



ORIGINAL ARTICLE

## Morphometric analysis of nasal shapes and angles in young adults<sup>☆</sup>



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### KEYWORDS

Female;  
Male;  
Anthropometry;  
Nose

### Abstract

*Introduction:* The size, angle, shape and type of nose are a signature indicating race, age and sex.

*Objective:* Describe and compare nasal angles, nose types, nostril models, and nasal profiles in young Turkish males and females.

*Methods:* The study group consisted of university students, 56 males and 59 females. Nasal measurements were obtained from all subjects, using anthropometric methods.

*Results:* The nose types of females and males were 78% and 70% narrow nose, respectively. The means of females' nasofrontal, nasal tip, nasolabial, and alar slope angles were  $133.16^\circ \pm 8.88^\circ$ ;  $77.91^\circ \pm 9.80^\circ$ ;  $98.91^\circ \pm 10.01^\circ$ , and  $80.89^\circ \pm 8.33^\circ$ , respectively. The means of males' nasofrontal, nasal tip, nasolabial, and alar slope angles were  $123.85^\circ \pm 13.23^\circ$ ;  $82.16^\circ \pm 9.98^\circ$ ;  $97.91^\circ \pm 8.78^\circ$  and  $85.98^\circ \pm 8.72^\circ$ , respectively.

*Conclusion:* The average values of the nose in this population may be used as a guide to plan corrective esthetic–cosmetic surgery and for burn scars of the nose.

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### PALAVRAS-CHAVE

Feminino;  
Masculino;  
Antropometria;  
Nariz

### Morfométrica análise de nasais formas e ângulos em adultos jovens

#### Resumo

*Introdução:* O tamanho, os ângulos, a forma e o tipo do nariz humano são uma assinatura que indica raça, idade e sexo.

*Objetivo:* Descrever e comparar os ângulos nasais, tipos de nariz, modelos de narina e perfis nasais em homens e mulheres jovens turcos.

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**Métodos:** Grupo de estudo consistiu de 56 jovens do sexo masculino e 59 do sexo feminino, que eram estudantes na Universidade. Medidas nasais foram obtidas de todas as disciplinas, através de métodos antropométricos.

**Resultados:** Tipos de nariz de fêmeas e machos foram encontrados na maior parte 78% e 70% nariz estreito, respectivamente. Os meios de nasofrontal das fêmeas, ponta nasal, nasolabial e ângulos de inclinação alar foram  $133,16 \pm 8,88$ ;  $77,91 \pm 9,80$ ;  $98,91 \pm 10,01$  e  $80,89 \pm 8,33^\circ$ , respectivamente. Os meios de nasofrontal dos machos, a ponta nasal, nasolabial e ângulos de inclinação alar foram  $123,85 \pm 13,23$ ;  $82,16 \pm 9,98$ ;  $97,91 \pm 8,78$  e  $85,98 \pm 8,72^\circ$ , respectivamente.

**Conclusão:** Os valores médios do nariz nesta população podem ser usados como um marco de orientação para planejar a cirurgia corretiva nos *aestheticcosmetics*, cicatrizes de queimadura do nariz.

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## Introduction

The nose has a number of vital functions. It filters, heats, and moistens inhaled air; it is the first line of defense against inhaled allergens; it acts as a sensory olfactory organ and affects resonance in speech production. Conditions such as deviated septum and turbinate hypertrophy affect nasal geometry and may impair nasal patency and the physiology of the nose, due to reductions in the inner dimensions of the nasal cavity and increases in the resistance to airflow.<sup>1</sup> For centuries, anthropologists and clinicians have attempted to objectively comprehend the concept of facial beauty.<sup>2</sup> Renaissance artists emphasized that facial beauty is rooted in symmetric and balanced proportions. Their quantitative descriptions persisted as neoclassical cannons, which are currently used in reconstructive facial operations.<sup>3</sup> The shape of the nose is a signature indicating the ethnicity, race, age, and sex.<sup>4</sup> Anthropometric parameters vary with age, sex, and ethnic background, and several authors have attempted to document normative values which may serve as references.<sup>5</sup> The size, shape and proportions of the nose provide beauty or handsomeness, because it is at the center of the face.<sup>6</sup> Knowledge of the unique shape, anatomy, and dimensions of the human nose is essential for surgeons undertaking esthetic repair and reconstruction of noses.<sup>7</sup>

