Anthropometric Study of Nasal Index among the Population of Bangladeshi Santal Female

Moumita Talukder[1], Ripon Kumar Das[2], Sagana Shahreen Chowdhury[3], Zinnat Ara Yesmin[4], Laila Anjuman Banu[5]

Abstract:

Context: *The craniofacial anthropometric norms are essential for establishing the facial identity of a person. The Santal community being one of the major tribes of Bangladesh, there are few recorded data in the literature on the craniofacial anthropometry of that population. Study addressing the craniofacial anthropometry of the adult Santal females of Bangladesh can make a contribution in setting a standard of normative craniofacial anthropometric values and indices of adult Bangladeshi Santal females.*

Materials and methods: *The study was a cross-sectional descriptive type with observational components carried out in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, between July 2012 and December 2013. The study was conducted on 100 Santal females of Sirajgonj district, Bangladesh. The nose height and the nose width were measured using physical procedure and nasal indices were calculated.*

Results: The nasal indices showed that nose of Bangladeshi Santal females are leptorrhine (50%), mesorrhine (42%), Hyperleptorrhine (5%) and Chamaerrhine (3%).

Conclusion: *The study findings depict that nose of Bangladeshi Santal females are mostly leptorrhine (50%) and mesorrhine (42%).*

Key words: *Anthropometry, nose height, nose width, nasal index*

Introduction

Anthropometry plays an important role in industrial design, clothing design, ergonomics and in architecture, where the data obtained from anthropometric measurements are used to produce various products, equipment, tools, clothing, furniture, shoes, goggles interior dimension of airplane cockpits, helmets, and submarine dimension.[1] For establishing the facial identity of a person the craniofacial anthropometric norms are essential. The craniofacial anthropometric data are also used in forensic

[1]Assistant Professor, Department of Anatomy, Shaheed Suhrawardy Medical College, Dhaka

[2]Junior Consultant, Orthopaedic surgery, NITOR, Dhaka

[3]Lecturer, Department of Anatomy, Shaheed Suhrawardy Medical College, Dhaka

[4]Assistant Professor, Department of Anatomy, Bangabandhu Sheikh Mujib Medical University, Dhaka

[5]Professor of Genetics and Molecular Biology, Bangabandhu Sheikh Mujib Medical University, Dhaka

Correspondence: Dr. Moumita Talukder
Email: moumitatalukder150@gmail.com

medicine, treating congenital or post traumatic disfigurement and diagnostic knowledge between patient and normal population, plastic surgery, oral surgery, pediatrics and dentistry. Anthropometric evaluation is an essential feature of geriatric nutritional evaluation for determining malnutrition, overweight, obesity, muscular mass loss, fat mass gain and adipose tissue redistribution.[2] Ecological, biological, geographical, racial, gender and age factors influence the dimensions of human body.[3] Prasad et al[4] discuss Krishan's research work that, environmental and genetic factors influence the architecture of internal structure and tissue components, shape and form of an individual. In addition, sex has a direct relationship with anthropometric characteristics. Koirala[5] stated that 'anthropometry is the hallmark technique that deals with the study of body proportion and absolute dimensions that vary widely with age and sex within and between racial groups'.[5] Many craniofacial values would help in assessing 'appropriate beauty'. Thus craniofacial anthropometry has also

been considered as useful for artists, beauticians and hair designers. Choe et al[6] opined that a beautiful face arises from symmetric, balanced and harmonious proportions. The authors also mentioned that reestablishment of facial harmony requires restoration of proportional facial structures and elimination of disproportionate relationships. People of different religions and ethnic groups vary genetically and geographically in their craniofacial features. Therefore, a single standard of anthropometric variables is not appropriate for being applied to diverse racial and ethnic groups. The craniofacial indices provide a system for metrical parameters of sizes and proportions of craniofacial features.[7] Craniofacial indices yield a numerical expression, and it is an important parameter in evaluating inter and intra- population comparisons of crania as well as the sexual dimorphism.[7] Craniofacial anthropometry is a comparatively new field in Bangladesh. According to Bangladesh population census of 1994[9], the total Santal population in Bangladesh is almost 2, 25,000. The Santal community is one of the oldest ethnic groups in Bangladesh and India. Craniofacial anthropometric studies on the Santal communities are not very abundant in the available literature. However, to the best of the present researcher's knowledge, there is probably no recorded data of the craniofacial measurements of Bangladeshi Santal females. The people from the Santal ethnic group are visibly somewhat different in their physical characteristics from the Bengali population. Broadly speaking, they carry the racial characteristics of the Proto-Australoid.[8] The Santal are one of the oldest and largest tribal population in Bangladesh which migrated from the mainland of Australia to India and belongs to the "Proto-Australoid" race.[8] The results of this study are expected to be useful to physical anthropologists, genetic counselors, forensic scientists, beauticians, plastic and reconstructive surgeons as well as many others of different fields.

