Manipuri population the boys and men had larger noses than girls and women, appearing from the age above 12 years; a finding in general accord with the previous results[35]. So ,considering the above age related observations the age group taken in the present study i.e. 17-19 years is expected to give a fair enough estimate of the dimorphic potential of the nasal index in North Indians. The present study supports the previous study of Franciscus and Long[30] in their rejection of the argument that nasal breadth contributes little to the world-wide variation in the human nasal index. The width of the nose like length when compared between sexes was highly significant ('p'<0.001).

Conclusions

If the face is the index of the mind, it is not an exaggeration to place the nose as an index of the face. Variations are a rule rather than an exception. The present study provides a morphometric representation of the nasal profile in both sexes. With age, race and sex consideration the present quantitative estimation and statistical analysis assumes enormous significance. The results indicate that the nasal dimensions have a dimorphic predisposition ('p'<0.001) which should be considered to achieve better surgical outcomes. The value for males and females is 71.15±6.51. This value is very near to the leptorrhine range (nasal index of 69.9 or less) .Indians are generally considered Caucasians and hence the proximity to the leptorrhine range. While it is an established fact that Indians are closer to Caucasians compared to other groups there is no doubt that Indians are one of the most divergent Caucasoid groups in circulation.

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