Research Article

Gender Based Comparative Morphometric Analysis of Adult Nose

Muhammad Naeem[1], Bakht Aziz[2], Maroof Aziz Khan[3], Azhar Hameed[4]

[1] Associate Professor, Department of ENT, KEMU/ Mayo Hospital, Lahore; [2] Assistant Professor, Department of ENT, Lahore General Hospital, Lahore; [3] Professor & Head of ENT Department, KEMU/ Mayo Hospital,, Lahore; [4] Former Professor of ENT, KEMU/ Mayo Hospital, Lahore.

Abstract

Background: The measurements of nose is important cosmetically and medico legally. It is being done since Greek age. In modern times its importance is increased.

Objective: To determine the values of morphometric measurements from nose of adult males and females and to compare them with each other.

Material & Method: This Comparative cross sectional study was conducted at Mayo Hospital Lahore during April 2014 to December 2014. Total of 210 subjects were recruited initially, while 10 patients did not follow. So total 200 patients were studied. Surface measurements were taken directly from the nose of all subjects. Data was recorded and analyzed in SPSS.

Results: Mean length of dorsum of nose was 5.22±0.41 cm in males and 4.74±0.31cm in females. Nasal width was 3.91±0.26cm in males and 3.79±0.28cm in females. Distance between nasal tip and level of upper lip was 1.21±0.29cm in males and 1.42±0.22cm in females. Naso-frontal angle was 151.18±5.33° in males and 148.75±6.25° in females. Naso-labial angle was 105.25±11.01° in males and 109.53±9.35° in females. Stomion- Menton (SM) distance was 4.37±0.43cm in males and 4.05±0.30cm in females. Nasal root width was 1.69 cm in males and 1.41 cm in females.

Conclusion: Data explained that nose of male is longer and wider as compared to females. Nasal length is greater than SM distance. Nasal root is narrow in our population. Naso-frontal angle is greater in males as compared to females while naso-labial angle is greater in females as compared to males.

Received | 20-08-2018: **Accepted** | 27-09-2019

Corresponding Author | Dr. Muhammad Naeem, Associate Professor, Department of ENT, KEMU/ Mayo Hospital, Lahore
E-mail: drnaeem_ent@outlook.com

Keywords | Morphometric, Anthropometry, Nose.

Introduction

Anthropometry comes from a Greek word. "Anthropos" which means human and "Metron" which means to measure.[1]

Anthropometry is the science which deals with measurements of the size, width and proportions of human body. Face is the defining feature of a person. Every part of the face plays a vital role in producing a natural and harmonious look but nose has central and most prominent position on face and so accounts the most.

Measurements of the human face as part of the body have been performed since the Greek era.[2] Disfigurement of the nose causes psychosocial problems so normal measurements of nose should be available to improve its shape. The improvement of facial aesthetics has rapidly become one of the desired

objectives of orthodontic treatment.[3] Aesthetic features are different from one race to another and this should be considered for treatment planning.[4] For reconstructive and cosmetic surgery, realistic sizes and proportion are assessed using anthropometric techniques and used as guidelines to correct deformities and disproportions.[2] The nose must not only be looked at in isolation, but also with respect to the rest of the face, in order to create or preserve overall facial balance and harmony.[5] The size and shape of nose is important aesthetically in both sexes as males on average have larger noses than females.[6]

Since differences in size and shapes of noses are important in aesthetic surgery therefore the purpose of present study was to obtain average morphometric values and variation in different parameters of nose of males and females in Pakistan. This study provides gender based comparative morphometric analysis of nose which is important for cosmetic surgery. The morphometric measurements of nose, its relations with face and its gender based comparison not previously done in Pakistan. So this study fills the gap in local research, gives values for proper aesthetic surgery and medico legal examinations.