Determining nose types, nostril models, nasal profiles, and angles of the nose provides norms for the study of abnormalities or the effects of aging and disease; or changes due to body growth, and ethnic and racial differences.<sup>8</sup> Racial and ethnic morphometric differences have been the focus of investigations.<sup>9,10</sup>

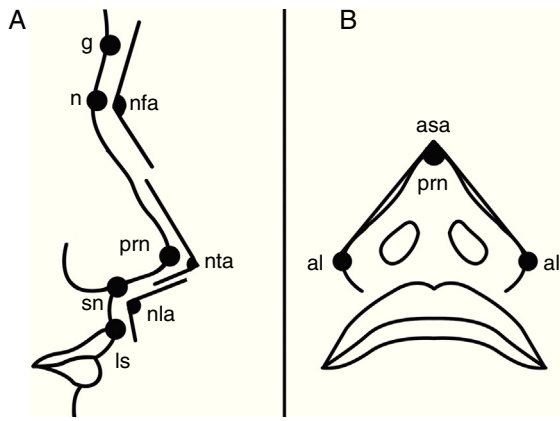
This study aimed to describe the differences in nasal angles, nose types, nostril models and nose profiles in young Turkish males and females and compare them with the studies found in the literature.

## Materials and methods

The present study recorded nasal types, nostril models, and angles of university students of physical education and

sports, who were 18–30 (mean 21.22) years of age, selected by a random sampling method, totaling 115 healthy students (59 females and 56 males). These individuals had no noticeable nasal or facial disfigurement, nor previous nasal or facial surgery.<sup>5</sup> This study was approved by the Ethics Committee of University Clinical Research (Ethics Committee Number: 569). All objects were previously described; which from the point of nasal measurements by using anthropometric instruments and were signed informed consent form. Body weight was measured using a Seca scale (Seca, Mod 220, with precision of 0.1 kg – Hamburg, Germany), without shoes, barefoot, and with as few clothes as possible. Body height was measured in anatomic position using a portable stadiometer (Seca, Mod 220, Hamburg Germany), with precision of 0.5 cm.<sup>5</sup> Mean body weight and height of the male subjects were 77.34 kg (53.40–112.20 kg) and 177.02 cm (163.00–194.00 cm), respectively. Mean body weight and height of the female subjects were 59.32 kg (38.40–86.00 kg) and 164.83 cm (150–182 cm), respectively.

Anthropometric measurements were obtained from all included subjects, using standard anthropometric methods and instruments described in literature.<sup>5</sup> The measurements of angles were calculated in degrees ( $^\circ$ ), and were performed by the same researcher under normal anatomic position and in the Frankfurt horizontal plane (FH).<sup>5</sup> Assessment of the position of the nose, by judging the relationship of the upper and the lower edges of the ear to the eye brow level and the ala level, respectively, requires maintaining the subject's head in the FH, which is defined by a line connecting the orbital (the lowest point of the infraorbital margin) and the porion (point at the upper edge of the auditory meatus) or tragon (landmark on the upper edge of the tragus), maintained horizontal with the help of a commercial angle meter.<sup>6</sup> The data were analyzed using the SPSS, version 18.0 for Windows. Differences between male and female values were tested by Student's *t*-test for normally distributed variables, and by the Mann–Whitney *U* test for variables that were not normally distributed. Fisher's exact test was used to assess the relationship between types of nose, according to sex. The significance level was defined as  $p = 0.05$ . Values were expressed as mean  $\pm$  standard deviation (SD).<sup>11</sup> Nasion



**Figure 1** Facial and nasal soft tissue landmarks. (A) Facial soft tissue landmarks of glabella (g), nasion (n), pronasale (prn), subnasale (sn), labiale superius (ls) and angles of nasofrontal (nfa), nasal tip (nta), and nasolabial (nla) were demonstrated on lateral view. (B) Facial soft tissue landmarks of alare (al), pronasale (prn) and alar slope angle (asa) were demonstrated on basal view.