Materials and methods
A cross-sectional and descriptive type of study with some observational component was conducted on one hundred adult Santal females of Ranirhat, Belghoria and Nawpan areas of Sirajgonj district

in Bangladesh. Data analysis was carried out in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. Ethical clearance to conduct the research was obtained from the Institutional Review Board (I.R.B) of BSMMU. Prior permission was taken from relevant authorities from the local community leaders before commencement of the study. All the participants aged from 25 to 45 years, female by sex, Santal by ethnicity, Bangladeshi by nationality were selected using convenience sampling technique. Individuals with mixed ethnic origin, any craniofacial abnormality, pregnancy, history of respiratory distress, heart failure, renal failure, malocclusion of teeth, common genetic, endocrine or neurological disorder, any trauma or surgery of the face or nose were excluded from the study.

The anatomical landmarks
Nasion (n) - It is the midpoint of the nasofrontal suture. In the lateral view, it represents the apex of the frontonasal angle.

Subnasale(sn) - It is the junction between the lower border of the nasal septum and the cutaneous portion of the upper lip in the midline.

Alare (al) - It is the most lateral point on the nasal ala on each side of the nose.

Anthropometric measurements:
i)   **Nose height (n-sn):** It is the linear distance from the 'nasion' to the 'subnasale'.

ii) **Nose width (al-al):** It is the linear distance between the 'alares'.

**Procedures of Measuring the Variables Studied:** All the nasal measurements were taken with the participants sitting on the chair; head in anatomical position.[10] All the measurements were taken twice to control for measurement error and were recorded in the data sheet with the help of a volunteer. The final value that was used for the study was the average of the two obtained values. A third reading was taken if the initial two measurements showed a major discrepancy and the two closer readings would then be used.[11] For measuring the nose height, the sliding caliper was held vertically with the inner edge of the fixed arm

was placed to the subnasale, holding it in place with the thumb and index fingers, with the scale to the side of the participant's nose. The movable arm was slide up to the nasion[12] and the digital reading was then recorded in millimeters. For measuring nose width, the participant was asked to sit relaxed without flaring the nostrils or moving the nasal tip at the time of the measurement so that the dimensions of the nose did not alter. The sliding caliper was opened slightly wider than the width of participant's nose. The caliper was approached until the tips were just passing the maximum lateral curvature of the alae. Carefully, the tips were closed until the inner edges of the arms of the caliper just touched lateral edges of the alae (alare). Care was taken not to compress these soft tissue landmarks when measurement was taken.[12] The digital reading was then recorded in millimeters.

The variables of nasal index were calculated. The nasal index is the ratio of nasal width to the nasal length expressed as percentage.[8]

Nasal index: It is the ratio of the nasal width to the nasal length expressed as a percentage.[8] The formula is:

$$\text{Nasal index} = \frac{\text{Nasal width (al – al)}}{\text{Nasal height (n – sn)}} \times 100$$
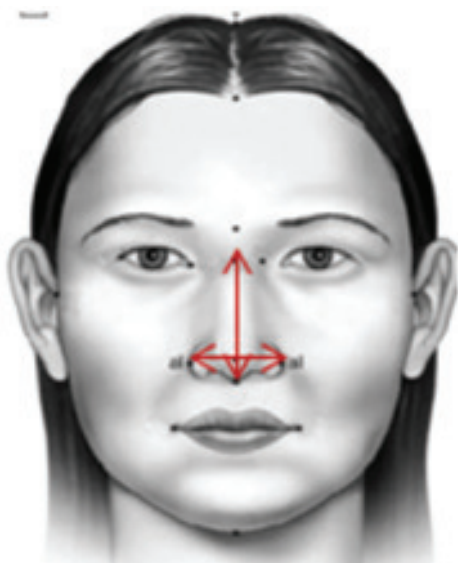
Fig-1: *Diagrammatic representation of nasal index of a manikin*

The above index was determined on the basis of international anatomical descriptions. Based on this index, the types of nose shapes were categorized according to Martin and Saller classification [13] (Table I).

