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Somatometric Analysis of Nasal Morphology in the Endogamous Groups of Punjab

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ABSTRACT

"Nose" is one of the most important structures of the face in terms of facial aesthetics. Population based cross-sectional study was carried out on 600 adults of three different endogamous groups (Brahmin-200, Majhabi-Sikh-200 and Muslim-200) inhabiting Punjab. Four nasal parameters were measured for each selected individual and nasal index was calculated. Sexual dimorphism was recorded in all parameters except for nasal depth among Muslims. The parameters showed significant differences between three groups ($p<0.001$) and clearly showed the anthropometric variation for nasal parameters in three communities. Therefore, it can be suggested that nasal parameters can play significant role in determining sex and ethnicity of characteristic pure races of national importance and the plastic surgeons can utilize this knowledge during rhinoplasty of an individual from a particular endogamous group.

Key word: Endogamous groups, Sexual dimorphism, Nasal parameters, Anthropometric variations, rhinoplasty

INTRODUCTION

The nose which is centered in the middle of the face is the most noticeable feature and also considered as one of the best clues to racial origin. The importance of nose is so great that one might label it "Nasal Science". Its shape including slope of tip and the septum differ from race to race, tribe to tribe and from one environmental region of the world to the other. Comparison of changes in these parameters between parents, off-springs and siblings can give a clue to genetic transmission of inherited characters **(Kondo et al, 1999).**

Nasal topography is the first step a surgeon takes prior to perform rhinoplasty to change the shape or size of the nose. Thus 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 **(Olutu et al, 2009).** The measurements of nose can help to reveal the course of evolution leading to the modern varieties of man and is also useful in determination of race and sex of individual or group whose identity is unknown. Nasal

index of a race appears to be markedly related to climate; the narrower noses are favored in cold and dry climate whereas broader noses in warmer and moister one as a consequence of natural selection in human evolution **(Oladipo et al, 2009).**

Lack of background data especially that of some particular endogamous groups against which deviations from normal could be assessed, urges the need for baseline studies in the developing countries like India. So an effort has been made to compare the nasal parameters of three endogamous groups of Punjab (India).

MATERIAL AND METHODS

The present cross-sectional research is based on the nasal anthropometry of three endogamous groups residing in Punjab state of India. A total of 600 adult subjects (age range from 25-45yrs) including 200 Brahmins (males-100, females-100), 200 Majhabi-Sikhs (males-100, females-100) and 200 Muslims (males-100, females-100) were measured for various (nasal height, nasal length, nasal breadth, nasal depth) nasal parameters using standardized techniques given by Martin & Saller (1957) and Singh & Bhasin (1968). The data collected was fed into the computer and statistically analyzed for mean, standard deviation (SD) and t-values.

RESULTS

Descriptive statistics of nasal parameters of Brahmins, Majhabi-Sikhs and Muslims (male and female) are shown in table 1. In general, it can be noted that the minimum measurements were always contributed by the females in all the three endogamous groups. Exceptions had been observed for nasal depth among Muslim males and females.

Table 1- Mean, standard deviation and 't' value of various nasal parameters among male and female subjects in three endogamous groups **(Intra-group comparison)**

Parameter	Brahmin			Majhabi-Sikh			Muslim		
	Male	Female	t value	Male	Female	t value	Male	Female	t value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Nasal Height	53.73±3.27	49.14±3.51	9.57*	51.31±4.01	48.32±2.46	6.36*	53.24±4.81	46.83±4.45	9.79*
Nasal Length	47.59±4.24	44.09±3.79	6.16*	44.64±4.73	41.41±2.21	6.18*	45.88±4.62	39.36±4.21	10.43*
Nasal Breadth	37.47±4.29	34.24±2.73	6.35*	39.66±4.55	33.36±3.02	11.54*	35.37±3.19	31.99±1.6	9.47*
Nasal Depth	20.87±3.14	17.72±3.67	6.52*	18.63±3.26	16.97±3.09	3.69*	16.53±1.65	16.23±1.77	1.24
Nasal Index	70.02±9.13	69.89±6.04	0.12	76.51±8.98	68.95±6.22	6.92*	67.04±8.87	69.38±8.09	1.94

*$p<0.05$

Table 2 depicts the inter-group comparison for various nasal parameters between Brahmins, Majhabi-Sikhs and Muslims for both sexes i.e. t-value has been calculated for nasal parameters.

