



AN ANTHROPOMETRIC STUDY OF NASAL INDICES IN TWO INDIAN STATES

Anatomy

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ABSTRACT

The nasal index has a great value in forensic medicine, anthropological studies, because it is one of the anthropometric indices acknowledged in nasal surgery as well as management. Nasal index shows the ratio of the width to the height of the nasal skeleton. Objectives: The aim of this study was to analyze the nasal parameters and nasal index of dry cranium in West Bengal. Methodology: Nasal height and nasal breadth were measured with a vernier caliper in 115 adult crania from different medical colleges and Science College of Kolkata and Delhi. From these variables, nasal index was calculated as nasal breadth/ nasal height $\times 100$. Results: For the population of West Bengal, the values of nasal aperture height, nasal breadth and nasal index were 47.1 (± 3.7) mm, 25.3 (± 2.8) mm and 52.2 (± 5.85) respectively. For the population of the state of Delhi, the values of nasal height, nasal breadth and nasal index were 35.2 (± 3.1), 26.3 (± 2.9) and 76.94 (± 3.2). Nasal height and nasal index were significantly higher in Delhi than in West Bengal. There was no significant difference in the nasal breadth in the two states of India. Conclusion: The crania in the state of West Bengal exhibit hyperleptorrhine whereas the crania in the state of Delhi exhibit mesorrhine.

KEYWORDS

Cranium, Nasal breadth, Nasal height, Nasal index

INTRODUCTION

The term anthropometry refers to a set of systematized measuring techniques for expressing the dimensions of the human body and skeleton quantitatively.[1] Measurement of nasal index is important for studies of human growth, population variation and aesthetic surgery. Nasal index is mostly conducted with the aim of obtaining the characteristics of ethnic groups inhabiting a particular geographic region, these assist in understanding the frequency distribution of human morphologies and also provide the basis for comparison among different races.[2] The nose is an obvious important part of the facial features of a person.[3] Particular attention by the surgeon to the facial morphology, when planning the rhinological operation, will benefit the patient in many respects.[4] The favorable corrections of nasal deformities constitute one of the most challenging areas of facial aesthetic surgery. For such an important task baseline records and an understanding of their interplay are essential.[5] The most important nasal dimensions are height and breadth of nose that determine the nasal index. The nasal index is calculated with nasal height and breadth of nose. Nasal index = Nasal breadth / Nasal height $\times 100$. This provides a data base of facial measurements useful for orofacial surgeons in facial reconstruction. In the present study, we have calculated nasal index in the persons from West Bengal and Delhi region.

Based on nasal index, the human nose can be grouped in to five categories as described in Table 1 [6, 7].

Table 1

Nasal index	Classification
<54.9	Hyperleptorrhine
54.9-69.9	Leptorrhine
70.0-84.9	Mesorrhine
85.0-99.9	Platyrrhine
>100.0	Hyperplatyrrhine

MATERIAL & METHODS

The present study has been carried out on 115 adult dry crania unknown sex and age, from different Medical Colleges and Science College of Kolkata and 115 crania from different medical colleges of Delhi. All the measurements were taken with digital sliding caliper. The samples were collected from Department of Anatomy of different medical colleges of Kolkata and Delhi and Department of Anthropology of Calcutta University. Samples were of normal outline without any sign of previous fractures, skulls were in a disease free state e.g. cancer with deformed outline and all the sutures were closed (skeletally mature). Descriptive statistical analysis has been carried out in the present study. Results of continuous measurements are presented on Mean $\pm$ SD (Min – Max) of the actual values of all metric parameters and results on categorical measurements are presented in

Number (%). The Statistical software namely SPSS software was used for the analysis of the data and Microsoft word and Excel have been used to generate tables, diagrams, graphs and charts. The skulls were placed on a table. Firstly, landmarks nasion, nasospinale and two lateral most points on the rim of the nasal aperture, required for measurements were marked on the skull with the help of a permanent marker pen. Then the distance between the landmarks were recorded using spreading calipers and sliding calipers in centimeters to the nearest millimeters. Parameters were measured, recorded, tabulated first. Later, skull indices were calculated from the recorded observations. Nasal height was taken as the straight distance between the nasion and the nasospinale.⁸ Nasal breadth was taken as the maximum breadth of the pyriform aperture.

Nasion(n) – the point where the internasal suture meets the frontonasal suture on the midsagittal plane.⁸

Nasospinale(ns) – the point where a line tangent to the two lateral curves of the lowest margin of the pyriform aperture crosses the midsagittal plane. In practice it is usual to take the tangent.⁸

$$\text{Nasal Index} = \frac{\text{Nasal breadth}}{\text{Nasal height}} \times 100^{10}$$



Measuring values by vernier caliper



Picture showing the exact location of the points

RESULTS

The statistical analysis with respect to the measurement of nasal

variables of nasal height, nasal breadth and nasal index of unknown age and sex in the two studied regions are follows. In this study, 115 crania from west Bengal and 115 samples from the state of Delhi were evaluated for the nasal index.