Table-I
Categories of the classical nasal index

| Category	Index value
Hyperleptorrhine (very narrow nose)	≤54.9
Leptorrhine (narrow nose)	55.0-69.9
Mesorrhine (medium nose)	70.0- 84.9
Chamaerrhine (wide nose)	85.0-99.9
Hyperchamaerrhine (very wide nose)	≥100.0

After collection of the data, the values of the different selected nasal variables were manually entered into a computer-based software program. Data analysis was done using SPSS (Version 17).

Results

Table -II
Measurements of craniofacial variables and calculated index

Measurement (cm)	Value (cm)	
	Range	Mean (± SD)
Nose height	3.60-5.70	4.45 (± 0.32)
Nose width	2.25-3.73	3.07 (± 0.34)
Nasal index	50.56-88.09	69.29 (± 8.37)

The frequency distribution of the nasal index suggests that fifty percent of the Santal females had narrow or 'leptorrhine' (50%) followed by medium or 'mesorrhine' (42%) nose. 5% of the nasal indices were less than 54.9 and 3% of the nasal indices ranged from 85 to 99.9 (Figure 2). No hyperchamaerrhine or very wide nose was found.
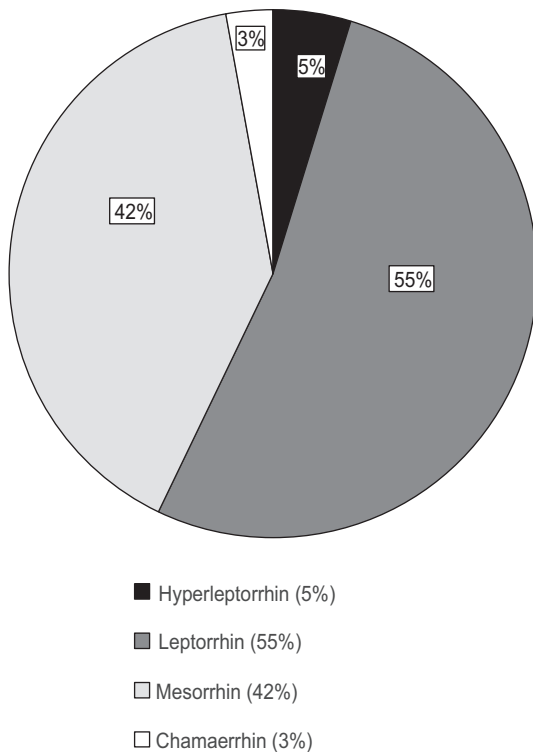
Fig.-2 *Relative percentage frequencies of different nose types based on the nasal index in the Santal females.*

Discussion:

The Santal females of the present study were found to have a similar mean value to a Dravidian 'Malaysian Indian' female population of Malaysia.[11] When compared with the Negroid populations, the Santal females of the present study were found to have a much lower mean than a 'Onge' population of Little Andaman Island[13] , 'Yoruba'[14] , 'Omoku'[15] population of Nigeria. On the other hand, the Santal females of the present study were found to have a relatively greater mean than a 'Hausa' population of Nigeria .[16] The present study findings showed a considerably greater mean value than a Caucasoid population of European ancestry, USA.[17] The present study showed a much lower mean than that of a Mongoloid females like 'Garo' tribe of Bangladesh[18] whereas the present study was found to have a similar mean value to a 'Korean American' female population of USA .[19] When compared to the other Indian sub continental

populations, the Santal females of the present study were found to have a much lower mean than the studied 'Dangi' and 'Ahiwar' subcast.[20] According to anthropological studies, the shape of nose can be influenced by the environmental climatic condition, race and tribe. Large nasal index indicates broad nose which is correlated with hot and moist climate, and small nasal index indicates narrow nose which is correlated with cold and dry conditions .[14] As the climate of Sirajgonj district of Bangladesh is moderate, small nasal index could be helpful for Santal to adapt and to survive efficiently in this climatic condition of their surroundings. For this reason, it is thought that the differences in nose shape among populations are not only for racial, ethnical and genetic factor but also for adaptation of climate. That is why the people of different racial groups show similarities, while people of similar racial groups show variations in nose shape.