Table 2- Statistical analysis (t-value) for craniofacial measurements among three endogamous groups **(Inter-group comparison)**

Parameter	Brahmins/Majhabi-Sikhs		Brahmins/Muslims		Majhabi-Sikhs/ Muslims	
	Male	Female	Male	Female	Male	Female
Nasal Height	4.68*	1.91	0.84	4.08*	3.08*	2.93*
Nasal Length	4.64*	6.11*	2.73*	8.35*	1.87	4.31*
Nasal Breadth	3.50*	2.16*	3.93*	7.11*	7.72*	4.01*
Nasal Depth	4.95*	1.56	12.24*	3.65*	5.74*	2.07*
Nasal Index	5.07*	1.09	2.34*	0.51	7.5*	0.42

*$p<0.05$

Nasal Height: It had been observed that Brahmin (53.73 mm) and Muslim (53.24 mm) males had almost same value of nasal height while Majhabi-Sikh males (51.31 mm) had lowest value. In case of females, the value of nasal height was highest in Brahmins (49.14 mm) followed by Majhabi-Sikhs (48.32 mm) and Muslims (46.83 mm) respectively.

Inter group comparison (Table 2) indicated that the differences for nasal height were statistically significant ($p < 0.05$) between all groups except between males of Brahmin and Muslim and between females of Brahmin and Majhabi communities where no significant differences were recorded.

Nasal Length: Brahmin males had been found to have the highest value of nasal length (47.59 mm) followed by Muslims (45.88 mm) and Majhabi-Sikhs (44.64 mm) while in case of females, the sequence was Brahmins (44.09 mm) followed by Majhabi-Sikhs (41.41 mm) and Muslims (39.36 mm) in descending order.

Inter group comparison (Table 2) showed that the differences for nasal length were highly significant ($p < 0.05$) between all the endogamous groups (both males & females except Majhabi-Sikhs/ Muslims), an interesting finding.

Nasal Breadth: Comparing different groups with each other (Table 2), it had been observed that differences for nasal breadth were significant between all the endogamous groups for both males as well as females ($p<0.05$).

Nasal Depth: Brahmins were having the highest value of nasal depth for both the males (20.87 mm) and females (17.72mm) while Majhabi-Sikhs had the highest value (18.63 mm) among females.

Table 1 shows that males of two groups (Brahmins and Majhabi-Sikhs) were having higher value of nasal depth than their female counterparts and the differences in parameter for these two groups were highly significant ($p < 0.05$). However, among Muslims, the mean value of nasal depth overlapped in males and females and no significant differences were seen in Muslims.

Intergroup comparison as shown in Table 2 indicated that the differences for nasal depth were statistically highly significant ($p < 0.05$) between all the three endogamous groups (for both sexes) except between Brahmin and Majhabi-Sikh females.

Nasal Index: There were two communities i.e. Majhabi-Sikhs and Muslims where males and females had been found to differ statistically for nasal index. In third group (Brahmins) non-significant differences were seen among males and females.

An interesting finding had been noted for nasal index i.e. none of the females of three groups showed statistical difference for the nasal index while males of all the three endogamous groups differed significantly.

DISCUSSION

The concept of beauty and normal facial proportions has changed with time. It is apparent that what is considered beautiful and acceptable for one culture may differ with that for another culture. Inherently, the notion for a single aesthetic and beauty is grossly inadequate. Thus a new model of aesthetic standards and beauty unique to a particular endogamous group is required. With the substantial increase in the number of cosmetic surgeries performed for patients of every racial group, it has become a great responsibility for surgeons to maintain core ethnic features while achieving cosmetic enhancement.

Nasal height

Nasal height is strongly correlated with facial height as such the nasal index is also correlated with facial index **(Rastogi & Shukla, 2003).** Table 1 showed that males of all the three endogamous groups possessed significantly higher values of nasal height than their female counterparts thus indicating that males had longer noses than females.

The differences for nasal height were statistically highly significant ($p<0.05$) between males and females of all the three endogamous groups of the present study, thus suggesting that nasal height could be used as an indicator for sexual dimorphism. The results of the present study agreed with earlier studies done by others **(Ngeow and Aljunid, 2009; Oladipo et al, 2009)** where they found sexual dimorphism in nasal height between males and females but our study was not in consonance with **Nagle et al (2005)** as they did not find any significant ($p=0.11$) difference for nasal height between males and females.

