

# Nasal Parameters and Facial Index in Medical Undergraduates: A Cross Sectional Study

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## ABSTRACT:

**Introduction:** Face has priority in identification of an individual. Nose occupying the middle of face is an important sense organ that helps in respiration. Nose and face can be classified into different types according to nasal index and facial index. The aim of this study was to analyze nose and face type and find out its dominance in different sex of Nepalese and Indian population. **Methods:** This was a quantitative observational study conducted on 156 medical students. Data were collected then nasal index and facial index were calculated. Descriptive statistical data i.e. mean, standard deviation, together with the independent samples t-test results for anthropometric variables of nasal and facial parameters in sex and Nationality (Nepalese and Indian) were analyzed. **Results:** All the measurement values were more in males compared to females, but the sexual dimorphism in nasal index (male  $76.25 \pm 7.75$ , female  $75.70 \pm 8.05$ ) and facial index (male  $85.77 \pm 8.1$ , female  $82.97 \pm 7.63$ ) is not statistically significant. Chi square test revealed significant difference in face type among Nepalese and Indian population. Mesorrhine was the most common type of nose in both the population. Nepalese had commonly euryprosopic type of face while Indians had hypereuryprosopic type of face. **Conclusion:** Sexual dimorphism was not significant in both nasal and facial parameters while type of face was helpful in differentiation of Nepalese and Indian population.

**Key words:** Anthropometric, Facial index, Nasal index, Sexual dimorphism

## INTRODUCTION:

The face is part of front of head, between the ears and from hairline to chin. It includes the forehead, eyes, nose, mouth, and chin.[1] External nose is one of the most important factors characterizing the face and serves cosmetic function by enhancing an individual's personality and beauty. [2] The size and shape of face and external nose vary in individuals, and primarily are determined by

genetic and developmental factor, but other factors such as gender, race and ethnicity, climate, socio-economy and nutrition also play an important role in their variation.[3]

The Nasal index (NI), the ratio of nasal width to the nasal height multiplied by 100 is useful in sex determination, distinguishing racial and ethnic differences, nasal analysis, and rhinoplasty.[4,5]

The facial index (FI), the ratio of facial length to the maximum width of face multiplied by 100 is also another important parameter to determine the sex, genetic counseling, reconstructive surgery, for orthodontists and forensic investigation.[4,6]

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The aim of this study was to evaluate the significance of the nasal and facial indices in determination of sex in Nepalese and Indian students. It also helped to classify the type of nose and face among them. As the proportions of the nose and face is important esthetically and functionally, the present study could help plastic and reconstructive surgeons, maxillofacial and cosmetic surgeons, to plan preoperative and postoperative surgical strategies especially during treatment of traumatic injuries and secondary deformities in cleft lip and palate patients.

## METHODS:

This was an observational, cross-sectional study conducted on 156 undergraduate medical students (Nepalese and Indian), aged between 17-25 years, in December 2018. After obtaining the ethical clearance from Institutional Review Committee of Lumbini Medical College (IRC-LMC 014-H/018), the data was collected in department of Anatomy. All the consenting students were involved in the study who had no history of congenital naso-facial deformities, past and existing craniofacial and nasal trauma or surgery. Participants whose, either parents and/or grandparents (both maternal and paternal) had intercaste marriage were excluded. The aim of study and measurement procedures were explained verbally to each participant and consent obtained. They were seated on a chair, in relaxed position, with their head held out in Frankfort's plane. Nasal Length (NL) was measured from nasion to pronasale, Nasal Height (NH) was measured from nasion to subnasale, Nasal Breadth (NB) was considered as maximum breadth at right angle to the nasal height from ala to ala (i.e. the most laterally placed points on the nasal wings), and Nasal Depth (ND) was taken from pronasale to subnasale. Similarly, Facial Height (FH) was measured between nasion to gnathion and Facial Breadth (FB) was measured between two zygomatic prominences. A standard digital sliding caliper "Gyros Digi-Science Accumatic Pro Digital Electronic Caliper" was used for measurements. All the measurements were recorded in millimeter. To maintain the accuracy, the measurements were taken by same observer thrice and the mean value was considered for further analysis. The measurements were made with a permissible error of one mm. After measurements were taken, nasal index and facial index were calculated. The nose and face types were classified according to respective index.

