

Facial anthropometric analysis of Iranian women with focus on effects of rhinoplasty

Fariba Ghalamkarpour, MD*
Mahsa Jalalinejad, MD
Sahar Dadkhahfar, MD

Department of Dermatology, Skin Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

**Corresponding author:
Fariba Ghalamkarpour, MD
Skin Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Email: fgghalamkarpour@yahoo.com*

Background: Anthropometric measures can widely vary among different populations. Given the rising popularity of nonsurgical and surgical aesthetic procedures, standard facial anthropometric measurements are necessary for evaluating the outcomes of cosmetic and rejuvenating procedures. This study aimed to determine the anthropometry profile of Persian women, focusing on key facial parameters. Our secondary goal was to explore any change in these dimensions secondary to rhinoplasty.

Methods: Facial anthropometric measurements were successfully evaluated in 207 healthy Iranian adult women. Using nine landmarks (trichion, glabella, nasion, subnasale, labiale superius, labiale inferius, gnathion, endocanthion, and exocanthion), ten standard anthropometric measurements and two angles were obtained. The measurements were analyzed separately for those with a history of rhinoplasty and those with a natural nose.

Results: The height of the upper third, middle third, and lower third of the face was 7.04 (36.43%), 5.61 (29.04%), 6.67 (34.53%) cm, respectively. Other key measurements included: total face height 19.33 cm, nasal height 5.62 cm, philtrum length 1.61 cm, lower lip to gnathion 3.50 cm, right palpebral fissure length 3.79 cm, left palpebral fissure length: 3.82 cm, interocular diameter 3.71 cm, nasolabial angle 80.06°, and frontonasal angle 135.47°. There was no significant difference between the measurements for those with or without rhinoplasty. Also, the different age groups (18-25, 25-40, and 40-65 years) were statistically similar in these measurements.

Conclusion: The difference in anthropometric measurements of this study with previous reports reveals the necessity of using specific anthropometric standards for Persian/Iranian women.

Keywords: anthropometry, rhinoplasty, Iranian, Persian

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INTRODUCTION

Human face analysis requires a delicate technique that combines anthropologic and aesthetic tools ¹. The anthropometric indices depend on not only the bony structures of the face but also the soft tissues that cover them ². Age, sex, race, ethnicity,

and environmental factors could significantly alter anthropometric measurements. It is expected that people in different populations have unequal norms for craniofacial anthropometry, with the genders also varying in these indices ³.

Several studies have been performed to evaluate patients' soft tissue profiles and detect the normal

anthropometric values ^{3,4}. Evaluation of typical values of anthropometric measurements in a population and certain age groups allows clinicians to make correct decisions for successful and precise beauty enhancement in establishing optimal facial harmony and could also be used for evaluating the effect of growth and other factors on anthropometric measurements ^{4,5}. Due to the significant difference between varying populations, it is critical to define the normal anthropometric values among Iranians, allowing the preservation of ethnic features after cosmetic procedures ⁶.

Rhinoplasty is a popular facial plastic surgery procedure among Iranian women ^{7,8}. The quantitative measurements of the face could significantly change after surgical procedures ⁹. To the best of our knowledge, no study has been performed to evaluate the effect of rhinoplasty on anthropometric measurements among Iranian women. This could help the proper planning of cosmetic procedures in this population since many of the currently used indices are derived from Western literature ⁶. Therefore, it is vital to establish specific anthropometry measures for Persian women. The present study was designed to evaluate anthropometric norms in Iranian women, focusing on the probable effects of rhinoplasty on anthropometric measurements.

PARTICIPANTS AND METHODS

In this cross-sectional study, 207 healthy Iranian adult women ranging from 18 to 65 years in age were included. All of the included individuals, as well as both their parents, were born and lived in Iran.

Patients with abnormal maxillary and mandibular growth or a history of congenital facial disfigurements were excluded from our study. Other exclusion criteria were a history of any facial trauma or surgeries other than rhinoplasty. In order to minimize the effects of aging on facial proportions, participants were divided into the three groups of 18-25, 25-40, and older than 40 years old. The history of rhinoplasty was also evaluated and documented.

Anthropometric measurements

The measurements were obtained in person

with a standard caliper (Figure 1). Participants were asked to keep the head position parallel to the ground and sit in an upright relaxed position while looking at a distant object. From a total of nine landmarks, including the trichion (tr), glabella (g), nasion (n), subnasale (sn), labiale superius (ls), labiale inferius (li), gnathion (gn), endocanthion (en), and exocanthion (ex), twelve standard anthropometric measurements and two angles were obtained. These measurements included the nasofrontal angle, nasolabial angle, short forehead height, forehead height, nasal height, lower facial height, morphological facial height, philtrum length, distance between the labiale inferius and gnathion, total face height, palpebral fissure length right, palpebral fissure length left, and interocular diameter (Figure 2).