(n), the point in the midline of both the nasal root and the nasofrontal suture. Subnasale (sn), the midpoint of the columella base. Pronasale (prn), the most prominent point on the nasal tip. Glabella (g), the mid-point between the eyebrows. Labiale superius, the midpoint of the upper vermillion line, and the alare (al), the point where the nasal blade (ala nasi) extends farthest,<sup>12</sup> are shown in Fig. 1A and B.

In the present study, the following parameters were measured and noted: nasofrontal angle; glabella–nasion–pronasale (g–n–prn), nasal tip angle; nasion–pronasale–subnasale (n–prn–sn), nasolabial angle; pronasale–subnasale–labiale superius (prn–sn–ls) and alar slope angle; alare–pronasale–alare (al–prn–al), width of the nose; alare–alare (al–al), total nose length; and nasion–subnasale (n–sn).<sup>5,12</sup> These are shown in Fig. 1A and B.

$$\text{Nasal Index} = \frac{\text{width of the nose (al-al)} \times 100}{\text{total nose length (n-sn)}}$$

According to the index, the nose is divided into seven types (Olivier classification).<sup>13</sup>

These are: overly narrow nose (X–39.99), very narrow nose (40.00–54.99), narrow nose (55.00–69.99), medium

**Table 2** Number and percentage of individuals among various nose types of young Turkish females and males.

Nose types	Females	Males	Total
Very narrow nose	6 (10%)	2 (3%)	8 (7%)
Narrow nose (55–69.9)	46 (78%)	39 (70%)	85 (74%)
Medium nose (70–84.9)	7 (12%)	14 (25%)	21 (18%)
Broad nose (85–99.9)	0	1 (2%)	1 (1%)

According to gender, nose type variability was determined ( $\chi^2 = 4.61$ ;  $p = 0.11$ ).

nose (70.00–84.99), broad nose (85.00–99.99), very broad nose (100.00–114.99), and overly broad nose (115.00–X).<sup>14</sup>

## Results

The means of females' nasofrontal angle, nasal tip angle; nasolabial angle and alar slope angle were  $133.16^\circ \pm 8.88^\circ$ ;  $77.91^\circ \pm 9.80^\circ$ ;  $98.91^\circ \pm 10.01^\circ$  and  $80.89^\circ \pm 8.33^\circ$ , respectively. The means of males' nasofrontal angle, nasal tip angle; nasolabial angle, and alar slope angle were  $123.85^\circ \pm 13.23^\circ$ ;  $82.16^\circ \pm 9.98^\circ$ ;  $97.91^\circ \pm 8.78^\circ$  and  $85.98^\circ \pm 8.72^\circ$ , respectively (Table 1). There were statistically significant differences between the mean values of the nasofrontal angle, nasal tip angle and alar slope angle ( $p < 0.05$ ).

Nose types were calculated based on the number and percentage of nose types by gender. For females, there were six (10%) with very narrow nose, 46 (78%) with narrow nose, seven (12%) with medium nose. For males, there were two (3%) with very narrow nose, 39 (70%) with narrow nose, 14 (25%) with medium nose and one (2%) with broad nose. According to gender, nose type variability was determined ( $\chi^2 = 4.61$ ,  $p = 0.11$ ).

For all individuals (males and females), there were eight (7%) with very narrow nose, 85 (74%) with narrow nose, 21 (18%) with medium nose and one (1%) with broad nose (Table 2).

Measurement and evaluation of the wings of the nose typological findings as a result of the way the nostrils, in both males and females as a result of separate reviews have identified five different nostril models.