Human nose can be classified according to NI as: [7]

Hyperleptorrhine (excessively long and narrow) with NI of 54.9 and less.

Leptorrhine (moderately long and narrow nose) with NI between 55 and 69.9.

Mesorrhine (medium nose) with NI between 70 and 84.9.

Platyrrhine (moderately broad nose) with NI between 85 and 99.9.

Hyperplatyrrhine (very broad nose) with NI 100 and above.

Face can be classified into five categories according to FI: [7]

Hypereuryprosopic (very broad, short face) with FI of 79.9 and less.

Euryprosopic (broad, short face) with FI between 80 and 84.9.

Mesoprosopic (normoprosopic: average face) with FI between 85 and 89.9.

Leptoprosopic (long, narrow face) with FI between 90 and 94.9.

Hyperleptoprosopic (very long, narrow face) with FI of 95 and above.

The data was entered and analysis done using Statistical Package for Social Sciences (SPSS™) software version 16. Basic descriptive statistics i.e. mean (M), standard deviation (SD) were calculated in different sex and nationality. Further analysis were done to test the significance of the variables by using independent sample t-test and chi square test. P value <0.05 was considered to be statistically significant.

## RESULTS:

There were 97 Nepalese students (56 male and 41 female) and 59 Indian students (25 male and 34 female). Descriptive statistical data for anthropometric variables of nasal and facial parameters in sex (male and female) and in Nationality (Nepalese and Indian) are given in tables 1 and 2 respectively.

The nasal and facial measurements compared between males and female (table 1) showed larger mean values for all anthropometric variables in male

than in female; however, all parameters were not statistically significant in both sexes.

Table 1. Nasal and facial parameters in males (n=81) and females (n=75).

Anthropometric Variables	Sex	Mean ± SD	p value *
Nasal Breadth	Male	3.72 ± 0.23	0.07
	Female	3.45 ± 0.28	
Nasal Height	Male	4.91 ± 0.35	0.11
	Female	4.58 ± 0.28	
Nasal Length	Male	4.67 ± 0.35	0.24
	Female	4.30 ± 0.32	
Subnasle-Prognathion (Nasal Depth)	Male	1.51 ± 0.22	0.13
	Female	1.44 ± 0.19	
Nasal Index	Male	76.25 ± 7.75	0.50
	Female	75.70 ± 8.05	
Facial Breadth	Male	13.08 ± 1.01	0.97
	Female	12.43 ± 0.96	
Facial Height	Male	11.15 ± 0.61	0.15
	Female	10.25 ± 0.50	
Facial Index	Male	85.77 ± 8.31	0.41
	Female	82.97 ± 7.63	

\* p value calculated by Student's t test

In table 2, comparison of nasal index between Nepalese and Indian students (both sexes together) indicate that Indians (77.62 ± 8.30) had a higher mean nasal index than Nepalese (75.00 ± 7.48). Facial index in Nepalese was 85.98 ± 8.33 and in Indian, 81.87 ± 7.02. There was no significant difference in both nasal and facial index between two

populations. Nasal length was significantly higher in Nepalese (4.58 ± 0.39) in comparison to Indian (4.35 ± 0.32) while facial breadth was significantly higher in Indian (13.01 ± 0.89) than in Nepalese (12.62 ± 1.09). These differences showed that Nepalese had slightly longer nose as compared to Indians, and Indians had slightly broader face as compared to Nepalese. Overall, mean nasal breadth, nasal height, nasal length and facial height were found to be larger in Nepalese while mean nasal depth, nasal index, facial breadth and facial index were larger in Indian.

Table 2. Nasal and facial parameters in Nepalese (n=97) and Indian (n=59).

Anthropometric Variables	Nationality	Mean ± SD	p value *
Nasal Breadth	Nepalese	3.61 ± 0.28	0.75
	Indian	3.57 ± 0.31	
Nasal Height	Nepalese	4.83 ± 0.35	0.19
	Indian	4.62 ± 0.32	
Nasal Length	Nepalese	4.58 ± 0.39	0.03
	Indian	4.35 ± 0.32	
Subnasle-Prognathion (Nasal Depth)	Nepalese	1.45 ± 0.20	0.89
	Indian	1.52 ± 0.21	
Nasal Index	Nepalese	75.00 ± 7.48	0.28
	Indian	77.62 ± 8.30	
Facial Breadth	Nepalese	12.62 ± 1.09	0.03
	Indian	13.01 ± 0.89	
Facial Height	Nepalese	10.78 ± 0.72	0.64
	Indian	10.61 ± 0.69	
Facial Index	Nepalese	85.98 ± 8.33	0.26
	Indian	81.87 ± 7.02	