Table 3- Comparison of nasal height of different populations

Population	Author	Male		Female	
		Sample size	Mean±S.D.	Sample size	Mean±S.D.
Latvians	Nagle et al (2005)	39	58.7±5.4	38	56.7±5.7
Jat-Sikhs (Punjab)	Singla (2005)	300	51.51±4.41	--	--
Banias (Punjab)	Singla (2005)	300	50.07±3.86	--	--
Ahirwars (Madhya Pradesh)	Singh &Purkait (2006)	59	43	52	41
Dangis (Madhya Pradesh)	Singh &Purkait (2006)	67	46	67	43
Igbos (Nigeria)	Oluto et al (2009)	300	48.7±0.84	300	44.6±0.74
Ibibios (Nigeria)	Oladipo et al (2010)	400	41.5±0.34	400	39.3±0.35
Ijaws (Nigeria)	Oladipo et al (2010)	500	40.8±0.25	500	38.9±0.30
Brahmins	Present study	100	53.73±3.27	100	49.14±3.51
Majhabi-Sikhs	Present study	100	51.31±4.01	100	48.32±2.46
Muslims	Present study	100	53.24±4.81	100	46.83±4.45

Available data has been presented in Table 3 from different regional, racial and endogamous origin. It indicated that Majhabi-Sikh males resembled Jat-Sikh males in nasal height while Brahmin and Muslim males had got higher values of nasal height next to Latvians. It was pertinent here to correlate the fact that Majhabi-Sikhs and Jat-Sikhs are exposed to similar

vagaries in agricultural work of farming, thus having same values. It may safely be deduced that environment and geography play an important role in development of nasal height.

Nasal length

Table 1 showed that males of all the three endogamous groups possessed higher values of nasal length than their female counterparts and the differences for nasal length were statistically highly significant ($p<0.05$), thus indicating that nasal length can be used as a criterion to differentiate males from females.

Table 2 showed that differences for nasal length were highly significant between all the three endogamous groups for both males as well as females. It is pertinent to mention here that nasal length is endogamous or racial specific.

Table 4 - Comparison of nasal length of males of different populations

Population	Author	Sample size	Mean±S.D.
Jat-Sikhs (Punjab)	Singla (2005)	300	45.43±3.88
Banias (Punjab)	Singla (2005)	300	43.64±3.67
Brahmins	Present study	100	47.59±4.24
Majhabi-Sikhs	Present study	100	44.64±4.73
Muslims	Present study	100	45.88±4.62

Comparative picture of males of the present study with earlier reported other endogamous groups of Punjab (Table 4) indicated that Brahmins had the longest nose and Banias had the shortest nose while Muslims and Jat-Sikhs possessed almost same length of nose.

Nasal breadth

Table 1 showed that males of all the three groups of the present study possessed higher values of nasal breadth thus having broader noses than their female counterparts and the differences for nasal breadth were statistically significant ($p<0.05$).

The results of the present study agreed with earlier studies done by others where they found sexual dimorphism in nasal breadth between males and females **(Ngeow and Aljunid, 2009; Oladipo et al, 2009)** but our study was not in consonance with **Nagle et al (2005)**.

Comparing different groups with each other, it could be seen in table 2 that differences for nasal breadth were highly significant between all the endogamous groups for both males as well as females ($p<0.05$).

Thus it could be safely stated that nasal breadth had more predictive value for race or endogamous differentiation and sex differentiation.

Table 5 - Comparison of nasal breadth of different populations

Population	Author	Male		Female	
		Sample size	Mean±S.D.	Sample size	Mean±S.D.
Latvians	Nagle et al (2005)	39	35.3±3.2	38	32.8±2.7
Jat-Sikhs(Punjab)	Singla (2005)	300	36.84±3.23	--	--
Banias (Punjab)	Singla (2005)	300	39.48±3.07	--	--
Ahirwars (Madhya Pradesh)	Singh & Purkait (2006)	59	34	52	34
Dangis (Madhya Pradesh)	Singh & Purkait (2006)	67	35	67	33
Onges(Andaman islands)	Pandey (2006)	27	37.8±0.6	26	35.0±2.1
Igbos (Nigeria)	Oluto et al (2009)	300	48.7±0.84	300	44.6±0.74
Limbus (Nepal)	Shrestha (2009)	99	38.05±4.28	118	37.73±3.70
Rais (Nepal)	Shrestha (2009)	111	38.36±2.58	116	36.01±2.10
Ijaws (Nigeria)	Oladipo et al (2010)	500	40.6±0.25	500	37.9±0.25
Brahmins	Present study	100	37.47±4.29	100	34.24±2.73
Majhabi-Sikhs	Present study	100	39.66±4.55	100	33.36±3.02
Muslims	Present study	100	35.37±3.19	100	31.99±1.6

Available data has been presented in Table 5 from different regions, races and endogamous origin. The Latvian figures of either sex happened to be much lower and those of Igbos were much higher compared to the present study (Table 5). It showed that environment and geographical location may have an important role in development of nasal breadth.