The results for these measurements were



Figure 1. Standard instruments used for measuring facial anthropometric parameters.

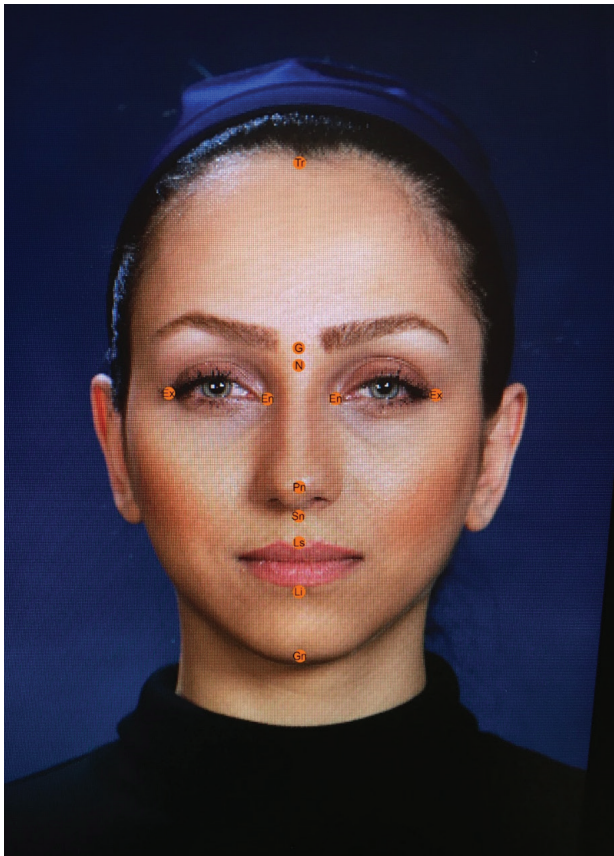


Figure 2. The anthropometric landmarks used to measure the indices in our study: trichion (Tr), glabella (G), nasion (N), pronasale (Pn), subnasale (Sn), labiale superius (Ls), labiale inferius (Li), gnathion (Gn), endocanthion (En), exocanthion (Ex).

compared between participants with positive or negative history of rhinoplasty. In this study, all linear measurements were reported in centimeters, and angles were expressed in degrees. The measurements were validated then compared with the previously published studies.

Statistical analysis

For the numerical variables, data were presented as the mean and standard deviation. The independent-samples t-test was used for statistical comparisons between two groups, like when comparing indices between those with or without a history of rhinoplasty. Also, one-way analysis of variance (ANOVA) was used for multiple comparisons, such as comparing indices between the age groups and different populations. All analyses were performed with IBM SPSS Statistics version 21.0, and a P-value less than 0.05 was considered statistically significant.

RESULTS

The measured indices of the three major facial divisions in all 206 participants are disclosed in Table 1. The mean age of the participants in the current study was 39 ± 12 years. The results of minor anthropometric measurements are depicted in Table 2. With regard to indices in the upper face, the mean forehead height was 7.05 ± 0 cm. The measurement of ocular indices revealed that the mean lengths of the right and left palpebral fissures were 3.79 ± 0.50 and 3.82 ± 0.49 cm, respectively. Also, the mean interocular diameter was 3.71 ± 0.39 cm.

The mean nasal height of our participants was 5.62 ± 0.47 cm, while the mean size of the lower face was 6.67 ± 0.58 cm. The mean measurements for philtrum length and lower lip to gnathion were 1.61 ± 0.55 and 3.50 ± 0.44 cm, respectively.

In our analysis, we divided the participants into groups with or without a history of rhinoplasty. The results pertaining to these groups are compared in Table 3. As shown, we did not find any significant differences in anthropometric indices among the rhinoplasty-positive and rhinoplasty-negative individuals. Additionally, our comparison of anthropometric parameters between the age-defined groups revealed no significant differences (Table 4).

Table 1. Major anthropometric measurements of our study participants (n = 206)

Facial division	Height (cm)
Forehead	7.05 ± 0.72
Midface	6.21 ± 0.66
Lower face	6.67 ± 0.58

Table 2. Minor anthropometric indices of our study participants

Anthropometric index	Results (n = 206)	
	Mean	SD
Total face height (cm)	19.33	1.16
Forehead height (cm)	7.05	0.72
Midface height (cm)	6.21	0.66
Lower facial height (cm)	6.67	0.58
Nasal height (cm)	5.62	0.47
Philtrum length (cm)	1.61	0.55
Lower lip to gnathion (cm)	3.50	0.44
Right palpebral fissure length (cm)	3.79	0.50
Left palpebral fissure length (cm)	3.82	0.49
Inter ocular diameter (cm)	3.71	0.39
Nasolabial angle (°)	80.06	13.60
Frontonasal Nasofrontal angle (°)	135.47	10.04

