

STUDY OF NASAL INDEX - A Review

A.Shreya Svitlana¹, M.S.Themozhi²

¹Undergraduate Student, Saveetha Dental College And Hospital Saveetha Institute Of Medical And Technical Sciences, Saveetha University

²Professor and Head, Department of Anatomy, Saveetha Dental College And Hospital, Saveetha Institute Of Medical And Technical Sciences, Saveetha University

ABSTRACT

Aim: To review the various studies and researches performed on the nasal index using nasal parameters such as nasal height and nasal width.

Objective of review: To determine if there is any clinical relevance of the shape and size of the nose in relation to physiology, pathology and surgery.

Type of review: Systematic review.

Background: Nasal index is an ethnic sensitive anthropometric index which is used to classify race and sex of an individual. The different shapes of the nose are mainly determined through the environmental factors and climatic conditions. The variations of skin and soft tissue covering the dorsum of the nose affect the final nasal contour and profile after nasal augmentation. With the substantial increase in the number of cosmetic surgeries performed, it has become a great responsibility for surgeon to maintain core ethnic features.

Result : Nasal proportions do vary between ethnic groups but the size and shape of the nose does not define Caucasian, Asian and African races respectively. Anthropologists agree that the nasal variations are due to man's adaptation to the environment. However, this theory remains to be proven. Published data on nasal physiology have not shown significant differences between the ethnic groups despite obvious differences in nasal proportions. The only area in which the size and shape of the nose is of relevance is in aesthetic and reconstruction surgery.

Conclusion:

Anthropometric data of the face and nose obtained would be useful for sex determination, forensics medicine, identifying nasofacial dysmorphology, and reconstructive facial and nasal surgeries.

Keywords: nasal index, anthropometric index, Caucasian, physiology.

Introduction:

Anthropometry provides scientific methods and techniques for taking various measurements and observation on the living man and the skeleton. Anthropometric studies are an integral part of craniofacial surgery and syndromology. Raymond Edler et al used anthropometric proportion indices for the measurement of facial attractiveness [1]. Symons in 1979 found that facial proportions tend to be relatively near to the mean of the population within their racial group[2] Anthropometric studies play an important role in distinguishing a pure race from the local mingling of races [3,4]. The nose is widely acceptable as one of the best clue to racial origin [5]. The nasal index is very useful in anthropology as it is one of the clinical anthropometric parameters recognized in nasal surgery and medical management. [6,7]. Regional and environmental climatic conditions are useful in determining the shape of the nose which may vary across different races & environments. Anthropometry provides a scientific method and technique for taking various measurements in different geographic regions and races. NI itself is a complex anatomic unit, so the anthropometric study was devised on the same, might play an important role during the reconstruction of rhinoplasty and facial surgeries [56].

Facial anthropometry has become an important tool used in genetic counseling, reconstructive surgery and forensic investigation [8,9,10]. The nose is considered as one of the best clues to racial origin. Its proportion is determined on the same principles as those of the skull, the importance of the nose is so great that one might label it "Nasal science" [11]. The nose can be categorized on the basis of Nasal parameters (Nasal height, Nasal width and nasal index); these three categories are commonly accepted [12,13]. Nasal analysis is the first step a surgeon takes before performing rhinoplasty (plastic surgery) to change the

shape of the nose [14]. There are certain variables that determines the shape of the nose, these variables includes: race, tribes and environmental climatic conditions [15] with narrower nose being favoured in cold weather and dry climate and broader nose in warmer climate [16]. This is to say that nasal elongation is influenced by adaptation to environment [17]. The nose has been classified into three major groups based on the nasal parameters-Leptorrhine or fine nose (69.9 or less), Mesorrhine or medium nose (70.0 – 84.9), Platyrrhine or broad nose (85.0) [18].