Table 5 showed that there was a stepwise ascent of nasal breadth in males of Punjab and the order seemed to be- Muslims, Jat-Sikhs, Brahmins, Banias, and Majhabi-Sikhs.

Nasal index

The nasal framework is described by nasal index. It could be seen from table 1 that Brahmin and Majhabi-Sikh males possessed higher value of nasal index than their female

counterparts whereas in case of Muslims, it was reverse. But the differences for nasal index were statistically significant between males and females of Majhabi-Sikh and Muslim groups.

Comparative picture of nasal index (Table 2) showed that differences for nasal index were highly significant only between males of all the three endogamous groups while it was insignificant between females of the three groups. The present study results were in consonance with **Oladipo et al (2009)** where they found no significant differences ($p>0.05$) between nasal index of Urhobo and Itskiri females of Nigeria (same geographical area).

The present data has been compared in Table 6 with other endogamous groups. Dangi and Majhabi-Sikh males had almost same value of nasal index though they belonged to different geographical areas. It was pertinent here to correlate their occupational habits as both groups were involved in farming, involving manual hard work. Onges and Ahirwars had comparatively higher value of nasal index.

Table 6- Comparison of nasal index of different populations

Population	Author	Male		Female	
		Sample size	Mean±S.D.	Sample size	Mean±S.D.
Jat-Sikhs (Punjab)	Singla (2005)	300	72±8.41	--	--
Banias (Punjab)	Singla (2005)	300	79.3±9.12	--	--
Onges (Andaman islands)	Pandey (2006)	27	87.43±6.63	26	90.07±7.10
Ahirwars (Madhya Pradesh)	Singh & Purkait (2006)	59	81	52	82.4
Dangis (Madhya Pradesh)	Singh & Purkait (2006)	67	76.5	67	76.5
Brahmins	Present study	100	70.02±9.13	100	69.89±6.04
Majhabi-Sikhs	Present study	100	76.51±8.98	100	68.95±6.22
Muslims	Present study	100	67.04±8.87	100	69.38±8.09

The three endogamous groups have been classified into different categories of nasal index (charts 1 and 2); classification standardized by Martin and Saller (1957).

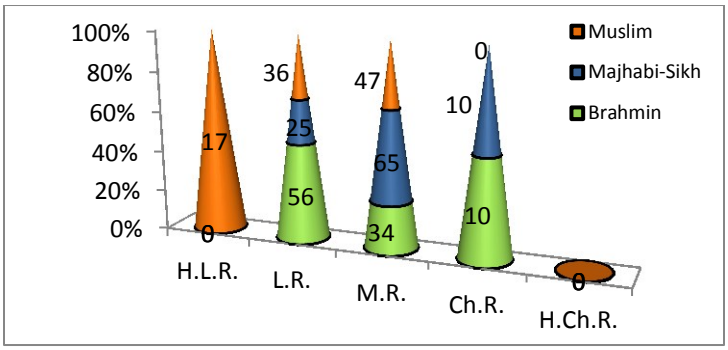

Figure 1- Distribution of different classes of Nasal index for males

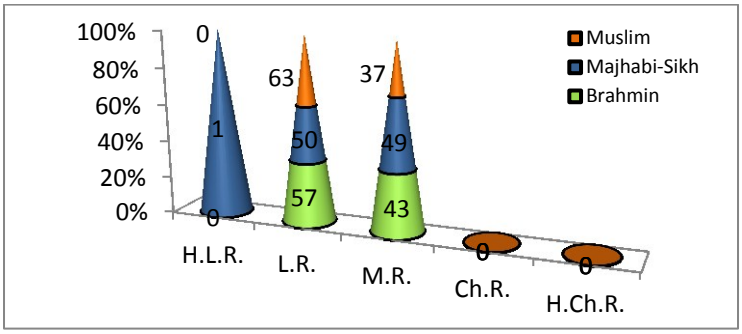

Figure 2 - Distribution of different classes of Nasal index for females

As evident from figures 1 & 2, an interesting finding was observed that among males, it was only Muslim community (17%) falling under hyperleptorrhine class of nose and same was true with Majhabi-Sikh females (1%). As no other endogamous group belonged to this class, it could be deduced here that males with nasal index below 54.9 are descendants of Muslim community and females of Majhabi-Sikh community.

Brahmin and Majhabi-Sikh males and not the Muslim males had chamaerrhine type of nose, though in only 10% of cases. None of the females had this feature as was the case of Muslim males.