\* p value calculated by Student's t test

Table 3. Comparative studies between nose type and face type in different sex

Sex	Nose Type	Face Type					Total (%)	p value
		Hypereuryprosopic (%)	Euryprosopic (%)	Mesoprosopic (%)	Leptoprosopic (%)	Hyperleptoprosopic (%)		
Male	Leptorrhine	0 (0%)	1 (5.88%)	4 (23.53%)	4 (23.53%)	8 (47.06%)	17 (100%)	.001
	Mesorrhine	12 (23.53%)	12 (23.53%)	12 (23.53%)	8 (15.69%)	7 (13.72%)	51 (100%)	
	Platyrrhine	4 (30.77%)	7 (53.85%)	1 (7.69%)	1 (7.69%)	0 (0%)	13 (100%)	
Female	Leptorrhine	3 (16.67%)	7 (38.89%)	4 (22.22%)	1 (5.55%)	3 (16.67%)	18 (100%)	.19
	Mesorrhine	16 (34.04%)	12 (25.53%)	8 (17.02%)	7 (14.90%)	4 (8.51%)	47 (100%)	
	Platyrrhine	4 (40%)	3 (30%)	2 (20%)	1 (10%)	0 (0%)	10 (100%)	

In both sexes, mesorrhine nose type was the dominant (Male: 62.97%, Female: 62.67%) while platyrrhine nose type was found the least (Male: 16.04%, Female: 13.33%). Leptorrhine nose type in male was 20.99% and in female, 24%. The most common face type in male and female was euryprosopic (Male: 24.69%, Female: 29.33%) and hypereuryprosopic (Male: 19.75%, Female: 30.67%) respectively. The least common face type was leptoprosopic in male (16.05%) and

hyperleptoprosopic in female (9.33%). Chi square test indicated both the nose type and face type were not significant between male and female i.e. 0.83 and 0.28 respectively.

Higher incidence of mesorrhine nose (Nepalese: 65.97%, Indian: 57.62%) followed by leptorrhine (Nepalese: 22.68%, Indian: 22.04%) and platyrrhine (Nepalese: 11.35%, Indian: 20.34%) was found in both Nepalese and Indian, which was not

Table 4. Comparative studies between nose type and face type in Nepalese and Indian.

Nationality	Nose Type	Face Type					Total (%)	P value
		Hypereuryprosopic (%)	Euryprosopic (%)	Mesoprosopic (%)	Leptoprosopic (%)	Hyperleptoprosopic (%)		
Nepalese	Leptorrhine	1 (4.54%)	3 (13.63%)	4 (18.19%)	5 (22.73%)	9 (40.91%)	22 (100%)	.001
	Mesorrhine	13 (20.32%)	16 (25%)	16 (25%)	9 (14.05%)	10 (15.63%)	64 (100%)	
	Platyrrhine	3 (27.28%)	7 (63.64%)	1 (9.08%)	0 (0%)	0 (0%)	11 (100%)	
Indian	Leptorrhine	2 (15.39%)	5 (38.46%)	4 (30.76%)	0 (0%)	2 (15.39%)	13 (100%)	.27
	Mesorrhine	15 (44.12%)	8 (23.54%)	4 (11.76%)	6 (17.64%)	1 (2.94%)	34 (100%)	
	Platyrrhine	5 (41.66%)	3 (25%)	2 (16.67%)	2 (16.67%)	0 (0%)	12 (100%)	



statistically significant ( $p$  value = 0.29).

Table 3 shows the comparative study of nose type along with face type in male and female. There was significant relation between nose type and face type in male ( $p = 0.01$ ) while in female it was not significant ( $p = 0.19$ ). In male euryprosopic face with platyrrhine nose was predominant (53.85%), while in female hypereuryprosopic face with platyrrhine nose was predominant (40%).

Present study (Table 4) shows Nepalese population have significantly euryprosopic face with platyrrhine nose ( $p = 0.001$ ) while Indian population have hypereuryprosopic face with platyrrhine nose, which was not significant ( $p = 0.27$ ). In Indian, hyperleptoprosopic face was least and in Nepalese leptoprosopic face was least common.