Table 2: Nasal Height-

POLPULATIONS	MEAN	S.D.	MIN	MAX	P-value
WEST BENGAL	47.11	3.72	38.26	56.03	0.0001
DELHI	35.21	3.18	26.18	44.24	

Table 2: Nasal Breadth-

POPULATION	MEAN	S.D.	MIN	MAX	P Value
WEST BENGAL	25.32	2.84	19.23	45.56	0.0001
DELHI	26.35	2.94	15.20	37.40	

Table 4: Nasal Index

POLPULATION	MEAN	S.D.	MIN	MAX	P-value
WEST BENGAL	52.24	58.52	41.07	90.14	0.0001
DELHI	76.94	3.23	55.46	98.42	

Table 5: Frequency Of Nasal Shape In West Bengal And Delhi Population

Type of skull	WEST BENGAL		DELHI		P-Value
	No. of skull	Percentage	No. of skull	Percentage	
Hyperleptorrhine	87	75.65	20	17.39	0.0001
Leptorrhine	26	22.61	38	33.04	
Mesorrhine	1	0.87	52	45.21	
Platyrrhine	1	0.87	3	2.61	
Hyperplatyrrhine	0	0.0	2	1.74	

The nose types for West Bengal and Delhi population based on the nasal index Table 5 and its distribution in this study were shown above.

DISCUSSIONS

- The face and the nose are very important physiognomic features in humans and the main cephalometric parameters to describe human morphology,
- The variations in the nose are greater than those found in the body as a whole.[11]
- A study was carried out in 1980 that showed most Western European possess leptorrhine type of nose, which is long and narrow with nasal index of 69.9 or less. Australians as well as the Bantus and Bushmen of African were platyrrhine, having broad nose with a nasal index of 85.0 and above 26. Similar to that of the general Western Europeans, a past study has shown that the nasal index of Germans are an average of 71.0 and below, which is leptorrhines [12].
- Australoids are platyrrhine with broad nose and have nasal index of 85, most Caucasians are leptorrhine with long and narrow nose and have nasal index of 69.9 or mesorrhine with index between 70.0 and 84.9 [13]. The Indo-Aryan is similar to the Europeans, possessing a fine nose [13] In Jingpo people in China are mesorrhine [14]. Indo-African [13] and AfroAmerican have platyrrhine nose type [15].
- This study has shown that the South Indians have a mesorrhine nose type, similar to the Aryans, Germans, Onges and Yoruba females, with nasal index of 77.3.
- Table 6 shows the comparison of nasal indices that has been acquired in the study with previously studied nasal indices of other populations.

Race/ Population	Nasal index	Author(s)/Year
Sudroid	89.80	Franciscus & Long 1991 [16] Oladipo et al., 2007(a) [21]
Aryans	83.00	Franciscus & Long 1991 [16]
Western Europeans	69.90	Heirnaux & Hartono 1980 [17]
Bantus	85.00	Heirnaux & Hartono 1980 [17]
German	71.00	Nichang, 2004 [18]
Male onges	72.3-97.7	Franciscus & Long 1991 [16]
Female onges	70.5-97.4	Franciscus & Long 1991 [16]
Igbo male	95.80	Oladipo et al., 2006 [20]
Igbo female	90.80	Oladipo et al., 2006 [20]
Yoruba male	90.00	Oladipo et al., 2006 [20]
Yoruba female	88.10	Oladipo et al., 2006 [20]
Ogoni male	106.10	Oladipo et al., 2007(a) [19]
Ogoni female	90.90	Oladipo et al., 2007(a) [19]

Ijaws	96.37	Oladipo et al., 2007(a) [21]
Yorubas	89.20	Oladipo et al., 2007(a) [21]
Igbos	94.10	Oladipo et al., 2007(a) [21]
Yoruba male	90.02	Oladipo, Fawehinmi et al. 2009 [22]
Yoruba female	83.58	Oladipo, Fawehinmi et al. 2009 [22]
South Indian	77.30	Nurul Syamimi & Babu KY, 2017 [23]
West Bengal & Delhi	52.24 & 76.94	Present study

- Table 6 clearly shows that ethnicity significantly affects nasal parameters as differences exist amongst different races/ tribes and ethnic groups as shown in the table.

CONCLUSIONS

The mean nasal indices of both West Bengal and Delhi population has been determined. The Delhi population fall within the mesorrhine or medium nose type. The west Bengal population fall within hyperleptorrhine or fine nose. The result of this study will be useful in forensic medicine and anthropology and will also serve as a future framework for estimating the other craniofacial variables in same population.