Nasal depth

Table 1 indicated that Brahmin and Majhabi-Sikh males possessed higher value of nasal depth than their female counterparts and the differences for nasal depth were statistically significant ($p<0.05$). However among Muslims, nasal depth figures overlapped in males and females to the extent that the differences were not significant.

Thus nasal depth could be used as criterion for sexual dimorphism only if the endogamous group is pre-determined as Brahmin or Majhabi-Sikh and not Muslim.

Table 7 - Comparison of nasal depth of different populations (males)

Population	Author	Sample size	Mean±S.D.
Jat-Sikhs (Punjab)	Singla (2005)	300	18.58±2.70
Banias (Punjab)	Singla (2005)	300	19.20±2.77
Brahmins	Present study	100	20.87±3.14
Majhabi-Sikhs	Present study	100	18.63±3.26
Muslims	Present study	100	16.53±1.65

It is clear from table 7 that Muslims had comparatively lower value of nasal depth and highest value had been observed in Brahmins. The ascending order for nasal depth in different endogamous groups of Punjab seemed to be –Muslims, Jat-Sikhs and Majhabi-Sikhs together, Banias and Brahmins.

CONCLUSION

The present study has been able to establish the mean nasal dimensions of males and females of Brahmins, Majhabi-Sikhs and Muslims of Punjab. It also established that as in other populations, the nasal parameters were sexually dimorphic among the three endogamous groups of Punjab mentioned above with exception to nasal depth. Knowledge of mean nasal measurements is important in evaluation of sex and racial differences, in clinical applications and in forensic applications. Thus plastic surgeons can utilize this knowledge during nasal reconstructive surgery and in rhinoplasty when facial aesthetics is to be improved upon. Forensic expert can also use this knowledge in their investigations.

REFERENCES

Kondo S, Wakatsuki E and Shibagaki H. 1999. A somatometric study of head and face in Japanese adolescence. *Okajimas Folia Anat Jpn* **76(4):** 179-185.

Martin R and Saller K. 1957. cited by Singh IR and Bhasin MK. 1968. *A laboratory manual on biological anthropology*. 1st edn, Kamla Raj Enterprises, Delhi.

Nagle E, Teibe U and Balode I. 2005. Craniofacial morphology in parents of cleft children and healthy individuals. *Stomatologija, Baltic dental and maxillofacial journal.* **8:** 53-56.

Ngeow WC and Aljunid ST. 2009. Craniofacial anthropometric norms of Malaysian Indians. *Indian journal of dental research* **20(3):** 313-319.

Oladipo GS, Udoaka AI, Afolabi EO and B0b-Manuel IF. 2009. Nasal parameters of Itsekiris and Urhobos of Nigeria. *The internet journal of Biological Anthropology* **3(1)**, viewed 2ndh October, 2010, <http://ISPUB.com/html>.

Oladipo GS, Okoh PD and Hart JS. 2010. Anthropometric study of some craniofacial parameters: Head Circumference, Nasal Height, Nasal Width and Nasal index of adult Ijaws of Nigeria. *Asian journal of Medical Sciences* **2(3):** 111-113.

Oladipo GS, Etieno E and Okoh PD. 2010. Facial, Nasal, Maxillary, Mandibular and Oro-facial heights of adult Ibibios of Nigeria. *Australian journal of Basic and Applied Sciences* **4(12):** 6306-6311.

Olutu J, Eroje A, Oladipo GS and Edibamode E. 2009. Anthropometric study of the facial and nasal length of adult Igbo ethnic group in Nigeria. *The Internet journal of Biological Anthropology* **2(2)**, viewed 29th April, 2010, *<http://ISPUB.com/html>*.

Pandey AK. 2006. Cephalofacial variation among Onges. *Anthropologist* **8(4):** 245-249.

Rastogi S and Shukla BRK. 2003. *Laboratory manual of physical anthropology.* 1st edn, Shiva art press, New Delhi.

Shrestha O, Bhattacharya S, Jha N, Dhungel S, Jha CB, Shrestha S and Shrestha U. 2009. Craniofacial anthropometric measurements among Rai and Limbu community of Sunsari district of Nepal. *Nepal Med Coll J* **11(3):** 183-185.

Singh IP and Bhasin MK. 1968. Introduction In: *A laboratory manual on biological anthropology*. 1st ed, Kamla Raj Enterprises, Delhi.

Singh P and Pukrait R. 2006. A Cephalometric study among Sub caste groups of Dangi and Ahirwar of Khurai block of Madhya Pradesh. *Anthropologist* **8(3):** 215-217.

Singla M. 2005. *Facial anthropometry in adult Jat-Sikh and Bania males of Punjab, India*. Thesis, Government Medical College, Patiala.

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