Nasal index which is a physical characteristic of a race is said to be related to climatic conditions [19]. It is obtained by division of the width of the nose by its height and multiplying the resultant factor by 100 [20]. There are several races which hold different anthropometric views these includes: Africa, Europe, Asia, Australia and the Pacific Indo-Africans etc. All races have their peculiarities and these vary considerably when referring to various anthropometric parameters [21]. A study was carried out and produced three categories for physiological classification; Afro-caucasians, Africans and Afro-Indians. The subjects of study were assigned to one of the three categories with the majority classified as Afrocaucasians (52%), Africans (24%) and Afro Indians (22%) [22,23]. Researchers found similarities within these categories. Similar anthropometric study was carried out to compare the nasal indices of Igbo and Yorubas for any existing differences or similarities. The report showed that the Igbo males and females had a mean nasal indices of 95.8 ± 0.44 and 90.8 ± 0.61 respectively while the Yoruba males and females had mean nasal indices of 90.0 ± 0.38 and 88.1 ± 0.47 respectively. The mean nasal indices of Igbo males and females were significantly higher than those of Yoruba males and females. However the Yorubas and Igbo still fall The Study Of Nasal Parameters (Nasal Height, Nasal Width, Nasal Index) Amongst The Yorubas Of Nigeria 2 of 5 within the same nose type called platyrrhines [24]. The South Indian population has the mesorrhine nose type. This information will be of significance in forensic science, anthropological studies and clinical practice [55].

Another study was also carried out on nasal indices of major ethnic groups in Southern Nigeria, these ethnic groups are: the Yoruba ethnic group, Ijaw ethnic group and Igbo ethnic groups. The result showed that on the average, the Igbo had a mean nasal index of 94.1 ± 0.37 , Yoruba 89.2 ± 0.30 and Ijaws 96.37 ± 1.06 . Thus the Ijaws had a significantly higher nasal index than females [25]. In 1980, a study carried out showed that most Western Europeans were leptorrhines having a long and narrow nose with a nasal index of 69.9 or less while the Bantus and Bushmen of African as well as the indigenous Australians were platyrrhine having broad nose with a nasal index of 85.0 and above [26]. A previous study has shown that the German nasal index is similar to that of the general Western Europeans average of nasal index of 71.0 and below leptorrhines [27]. Although nasal index of Yorubas has been investigated previously using smaller sample size, the study was however not comprehensive enough as other nasal parameters: nasal height and nasal width as well as age groups of subjects were not included in previous studies. Thus this present comprehensive study was aimed at documenting, using larger sample size, the nasal parameters on Yorubas and also comparing data of males and females for sexual dimorphism [28].

Human physical variability has been a subject of great interest for the scientists for very long time and anthropometry evolved as a standard scientific technique for measuring human body dimensions [29]. Physical anthropology relies mainly on external measurements and descriptions of the human body and in particular upon the skeleton. Such measurements are useful in the analysis and classification of fossil remains as well as study of living population. Facial anthropometry has become an important tool used in genetic counseling, reconstructive surgery and forensic investigation [30]. The part of the human nose that protrudes forwards from the face is the external nose. The shape of the external nose is variable, and is determined by ethmoid bone and nasal septum, which consist mostly of cartilage and which separates the nostrils. The human nose can be found in many shapes and sizes and ethnic influences can result in different appearances of the nose [31]. The shape of the nose can be determined by environmental climate condition [32]. The narrower noses are favored in cold and dry climates while broader noses in warmer, moister ones as a consequence of natural selection in human evolution [33]. Nasal index is very useful in anthropology in distinguishing racial and ethnic differences Long. It also exhibits sexual differences, and it has become a useful tool in Forensic Science [34]. The nose is one of the best clues to racial origin. The nasal index is very useful in anthropology and it is one of the clinical anthropometric parameters recognized in nasal surgical and medical management [35]. Nasal index is related to regional and climatic differences. Various studies have indicated racial and ethnic differences in nasal index amongst different populations [36]. 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 European, possessing a fine nose. In Jingpo people in China are mesorrhine [37].