Conclusion

Considering the various nasal measurements and indices, the majority of the adult Santal females of the present study had narrow or 'leptorrhine' (50%) followed by medium or 'mesorrhine' (42%) nose. The results of the present study on the adult Bangladeshi Santal population can provide the basic framework for formulating the standards of various anthropometric variables in the population. Some of comparisons made with other populations can contribute to the understanding of the relative status of the Santal population in the context of the anthropometric variations around the world, especially among the Proto-Australoid population. This would encourage others in taking up further research in this field. Apart from physical anthropology and forensic anatomy, these measurements would be useful in the fields of plastic surgery, oral surgery, ophthalmology, and otolaryngology as well as to the beauticians.

population who participated in the study showing extreme patience and being kind during data collection.

References:

1. 'Anthropometry' [Internet]. Wikipedia, wiki article. 2014 [viewed 10 February 2014] Available from: http://en.wikipedia.org/wiki/Anthropometry

2. Sanclez-Garcia, S, Gercia-Pena, C, Duque-Lopez, MX, Juarez- cedilla, T, Cortes- Nunez, AR and Reyes –Beamer, S. Anthropometric measures and nutritional status in a healthy elderly population. Biomed central public health. [Internet] 2007; 7(2): 1-10. Available from: doi:10.1186/1471-2458-7-2

3. Jahanshahi, M, Golalipour, MJ & Heidari, K. The effect of ethnicity on facial anthropometry in northern Iran. Singapore medical journal. [Internet] 2008 [viewed 30 July 2013]; 49(11): 940-43. Available from: http://www.ncbi.nim.nih.gov/pubmed/19037564

4. Prasad, A, Bhagwat, VB, Porwal, S and Joshi, DS. Estimation of human stature from length of ulna in Marathwada region of Maharashtra. International Journal of Biological & Medical Research. [Internet] 2012 [viewed 10 February 2014]; 3(4): 2337-41. Available from:http://www.biomedscidirect.com/journalfiles/IJBMRF2012970/estimation_of_human_stature_from_length_of_ulna_in_marathwada_region_of_maharashtra.pdf

5. Koirala, S. A comperative anthropometric study of Mongoloid and Tharu ethnic races in eastern Nepal. Webmedcentral.com. [Internet] 2012 [viewed 31 July 2013]; 3(6): 1-23 Available from: http://www.webmed-central.com/article_view/3512

6. Choe, KS, Sclafany, AP, Litner, JA, Yu, GP & Romo, T. The Korean American woman's face anthropometric measurements and quantitative analysis of facial aesthetics. Archives of facial plastic surgery. [Internet] 2004 [viewed 30 July 2013]; 6: 244-52. Available from:http://www.ncbi.nim.nih.gov/pubmed/15262719

7. Ilayperuma, I. Evaluation of cephalic indices: a clue for racial and sex diversity. International Journal of Morphology. [Internet] 2011, [viewed 30 July 2013]; 29(1): 112-17. Available from: http://www.scielo.cl/pdf/ij morphol/v29n1/art 19.pdf

8. Sharma, RN & Sharma, RK. Anthropology, [Internet] .Atlantic Publishers and Distributors, New Delhi. 1997[viewed 12 February 2014]. Available from:http://books.google.com.bd/books/about/Anthropology. html?id=dDrYsjGq35wC&redir_esc=y

9. Bangladesh.The Santals in Bangladesh. [Internet]. 2013[viewed 6 August 2013]. Available from: http://The%20 santals%20in%20Bangladesh-%20Bangladesh-Sirajgonjhtm.