Methods

After obtaining informed consent and ethical permission, total of 210 patients,[8] 105 males and 105 females were recruited for study. Ten patients did not follow. So total 200 patient, 100 males and 100 females from different areas of Pakistan visiting ENT Department of Mayo Hospital, Lahore, Pakistan were randomly selected and recruited for this study[(8)]. Adult male and female ENT patients without any acute illness and who were willing for this study were included while patients with pain, any noticeable nasal or facial disfigurement, previous nasal or facial surgery or any other acute illness or not willing for this study were excluded.

Mayo Hospital Lahore is a tertiary care hospital that provides health care to patients coming from all over Pakistan. Surface measurements were taken directly from noses of the subjects included in the study by measuring tape and a protractor. Each variable was measured twice in centimeters and angles in degrees by the same investigator. Measurements included were length of dorsum of nose, width of nose, nasal root width, Naso-frontal angle, Naso-Labial angle, Stomion to Menton (SM) distance, distance from Alar-Cheek junction to tip of nose, distance from Alar-Cheek junction to vertical line over most projecting point of upper lip and distance from line over most projecting point of upper lip and tip of nose as shown in figure 1. Demographic profile relevant data was recorded in a standard research tool (SPSS). Mean and standard deviations were compared for qualitative variables like age. Mean of various morphometric measurements of nose of males and females were taken.

Data entry and analysis was done by using SPSS 20. Quantitative variables were presented by using mean±SD while qualitative variables were presented by using frequency table and percentage. Independent sample T-test / Mann Whitney U test was applied to see the difference of morphometric measurements in males and females. Correlation co-efficient was determined to see the correlation between age and morphometric measurements in male and female. p-value ≤ 0.05 was taken as significant.

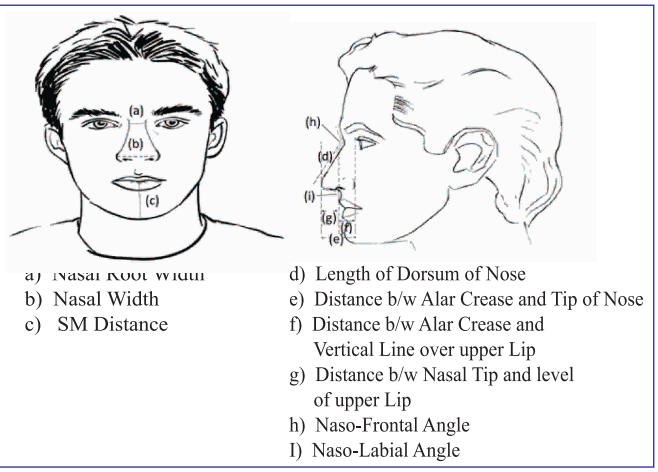

Figure 1: *Pictorial view for Measurements Calculations of Nose*

Result

Table 1: *Comparison of Morphometric Parameters*

Parameters	MEAN±SD		MINIMUM		MAXIMUM		p-value
	Male N=100	Female N=100	Male N=100	Female N=100	Male N=100	Female N=100	
Length of Dorsum of Nose	5.22±0.41 cm	4.74±0.31 cm	4.50	4.00	6.00	5.50	0.0001
Nasal Width	3.91±0.26 cm	3.79±0.28 cm	3.00	3.00	4.50	4.40	0.0001
Distance b/w Alar crease and tip of nose	2.56±0.32 cm	2.43±0 .23 cm	1.80	1.90	3.40	3.00	0.005
Distance b/w Alar crease and vertical line over upper lip	1.34±0.22 cm	1.00±0.13 cm	1.00	0.70	2.20	1.40	0.0001
Distance b/w Nasal Tip and level of upper Lip	1.21±0.29 cm	1.42±0.22 cm	0.60	1.00	200	1.90	0.0001
Nasal Root Width	1.69±0.13 cm	1.41±0.16 cm	1.30	1.00	1.90	1.80	0.0001
Naso-Frontal Angle	151.18±5.33 °	148.75±6.25 °	135	130	160	160	0.002
Naso-Labial Angle	105.25±11.01 °	109.53±9.35 °	90	90	130	130	0.004
SM Distance (Stomio-Menton)	4.37±0.43 cm	4.05±0.30 cm	3.50	3.40	5.00	5.00	0.0001

Note: Assumptions of normality was not full filled so Mann Whitney U test was applied to see the difference of morphometric parameters in males and females.