The shape of the external nose varies from one to another considerably. It is a pyramidal structure located in the midline of the mid face and attached to the facial skeleton [38]. Facial characters are mostly influenced by factors such as race, ethnicity, age, sex, and culture, and their variation has been the subject of an investigation from ancient times. [39,40] Morphometric difference in facial characters are always present among various races

in world geographic clusters.[41] Difference in nose types is significant in categorization between races [42]. Nasal index is the most common nasal parameter which may relate to regional and climatic differences. Longer narrower noses are favored in cold and dry climates while broader noses seen in warmer and moisten climate may consequence of natural selection in human evolution [43]. The morphological classification of face and nose has been successfully adopted by international security agencies. However, the use of morphological facial features in personal identification still remained inconclusive [44]. Facial identification with nasal morphometry is becoming more significant with the increase in crime rates, terrorist attacks [45]. Nasal index is also useful in anthropology in distinguishing racial and ethnic differences [46,47]. Nasal index is the ratio of nasal width to the nasal height multiplied by 100. It exhibits sexual differences and has become a useful tool in forensic sciences [48]. Dimensions obtained have a great potential to guide clinical decision, public health policy, relevant in aesthetic and reconstructive surgery, forensic investigation as well as studying variation in humans. The proportion of the nose and facial skeleton, both from in front and the side, are of utmost importance in rhinoplastic surgeon [49] Currently, very little data are available for Western Uttar Pradesh population [50]. Anthropometry comes from a Greek word “Anthropos” which means human and “metron” which means measure [51]. According to the WHO, the anthropometry is an inexpensive and noninvasive technique for assessing the size, proportions, and composition of the human body. Nasofacial anthropometry is a specific component of the anthropometric field that focuses on the facial and nasal regions which is also vital for sex determination, forensics uses, quantifying nasofacial dysmorphology, facial surgery, and diagnostic comprehension. By using accurate anthropometric measurements in craniofacial region, we can treat and reconstruct congenital or posttraumatic facial disfigurements successfully [52].

Anthropometry of any parts of the body varies between individuals and among races. The face and the nose are important physiognomic features in humans. Face and nose are developed from frontonasal prominences, nasal prominences, and maxillary and mandibular prominences and final characteristic of the face depends mainly on the changes in the proportion and position of these facial components, Moore [53]. The growth and development of humans are affected by many factors including geocological, biological, geographical, racial, gender, and age factors,[54,55].

Knowledge of the absolute and relative variability in the size and shape of the human body is crucial to study human growth, population variation, and medicolegal identification in forensics as well as in the optimization of instruments such as respirators, gas and dust masks, and military helmets [51].

Conclusion:

Therefore, it is expected that ethnic groups in the same climatic regions regardless of sexual dimorphism should have similarities in their nasal indexes . Anthropometric data of the face and nose obtained would be useful for sex determination, forensics medicine, identifying nasofacial dysmorphology, and reconstructive facial and nasal surgeries. More studies are needed in various fields of anthropometry within the Malaysian population to meet the demand in the medical and surgical fields. Our study results suggest that the nose can be a useful anthropometrical tool in determination of gender in forensic science and classification of fossil remains.

REFERANCES:

- 1.Edler R, Agarwal P. Use of anthropometry in facial attractiveness. *The European Journal of Orthodontics*. 2006;28(3):274–281.
2. Symons D. *The evolution of human Sexuality*, Oxford University Press, New York;1979.
3. Gray H. *Gray’s Anatomy*. 38th ed. London: Churchill and Livingstone, 1995: 432–5.
4. Barel P, Lobo SW, Menezes RG, Kanchan T, Krishan K, Bhattacharya S, Hiremath SS. An Anthropometric study of facial height among four endogamous communities in the sansari district of Nepal. *Singapore Med J* 2010;51(3):212
5. Madison G. *The passing of the great race part 1 language and nationality* 2004, Chapter, 2–4.
6. Hansen B, Mygind N, How often do normal persons sneeze and blow the nose? *Rhinol*.2002;40(1):407–426.
7. Zankl A, Eberie L, Schinzel A. Growth chart for nose length, nasal protrusion and philtrum length from birth to 97 years. *Am.J.Med. Genet*. 2002; 111(4):388–391