10. Lobo, SW, Chandrashekhar, TS & Kumar, S. Cephalic index of Gurung community of Nepal - an anthropometric study. Kathmandu University Medical Journal. [Internet] 2005 [viewed 16 February 2014]; 3(3):263-65, Available from:http://imsear.hellis.org/bitstream/123456789/46152/2/kumj2005v3n3p.263.pdf

11. Ngeow, WC & Aljunid, ST. Craniofacial anthropometric norms of Malaysian Indian. Indian Journal Of Dental Research. [Internet] 2009 [viewed 11February 2014] ; 20(3): 313-19, Available from: http://www.ijdr.in/article.asp?issn=09709290;year=2009;volume=20;issue=3;spage=313;epage=319;aulast=Ngeow

12. Kolar, JC & Salter, EM. Craniofacial anthropometry: practical measurement of the head and face for clinical,surgical and research use. Springfield, Illinois: Charles C Thomus Publisher Ltd.;

13. Pandey, AK. Cephalo-facial variation among Onges, Anthropologist. [Internet] 2006 [viewed 10 July 2013], vol. 8(4): 245-49, Available from: http://www.krepublishers.com/02-Journals/T-Anth/Anth-08-0-000-000-2006-Web/Anth-08-4-219-286-2006-Abst-PDF/Anth-08-4-245-249-2006-366-Pandey-A-K/

Anth-08-4-245-249-2006-366-Pandey-A-K-Text.pdf

14. Ikechukwu, CE, Bassey, T & Ihentuge, C. Study of nasal indices and bialar angle of the Ibo and Yoruba ethnic groups of Nigeria. Journal of biology, agriculture and healthcare, [Internet] 2012, [viewed 25 July 2013]; 2(11): 149-52 Available from:http://www.liste.org/journals/index.php/JBAH/article/download/3674/3723

15. Oladipo, GS, Okoh, PD, Akande, PA & Oyakhire, MO. Anthropometric study of some craniofacial parameters: head circumference, nasal height, nasal width and nasal index of adult Omoku indigenes of Nigeria. American journal of scientific and industrial research. [Internet] 2011[viewed 6 July 2013], 2(1):54-57 Available from: www.scihub.org/AJSIR/PDF/2011/1/AJSIR-2-1-54-57.pdf

16. Anas, IY. Nasal index of the Hausa ethnic group, a study conducted on students at Bayero university Kano. *Journal of medicine in the tropics*, [Internet]2010 [viewed 10 August 2013] vol.12, pp. 42-44,, Available from:http://dspace.unijos.edu.ng/bitstream/10485/1197/1/Nasal%20Index%20of%20the%20Hausa%20Ethnic%20Group,%20a%20Study%20Conducted.pdf

17. Lim, SB. Sexual dimorphism in soft tissue facial form as captured by digital three-dimensional photogrammetry, masters thesis, University of Pittsburgh, USA. [Internet]2012 [viewed 31 July 2013]. Available from: http://d-scholarship.pitt.edu/12444/2/Lim_Masters_ETD.pdf

18. Ferdousi, A. A comparative study of craniofacial anthropometry between adult Christian Bangladeshi Garo males and females, [MPhil thesis]. Dhaka: Bangabandhu Sheikh Mujib Medical University; 2011

19. Choe, KS, Sclafany, AP, Litner, JA, Yu, GP & Romo, T. The Korean American woman's face anthropometric easurements and quantitative analysis of facial aesthetics. Archives of facial plastic surgery. [Internet] 2004 [viewed 30 July 2013]; 6: 244-52, Available from: http://www.ncbi.nim.nih.gov/pubmed/15262719

20. Singh, P & Purkait, R. A Cephalometric study among sub caste groups Dangi and Ahirwar of Khurai block of Madhya Pradesh. Anthropologist. [Internet] 2006 [viewed 11 February 2014]; 8(3): 215-17. Available from: http://www.krepublishers.com/02-Journals/T-Anth/Anth-08-0-000-000-2006-Web/Anth-08-3-147-214-2006-Abst-PDF/Anth-08-3-215-217-2006-180-Singh-P/Anth-08-3-215-217-2006-180-Singh-P-Text.pdf