In the present study, nose type designated as hyperleptorrhine and hyperplatyrrhine were not observed in either sex of Nepalese and Indian population.

## DISCUSSION:

Anthropological studies of different regions of body help to compare variations in different age group, sex, race, and ethnicity. Such studies help not only anthropologists, anatomists, reconstructive surgeons but also forensic medicine experts for identification. The study of nasal and facial parameters are considered important factors from ancient time to classify racial, sexual and environmental variations.[8] The nasal index and facial index in different studies, have shown sexual dimorphism and racial differences between different populations.[2,3,9-12,16-21] In present study, less nasal index and more facial index was found in Nepalese when compared to Indian students (Table 2). The most common nose type in present study was mesorrhine followed by leptorrhine and platyrrhine which resembles with South Indian and North Indian population.[10] Earlier studies have shown majority of Caucasians have long and narrow nose, Indo-Aryan and European has fine nose.[11]

In a study conducted on Rai and Limbu ethnic groups of Nepal; Limbu females had broader nose in comparison to male counterpart. In the same study, when the parameters were compared between two ethnic groups; it was observed that the Rai had broader nose.[12] Tharu and Mongoloid ethnic groups of Nepal exhibited sexual dimorphism

along with significant nasal height.[13] Both of these studies had contrasting results to our study in Nepalese population which may be due to variation in ethnicity.

The Nigerian nose type was platyrrhine with significant sexual dimorphism.[2] In Andoni and Okrika tribes of Rivers State, Nigeria; platyrrhine nose type was common in Okrikas while the Andonis had Mesorrhine nose type. Nasal index was significant in Andoni ethnic group but insignificant in the Okrika ethnic group for sexual dimorphism. [14]

A study in nasofacial index among Malay, Chinese, and Indian university students showed the nasal index in all three races were mesorrhine type, but sexual dimorphism in all of them were statistically not significant. The result is comparable to our study in which most common nasal type is mesorrhine followed by leptorrhine and platyrrhine in both sex of Nepalese and Indian population and it was not statistically significant as well. The leptoprosopic face type was dominant for the Malays and Indians, while it was mesoprosopic type in Chinese. Sexual dimorphism for the facial index in Malay population was significant. In present study, common face type in Indian population is hypereuryprosopic which is contrasting to this study. The combine nasofacial relation found in Indian was leptoprosopic face with mesorrhine nose which is contrasting to present study in Indian population i.e. hypereuryprosopic face with platyrrhine nose.[15] The contrast in result of these study may be due to variation in sample size and participants selected may be of different places of India.

All of above studies had total absence of hyperleptorrhine and hyperplatyrrhine nose which is a similar finding to the present study.

The most common face type in present study was euryprosopic in male and in Nepalese population, while in female and in Indian population it is hypereuryprosopic. Sexual dimorphism in the facial index of present study was insignificant. A study of facial index among Malay population showed significant sexual dimorphism with mesoprosopic face type.[16] The mean facial index in Chinese male and female was  $89.02 \pm 4.92$  and  $88.52 \pm 4.89$  respectively and the dominant face type was mesoprosopic.[17] Comparative study between Indian and Malaysian students concluded both races

have mesoprosopic face type which was significant in sexual dimorphism in Malay population while it was insignificant in Indian population.[18] In similar comparative study among Malay, Chinese, and Indian sexual dimorphism was significantly seen in Indian population only.[22]

The research in the adult population of central Serbia concerning the total facial index, face shape showed complete absence of euryprosopic and hypereuryprosopic face which was a different result from other studies.[3] The results of our study are at variance with other studies, could be due to small sample size from different geographic location and of multiple races.

### CONCLUSION:

The mean nasal index and facial index in both sexes of Nepalese and Indian population have been identified. The study showed Nepalese population have comparatively longer nose than

Indian population while Indians have broader face in comparison to Nepalese population. These results are useful reference material for anthropometric records and in forensic medicine as well as for different surgical purposes. The present findings are based on study in mixed sample size of Nepalese and Indian population from different regions of respective countries. Further studies in different specific ethnic groups would help for data updates regarding classification of nose and face type.

### Conflict of Interest:

The authors declare that no competing interest exists.

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