8. 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.
9. Krishan K, Kumar R. Determination of stature from cephalo-facial dimensions in a North Indian population. *Legal Medicine* 2007 9(3):128-33
- 10.. Krishan K. Estimation of stature from cephalo-facial anthropometry in north Indian population. *Forensic Science International* 2008,181(1-3):52e1-52e6.
11. Moore K. L. and Dalley A. F. *Head and Neck; Clinically oriented anatomy*. Lippincott-Williams and Wilkins Publishers, Philadelphia.1999, PP.850-852
12. blishers, Philedelphia.1999, PP.850-852. 7. Williams P. L, Warwick R., Dyson. M, Bannister L. H. *Grays Anatomy 37th Edition*, Churchill Living Stone London.1995, Pp. 601-612
13. Akpa A. O. C. Ugwu C., Maliki A. O, Maliki S. O. Morphometric study of the nasal parameters in Nigeria Igbos. *Journal of Experimental and Clinical Anatomy*.2003.
14. Eickstedt E. V. *The races and types of western Himalayas*. Man in India 1926, Pp.237.
15. 4. Last R. J. *Anatomy applied and regional*. 6th edition. Churchill Livingstone 1981. Pp. 398 – 403.
16. Hall R. L, Hall D. A. *Geographic variation of native people along the pacific coast*. *Human Biology* 1995, Pp. 407-426.
17. Daniel B. *Racial anthropology and genetics of the Lebanese*. www.nasalindex of Lebanese.com 2002, Pp1-2.
18. Williams P. L, Warwick R., Dyson. M, Bannister L. H. *Grays Anatomy 37th Edition*, Churchill Living Stone London.1995, Pp. 601-612
19. Daniel R. K. *Hispanic rhinoplasty in the United States with emphasis on the Mexican American Nose*. *Plastic Reconstruction Surgery* 2003. Pp. 244-56
20. Aung, S. C., Foo C. L, Lee S. T. Three dimensional laser scan assessment of the oriental nose with a new classification of oriental nasal types. *Br. J. Plastic surgery* 2000, Pp. 109-116.
21. Elkind N. D., Evrei N , Joseph Jacobs. *The racial characteristics of modern Jews* 1903, Pp.23-62. 20. Hardlika, A. *Practical anthropology*. Philadelphia 1939. Pp. 85 – 92.
22. Fonseca E, Jorge J. A conservation approach to male rhinoplasty. *Aesthetic plastic surgery* 1996, Pp. 20 22. 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, Pp 37-40.
23. Oladipo G. S., Olabiyi A. O., Oremosu A. A. and Noronlu C. C. Nasal induces among major ethnic groups in Southern Nigeria. *Scientific Research and Essay* 2007, Pp. 20-22.
24. Oladipo G. S., Olotu J. E. and Didia B. C. Anthropometric study of Nasal parameters of the Ogonis in Nigeria. *Scientia Africana* 2007, Pp. 69 – 71
- 25- readth. *Am J. Physical Anthropology* 1991,Pp 419 – 427.
readth. *Am J. Physical Anthropology* 1991,Pp 419 – 427.
26. Hiernaux J, Hartono D. B. *Physical measurements of the adult Hadza of Tanzania* 1980, Pp 339 – 346.
27. Nichani J. R. Dimensional analysis – It's role in our preoperative surgical planning of rhinoplasty. *Clinical Otolaryngology and Allied Sciences* 2004, Pp. 5
28. Ochi K, Ohashi T. The effects of an external nasal dilator and nasal dimensions in Asians. *Otolaryngol Head Neck Surg*. 2002, Pp. 160 – 163