Table 3. Minor anthropometric indices in participants with or without a history of rhinoplasty

	With history of rhinoplasty (n=72)		Without history of rhinoplasty (n=134)		P-value
	Mean	SD	Mean	SD	
Total face height (cm)	19.39	1.19	19.33	1.16	0.856
Nasal height (cm)	5.61	0.46	5.62	0.48	0.873
Right palpebral fissure length (cm)	3.71	0.58	3.84	0.45	0.837
Left palpebral fissure length (cm)	3.75	0.53	3.86	0.47	0.351
Interocular diameter (cm)	3.68	0.40	3.73	0.39	0.725
Nasolabial angle (°)	79.95	13.85	80.13	13.55	0.626
Philtrum length (cm)	1.66	0.79	1.58	0.36	0.949
Lower lip to gnathion (cm)	3.48	0.41	3.50	0.46	0.657

Table 4. Anthropometric indices in different age groups

Anthropometric Index	18-25 years	25-40 years	>40 years	P-value
Forehead height (cm)	6.91 ± 0.75 (5.5-8)	7.06 ± 0.73 (5.5-9)	7.09 ± 0.71 (5.5-8.5)	0.572
Nasal height (cm)	5.57 ± 0.64 (4.7-7)	5.63 ± 0.44 (4.8-6.8)	5.63 ± 0.43 (4.5-6.4)	0.844
Midface height (cm)	6.26 ± 0.63	6.21 ± 0.68	6.20 ± 0.65	0.92
Lower facial height (cm)	6.64 ± 0.54 (5.6-7.5)	6.61 ± 0.58 (5.3-8.2)	6.76 ± 0.58 (5.5-8.3)	0.251
Philtrum length (cm)	1.63 ± 0.4 (1-2.4)	1.57 ± 0.33 (0.9-2.6)	1.65 ± 0.8 (0.7-7.5)	0.602
Lower lip to gnathion (cm)	3.46 ± 0.41 (2.6-4.3)	3.45 ± 0.46 (1.3-4.8)	3.57 ± 0.43 (2.7-4.5)	0.157
Total face height (cm)	19.12 ± 1.38 (16.8-21.7)	19.3 ± 1.15 (16-22)	19.46 ± 1.1 (17.2-22)	0.460
Right palpebral fissure length (cm)	3.91 ± 0.49 (2.5-4.5)	3.78 ± 0.49 (2.5-4.5)	3.76 ± 0.51 (2.2-4.7)	0.490
Left palpebral fissure length (cm)	3.93 ± 0.54 (2.5-4.6)	3.81 ± 0.5 (2.5-4.6)	3.76 ± 0.45 (2.5-4.5)	0.424
Interocular diameter (cm)	3.61 ± 0.38 (2.6-4.1)	3.74 ± 0.35 (3-4.5)	3.73 ± 0.44 (2.9-4.5)	0.452
Nasolabial angle (°)	80.68 ± 11.83 (65-98)	78.42 ± 14.3 (60-110)	81.86 ± 13.61 (60-110)	0.503
Nasofrontal angle (°)	133 ± 10.28 (110-155)	135.58 ± 9.38 (120-160)	136.59 ± 10.78 (110-160)	0.449

DISCUSSION

Analysis of the face is a key step in approaching candidates of plastic, reconstructive, orthodontic, or maxillofacial surgery involving the face. Overall, a harmonious face and ideal function are the most pivotal aims of aesthetic procedures¹. It is known that race and ethnicity have considerable effects on human faces^{10,11}. Although several studies have investigated the anthropometric indices of Persian women, this is the first to focus on the effect of an aesthetic procedure on such indices¹².

Sepehr *et al.* evaluated 107 Persian women using standard photographs and showed a statistically significant difference between the Persian women residing in the United States and North American white women (NAWW) in 18 of 26 measured anthropometric indices⁶. For the simplicity of comparison, we divided the face into three divisions and compared our results to Persian women and NAWW in their study. In the upper face, the mean forehead height, and in the midface, the mean midface height was higher and also longer lower face was detected in our participants. Mean nasal

height was longer. In the lower face, the nasolabial angle was smaller in Iranian women in our study. Interestingly, the right and left palpebral fissure lengths and interocular diameter were larger in our participants. It should be noted that we did not measure all the indices checked in their study, and we had a different methodology.

In another study on 200 healthy Iranian students (100 males, 100 females), facial anthropometric measurements were investigated by Bayat *et al.* When comparing our results with their findings, several differences are prominent: our participants had longer total face height, longer forehead, longer nasal height, larger right and left palpebral fissures, larger nasolabial angle, and smaller frontonasal angle¹³.