Among male participants age showed positive significant correlation for distance b/w nasal tip and level of upper lip, and nasal root width. While naso-frontal and naso-labial angles were negatively correlated with age in male participants. Among female participant Distance between Alar crease and vertical line over upper lip was negatively and distance between nasal tip and level of upper lip was positively correlated with age as shown in table "2".

Table 2: *Correlation of Age with Facial Morphometric Parameters*

Morphometric Parameters	Age(years) Correlation Co -efficient (r)			
	Male	p-value	Female	p-value
Length of Dorsum of Nose	0.156	**0.120**	0.049	**0.631**
Nasal Width	0.126	**0.211**	0.182	**0.07**
Distance b/w Alar crease and tip of nose	0.117	**0.244**	0.056	**0.577**
Distance b/w Alar crease and vertical line over upper lip	-0.099	**0.327**	-0.263**	**0.008**
Distance b/w Nasal Tip and level of upper Lip	0.235*	**0.018**	0.213*	**0.034**
Nasal Root Width	0.229*	**0.022**	0.1	**0.322**
Naso Frontal Angle	-0.342*	**0.000**	0.003	**0.978**
Naso Labial Angle	-0.216*	**0.032**	-0.084	**0.407**
SM Distance (Stomio-Menton)	0.065	**0.519**	-0.056	**0.583**

Note: * Correlation is significant at the 0.05 level (2-tailed), ** Correlation at the 0.01 level (2-tailed).

Discussion

Nasal length is measured from Radix to tip of nose (RT). In present study, it was 5.22±0.41cm in males and 4.74±0.31cm in females which is very close to the measurements made by Mar Wai et. al. in Indian population which had nasal length of 5.134±2.76cm in males and 4.74±3.12cm in females (7). Nasal width represented by the inter-alar distance i.e. alare-alare (AL-AL) is measured between the most lateral points on the alar curvature.[7] The Nasal width in our study, in males was 3.91±0.26cm and in females was 3.79±0.28cm which is very close to the measurements made by Mar Mar Wai et al in Indian population which had nasal width of 3.985±2.76cm in males and 3.546±2.71cm in females.[8] So nose is longer and wider in males as compared to females. The nasal tip projection is measured by Goode's and Byrd's method[(9)]. According to Goode's method nasal height is divided by nasal length and its percentage is nasal tip projection.[9] Nasal height is distance from alar cheek junction to tip of nose.[9] According to Goode's method, in our study nasal tip projection in males is 49.04% of nasal length (2.55cm) and in females is 51.26% of nasal length (2.42cm). Our results are close to the study done by Mahmoud F ElBestar et al, which showed nasal tip projection as 58.50% of nasal length.[10] According to Byrd's method, in our study nasal tip projection is 47.26% (1.20cm) in males and 58.43% (1.41cm) in females.