Ethics approval and consent to participate

Not applicable

Availability of data and material

Not applicable

Competing interests

Not applicable

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Authors contribution

Author Dr. Ankana Saha worked on the sample collection and methodology by specific measurements and tabulation of the results. Co-author Dr. Subhadeep Saha provide his expertise in executing the statistical calculations and writing the details of the manuscript.

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REFERENCES

- Roger Warwick, Peter L Williams, M Dyson, Bannister L H. Gray's Anatomy. 37th edition, London: Elsevier Churchill Livingstone; 1995: 601 – 612.
- Craniometric studies, No.27: A study of the nasal index in representative types of man. American Journal of Physical Anthropology; April/June 1930; 14 (2): 293-304.
- Z Heidari, H Mahmoudzadeh-Sagheb, T Khammar, M Khammar. Anthropometric measurements of external nose in 18-25 years old Sistani and Baluch aborigine women in the southeast of Iran. Folia Morphol; 2009; 68 (2): 88 – 92.
- B Khandekar, S Srinivasan, N Mokul, M R Thatte. Anthropometric analysis of lip – nose complex in Indian population. Indian J Plast surg. July – December 2005; 38(2): 128 – 131.
- Chimmalgi M, Kulkarni Y, Sant SM. Sexing of skull by new metrical parameters in Western India. Journal of Anatomical Society of India. 2007; 56 (1): 1-6.
- Porter JP, Olson KL (2003) Analysis of the African American female nose. Plast Reconstr Surg 111(2):620–626
- Gray H, Bannister LH, Berry MM, Williams PL (1995) Gray's anatomy: the anatomical basis of medicine & surgery, 38th edn. Churchill Livingstone, New York, p 2092
- Ales Hrdlicka, Practical Anthropometry, Wistar Institute of Anatomy and Biology, Philadelphia, 1939: 109-119, 135, 181-189, 197.
- Mischkowski RA, Scherer P, Ritter L, Neugebauer J, Keeve E. Diagnostic Quality of Multiplanar Reformation Obtained With a newly developed Cone Beam Device For Maxillofacial Imaging, dentomaxillofacial Radiology, 2008;37:1-9.
- Martin R, Saller K (1957) Lehrbuch der Anthropologie in Systematischer Darstellung, 3rd edn. Gustav Fischer Verlag, Stuttgart, p 11
- Bhargava I, Sharma JC. The nose in relation to head and face-an anthropometric study. Indian J Otolaryngol. 1959;11(4):213–218. [Google Scholar]
- Jimoh RO, Alabi SB, Kayode AS, Salihu AM, Ogidi OD. Rhinometry: spectrum of nasal profile among Nigerian Africans. Braz J Otorhinolaryngol. 2011;77(5):589–593. doi: 10.1590/S1808-86942011000500009. [DOI] [PMC free article] [PubMed] [Google Scholar]
- Sparks, C.S. and R.L. Jantz, A reassessment of human cranial plasticity: Boas revisited. Proceedings of the National Academy of Sciences, 2002. 99(23): p. 14636-14639.
- Xu B., Wang Y. Ma J. Li M. & Xu L. . 2011. A computer-aid study on the craniofacial features of Archang race in Yunnan province of China. Hua Xi Kou Qiang Yi Xue Za Zhi. 19(6):394-396.
- Ofodile, F.A. and F. Bokhari, The African-American Nose: Part I I. Annals of plastic surgery, 1995. 34(2): p. 123-129.
- Franciscus R. G., Long J. C. Variation in human nasal height and breadth. Am J. Physical Anthropology 1991, 419 – 427.

17. Hiernaux J, Hartono D. B. Physical measurements of the adult Hadza of Tanzania 1980, Pp 339 – 346.
18. Nichani J. R. Dimensional analysis – It's role in our preoperative surgical planning of rhinoplasty. *Clinical Otolaryngology and Allied Sciences* 2004, 5
19. Oladipo G. S., Olabiyi, A O, Oremosu A.A, Noronha, C. C. Nasal indices among major ethnic groups in Southern Nigeria. *Scientific Research and Essays* 2007, 2 (1): 20-22.
20. Oladipo G. S., Gwunireama I. U and Asawa O. D. Anthropometric comparison of nasal indices between the Igbos and Yorubas in Nigeria. *Global Journal of Medical Science* 2006: 37-40.
21. Oladipo G. S., Olotu J. E. and Didia B. C. Anthropometric study of Nasal parameters of the Ogonis in Nigeria. *Scientia Africana* 2007: 69 – 71
22. Oladipo G.S, Eroje M.A, Fawehinmi H.B. Anthropometric comparison of the nasal indices between the Adoni and Okrika ethnic groups of Rivers State, Nigeria. *International Journal of Medicine and Medical Sciences* 2009, 1(4): 135-137.
23. Nurul Syamimi binti Mohd Azlan Sunil and K. Yuvaraj Babu. The Nasal Index Of South Indian Skulls. *International Journal of Advanced Research (IJAR)* 2017, 5(4): 1816-1819.