More than two decades ago, Farkas conducted one of the largest quantitative anthropometric measurements on North American whites subjects¹⁴. The proposed standards are used as a reference by some physicians in Iran. The evaluation was performed on 1470 healthy young subjects, 750 males and 720 females, 18 to 30 years of age. Among them, 30 Iranian females were included.

They compared the measurements of the Iranians to the NAWW, revealing that the face height was greater in Iranian females. Our study also showed a larger total face height and approximately similar nasal height¹⁴. However, the intercanthal width and eye fissure length are different in that study from the present research.

One of the highlights of the current study was considering the effect of rhinoplasty on facial anthropometric indices. No significant difference was found between the participants with or without a history of rhinoplasty. We also divided our patients into three age groups to evaluate any age-related differences in the measured indices. We did not find any significant difference among the age groups. Hence, it appears that the same norms can be used for adult Iranian women regardless of their age, at least up to 65 years.

Previously, some studies evaluated the effect of growth on anthropometric parameters of Iranian boys aged 11-17¹⁵ and 4 to 11¹⁶. Asghari *et al.* compared facial anthropometric measurements between Iranian females and males. They reported that except for midface height, all other horizontal and vertical measurements for the face were larger in men compared to women².

The current study had some limitations that should be noted. Firstly, we measured nine landmarks and thus obtained only ten standard anthropometric measurements and two angles. Secondly, our study was restricted to women participants.

In conclusion, due to observable differences in facial measurements of our study and previous studies, multicenter nationwide studies are required to establish more reliable anthropometric measurements for Iranian/Persian women.

Conflict of Interest: None declared.

REFERENCES

1. Ozdemir ST, Sigirli D, Ercan I, et al. Photographic facial soft tissue analysis of healthy Turkish young adults: anthropometric measurements. *Aesthetic Plast Surg.* 2009;33(2):175-84.
2. Asghari A, Rajaeih S, Hassannia F, et al. Photographic facial soft tissue analysis of healthy Iranian young adults: anthropometric and angular measurements. *Med J Islam Repub Iran.* 2014;28:49.
3. Farkas LG, Katic MJ, Forrest CR, et al. International anthropometric study of facial morphology in various ethnic groups/races. *J Craniofac Surg.* 2005;16(4):615-46.
4. Husein OF, Sepehr A, Garg R, et al. Anthropometric and aesthetic analysis of the Indian American woman's face. *J Plast Reconstr Aesthet Surg.* 2010;63(11):1825-31.
5. Porter JP, Olson KL. Anthropometric facial analysis of the African American woman. *Arch Facial Plast Surg.* 2001;3(3):191-7.
6. Sepehr A, Mathew PJ, Pepper JP, et al. The Persian woman's face: a photogrammetric analysis. *Aesthetic Plast Surg.* 2012;36(3):687-91.
7. Mr F, Tabrizi AG, Bafghi AF, et al. Body dysmorphic disorder in aesthetic rhinoplasty candidates. *Pak J Med Sci.* 2013;29(1):197-200.
8. Atari M, Barbaro N, Sela Y, et al. Consideration of cosmetic surgery as part of women's benefit-provisioning mate retention strategy. *Front Psychol.* 2017;8:1389.
9. Sadeghian S, Shirvani A, Azamian Z. Assessment of the effect of simulated rhinoplasty and genioplasty on the facial profile attractiveness of patients with a convex face. *J Contemp Dent Pract.* 2018;19(6):719-25.
10. Milošević SA, Varga ML, Šljaj M. Analysis of the soft tissue facial profile of Croats using of linear measurements. *J Craniofac Surg.* 2008;19(1):251-8.
11. Nagle E, Teibe U, Kapoka D. Craniofacial anthropometry in a group of healthy Latvian residents. *Acta Med Litu.* 2005;12(1):47-53.
12. Jamilian A, Darnahal A, Hamed R, et al. Photogrammetric analysis of facial profile in Persian adults. *Gen Dent.* 2016;64(2):52-5.
13. Bayat M, Shariati M, Rajaeirad F, et al. Facial anthropometric norms of the young Iranian population. *J Maxillofac Oral Surg.* 2018;17(2):150-7.
14. Farkas LG. *Anthropometry of the head and face.* Raven Press; 1994.
15. Jahanbin A, Mahdavisahri N, Baghayeripour M, et al. Evaluation of facial anthropometric parameters in 11-17 year old boys. *J Clin Pediatr Dent.* 2012;37(1):95-101.
16. Mahdi E. Assessment of facial and cranial development and comparison of anthropometric ratios. *J Craniofac Surg.* 2012;23(2):e75-83.