Our results are close to the study done by Mahmoud F EiBestar which showed nasal tip projection as 49.40% of nasal height.[10] For assessment of tip projection, a line is drawn from alar-cheek junction to the tip of nose.[11] If 50-60% of the tip lies anterior to the vertical line adjacent to the most projecting part of upper lip then tip projection is normal.[5] The results of our study are comparable with another study done at Peshawar which presented the mean nasal tip projection in males and females as 1.5±0.48 and 1.3±0.24 cm respectively.[12] Tania et al presented more disparity with the present study that showed nasal tip projection 2.72±0.28 cm, 2.57±0.34 cm among males and females respectively.[13] Presently statistically significant difference in nasal tip projec-tion among males and females was observed which is in agreement with prior study.[13] In our study, the mean distance between alar-cheek junction and tip of nose is 2.56±0.32cm in males and 2.43±0.23cm in females and mean distance between nasal tip and level of most projecting part of upper lip 1.21±0.29 cm in males and 1.42±0.22cm in females. In our study, the distance between alar crease and vertical line over upper lip is ±0.22cm in males and 1.00±0.13cm in females. In our study, the mean length of the dorsum of nose was 5.22±0.41cm in males and 4.74±0.31cm in females ranging from 4.50cm to 6.00cm in males and 4.00cm to 5.50cm in females. In contrast, literature shows this length in reference to other measurements of face as Byrd and Hober calculated nasal length (RT) as being equal to the distance between Stomion and Menton (SM)[10] (so RT/SM ratio is 01). SM (Stomion to Menton) distance is 2/3rd of the lower 1/3rd of the face.[5] In our study, the mean SM distance is 4.37±0.43cm in males and 4.05±0.30cm in females, in contrast to study done by Jovana Milutinovic et al, the mean SM distance in anonymous females was 3.24cm and in attractive females was 2.8cm.[14] Nasal length (Radix to tip or RT) should ideally be equivalent to the Stomion to Menton (SM) distance. In our study RT/SM ratio is 1.19 in males and 1.17 in females as compared to 01 measured by Byrd and Hober.[9] For each and every parameter, the ratio between them is used, so that the actual length of the measured parameters is of no importance.[14]

The Radix or root of nose is the narrowest and back sited point of the nose which differentiates the nose from forehead.[15] In our study nasal root width is 1.69±0.13cm in males and 1.41±0.16cm in females in contrast to the study done by Naveen Reddy et al which showed it to be 1.31±0.11cm (1.04-1.58) in males and 1.23±0.11cm (1.02-1.46) cm in females.[16]

Naso-frontal angle is located between a line drawn from the radix tangent to the glabella and a second line from the same point tangent to nasal tip.[17] The latter can be tangential to the nasal dorsum as well.[18] A normal naso-frontal angle is 130±7 degrees in men and 134±7 degrees in women.[17] In contrast to this study, in our study, the naso-frontal angle in males was 151.18±5.33° and 148.75±6.25° in females. Another study done by Kyung Min Moon et al concluded the mean naso-frontal angle of 131.14° in males and 140.70° in females.[19]

The naso-labial angle is the angle formed between line coursing through the most anterior and posterior edges of the nostril and plump line dropped perpendicular to the natural horizontal facial plane.[5] This angle is usually between 95 and 100 degrees in women and 90-95 degrees in men.[5] In our study the mean naso-labial angle in men is 105.25±11.01 degrees and in women 109.53±9.35 degrees. In contrast to our study, another study done by Sinno HH et al the ideal naso-labial angle in females was 104.9±4.0 degrees and in males 97.0±6.3 degrees.[20]

Despite all the study lacks age related changes which could not be analyzed presently and is a future scope of upcoming study. Nasofrontal angles and other variations were noted to observe the norms of patients visiting to health facility and further to achieve diverse nomenclature in limited groups hence eases the management.

Conclusion

Normative data explained that nose of male is longer and wider as compared to females. Nasal length is greater than SM distance while literature shows them to be equal. Mean SM distance is greater than shown in the literature and nasal root is narrow in our population as compared to that of in Indians. Naso-frontal and naso-labial angles are also greater as compared to those of people of Far East. No parameter was same in either sex.

On the basis of results following key points may be

observed; 1. The study explained size and shape differences of noses of both genders in adults of Pakistan. 2. Data collected in present investigation can serve as a data base for the quantitative description of nose morphology in adults of each gender. 3. This data is important for aesthetic surgery. 4.The differences are important for aesthetic surgery.