29. Karambelkar RR, Shewane AD, Karambelkar RA, Umarji BN. Comparison of nasal morphology between Southern and Northern India. *Anatomica Karnataka* 2013;7(1):26-30.
30. Madison G. The passing of the great race past 1 language and nationality 2004, chapter 2;2-4. [3]. Lenog SC, Eccles R. A systematic review of Nasal Index and the significance of the shape and size of the nose in rhinology. *Clin Otolaryngol* 2009;34(3):191-8
31. Last RJ. *Anatomy Applied and regional 6edition*. Churchill Livingstone 1981:398-403.
32. Hall RL, Hall DA. Geographic variation of native people along the pacific coast. *Human biology* 1995:407-25.
32. Gangrade PR, Babel Hitesh. Anthropometric study of the nasal index of the Bheel – Meena tribe of Southern Rajasthan. *International journal of current research and review* 2012;04(19):88-90.
33. Gray H. Inner ear. In: Standring S. *Gray's Anatomy. The Anatomical basis of clinical practice*. 40 edition. London: Churchill Livingstone Elsevier, 2008;633-50.
34. Kaushal S, Patnaik VVG, Kaur P. Somatometric analysis of nasal morphology of Punjab. *Human Biology Review* 2013;2(1):1-11.
35. Otobo T, Otobo RT. The clinical Significance of Nasal Index in Ethno-Racial specific rhinoplasty. *The FASEB Journal* 2015;29(1):697.
36. Hegazy AA. Anthropometric Study of Nasal Index of Egyptians. *International Journal of Anatomy and Research* 2014;2(4):761-7.
37. Staka G, Dragidella F, Disha M. Anthropometric Study of Nasal Index of the Kosovo Albanian population. *Antrocom Online Journal of Anthropology* 2012;8:457-62.
38. 1. Standring S, editor. *Gray's Anatomy. The Anatomical Basis of Clinical Practice*. 40th ed. New York, Edinburgh: Churchill & Livingstone; 2008. p. 547.
39. Vegter F, Hage JJ. Clinical anthropometry and canons of the face in historical perspective. *Plast Reconstr Surg* 2000;106:1090-6.
40. Kanan UG, Achleshwar G, Apurva D. Morphometric variation in nose types of Gujarati population. *Asian J Med Res* 2012;1:118-20.
- 42.. Rajakshmi CH, Singh MS, Devi HB, Chandramani singh L. Cephalic index of foetues of Manipuri population – A baseline study. *J Anat Soc India* 2001;50:8-10.
43. Franciscus RG, Long JC. Variation in human nasal height and breadth. *Am J Phys Anthropol* 1991;85:419-27.
44. Hall RL, Hall DA. Geographic variation of native people along the Pacific Coast. *Hum Biol* 1995;67:407-26.
45. Roelofse MM, Steyn M, Becker PJ. Photo identification: Facial metrical and morphological features in South African males. *Forensic Sci Int* 2008;177:168-7
46. Ritz-Timme S, Gabriel P, Obertová Z, Boguslawski M, Mayer F, Drabik A, et al. A new atlas for the evaluation of facial features: Advantages, limits, and applicability. *Int J Legal Med* 2011;125:301-6.
47. Porter JP, Olson KL. Analysis of the African American female nose. *Plast Reconstr Surg* 2003;111:620-6. 1
48. Aung SC, Foo CL, Lee ST. Three dimensional laser scan assessment of the Oriental nose with a new classification of Oriental nasal types. *Br J Plast Surg* 2000;53:109-16.
49. Zhang XT, Wang SK, Zhang W, Wang XF. Measurement and study of the nose and face and their correlations in the young adult of Han nationality. *Plast Reconstr Surg* 1990;85:532-6.

50. Xu B, Wang Y, Ma J, Li M, Xu L. A computer-aid study on the craniofacial features of Archang race in Yunnan province of China. *Hua Xi Kou Qiang Yi Xue Za Zhi* 2001;19:394-6.
51. N. Khan, V. Leela, and G. Annavarapu, "A study of craniofacial anthropometrics in hyderabad (Deccan)—and a review of literature," *Journal of Medical & Allied Sciences*, vol. 2, no. 2, pp. 54–57, 2012.
52. L. G. Farkas, M. J. Katic, and C. R. Forrest, "International anthropometric study of facial morphology in various ethnic groups/races," *The Journal of Craniofacial Surgery*, vol. 16, no. 4, pp. 615–646, 2005. K. L. Moore, *Before We are Born: Essential of Embryology and Birth Defects*, San Diego, Calif, USA, Elsevier Science, 6th edition, 2003.
53. M. Jahanshahi, M. J. Golalipour, and K. Heidari, "The effect of ethnicity on facial anthropometry in Northern Iran," *Singapore Medical Journal*, vol. 49, no. 11, pp. 940–943, 2008.
54. C. Kurnia, S. Susiana, and W. Husin, "Facial indices in chinese ethnic students aged 20–22," *Journal of Dentistry Indonesia*, vol. 19, no. 1, pp. 1–4, 2012.
55. Ravichandran, Sudarsan, K. Yuvraj Babu, and Karthik Ganesh Mohanraj. "Correlation of facial and nasal index in gender determination." *Drug Invention Today* 10.12 (2018).
56. Svitlana, A. Shreya. "Study of nasal index among students of Saveetha Dental College." *Drug Invention Today* 10 (2018).