References

1. Khan N, Leela V, Annavarapu G. A study of craniofacial anthropometrics in Hyderabad (Deccan) and a review of literature. J Med Allied Sci. 2012; 2(2):54-7.
2. Vegter F, Hage JJ. Clinical anthropometry and canons of the face in historical perspective. Plast Reconstr Surg. 2000;106(5):1090-6.
3. Subtelny JD. The soft tissue profile, growth and treatment changes. The Angle Orthodontist. 1961; 31(2): 105-22.
4. Kandhasamy K, Prabu NM, Sivanmalai S, Prabu PS, Philip A, Chiramel JC. Evaluation of the nasolabial angle of the Komarapalayam population. J Pharam BioAllied Sci. 2012 (3); 313-5.
5. Jeffery E, Jansi, Rod J, Rohrich. Grabb and Smith Plastic Surgery, 6th Edition; 2007; 517-32.
6. Liu F, Van Der Lijn F, Schurmann C, Zhu G, Chakravarty MM, Hysi PG, et.al. A genome-wide association study identifies five loci influencing facial morphology in Europeans. PLoS genetics. 2012;8(9):e1002932.
7. Nawres AA. Primary Repair of Bilateral Complete Cleft Lip Nasal Deformity: Iraqi Experience. Medical Journal of Babylon. 2013;10(2):325-35.
8. Wai MM, Thwin SS, Yesmin T, Ahmad A, Adnan AS, Hassan AA et al. Nasofacial Anthropometric Study among University Students of Three Races in Malaysia. Advances in Anatomy. 2015;(4) Article ID 780756.
9. Byrd HS, Hobar PC. Rhinoplasty: a practical guide for surgical planning. Plastic and reconstructive surgery. 1993;91(4):642-54.
10. ElBestar MF, AlMahdy AY, Gharib FM et al. Assessment of nasal tip projection. The Egyptian Journal of Otolaryngology. 2015;31(2):105-10.
11. Kopacheva-Barsova G, Nikolovski N, Netkovski J, Shirgoska B, Avramovski A. Risks and Complications in Aesthetic and Functional Septorhinoplasty. Macedonian Journal of Medical Sciences. 2013; 6(3): 238-43.
12. Mushtaq N, Awan MH, Saood M, Awan MH. Nasal tip projection estimated by holdaway analysis in orthodontic patients visiting rehman college of dentistry. Journal of Khyber college o f dentistry. 2017;7(2):32-4.
13. Arshad T, Shaikh A, Fida M.Comparison of nasal profile in various skeletal patterns. Journal of Ayub Medical College Abbottabad.2013;25(1-2):31-5.
14. Milutinovic J, Zelic K, Nedeljkovic N. Evaluation of facial beauty using anthropometric proportions. The Scientific World Journal. 2014 (1); Article ID 428250.
15. Pousti SB, Jalessi M, Asghari A. Management of nasofrontal angle in rhinoplasty. Iranian Red Crescent Medical Journal. 2010;12(1):7-11.
16. Reddy N, Singh TR, Reddy S, Guruprasad Y. A cross-sectional clinical study on shape of nose inner-canthal distance and geometric progression as predictors for width of the maxillary incisor teeth. Journal of natural science, biology, and medicine. 2014;5(2):265-7.
17. Sharma VP ,Singh GP, Verma SL,Multidisciplinary appraisal of treacher Collins-Francesschetti Syndrome Edition, Philadelphia. PA. Elseviar, 2006. P. 42.
18. Conrad K, Gillman G. Rfining Osteotomy Techniques in Rhinoplasty. J Otolaryngol 1998; 27 (1):1-9.
19. Moon KM, Cho G, Sung HM, Jung MS, Tak KS., Jung SW. Problems associated with alloplastic materials in rhinoplasty; Arch Plast Surg. 2013; 40(5): 610-5.
20. Sinno HH, Markarian MK, Ibrahim AM Lin SJ. The ideal nasolabial angle in rhinoplasty: a preference analysis of the general population. Plast Reconstr Surg. 2014; 134(2): 201 -10.