Nostril models of females:

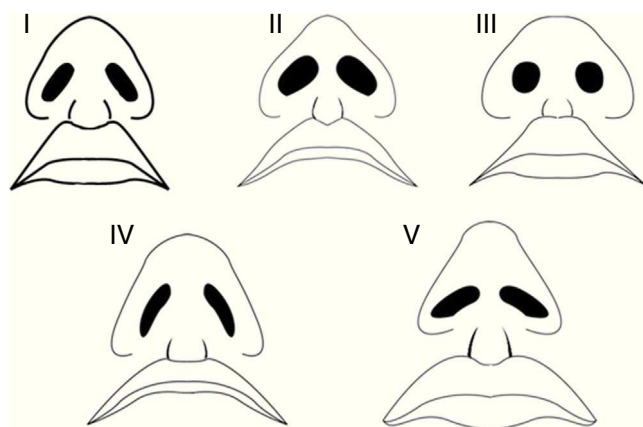
I Wide blunt nasal base, parallel to the ala of the nose, narrow oval nostril.

**Table 1** Student *t*-test for equality of means among nasal angles in young Turkish females and males.

Angle	Females		Males		<i>p</i>
	$X \pm SD$ (°)	Med (°) (min–max)	$X \pm SD$ (°)	Med (°) (min–max)	
Nasofrontal angle	$133.16 \pm 8.88$	133.00 (114–148)	$123.85 \pm 13.23$	122.50 (83–150)	0.001 <sup>a</sup>
Nasalip angle	$77.91 \pm 9.80$	77.50 (60–105)	$82.16 \pm 9.98$	81.25 (66–113)	0.02 <sup>a</sup>
Nasolabial angle	$98.91 \pm 10.01$	100 (75–126)	$97.91 \pm 8.78$	97.50 (80–124)	0.57 <sup>b</sup>
Alar slope angle	$80.89 \pm 8.33$	80 (62.50–112.50)	$85.98 \pm 8.72$	87.50 (64–102.50)	0.001 <sup>a</sup>

<sup>a</sup> Significant.

<sup>b</sup> Non-significant.



**Figure 2** Nostril models in young Turkish females.

- II Narrow blunt nasal base, parallel to the ala of the nose, triangular nostril.
- III Wide sharp nasal base, round nostril.
- IV Wide blunt nasal base, parallel to the ala of the nose, long and large nostril.
- V Wide sharp nasal base, parallel to the nasolabial groove, wide oval nostril (Fig. 2).

Nostril models were calculated based on the number and percentage of females nostril models: 17 (28.81%) model I, 17 (28.81%) model II, eight (13.55%) model III, ten (16.94%) model IV and seven (11.86%) model V.

Nostril models of males:

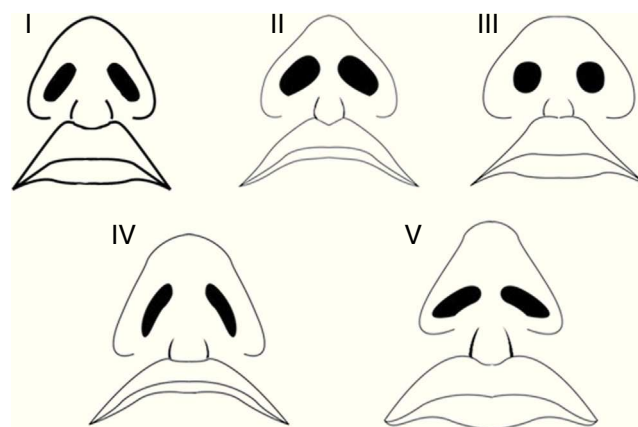
- I Middle sharp nasal base, parallel to the ala of the nose, narrow oval nostril.
- II Wide sharp nasal base, parallel to the ala of the nose, wide oval nostril.
- III Wide blunt nasal base, round nostril.
- IV Wide blunt nasal base, parallel to the ala of the nose, narrow oval nostril.
- V Middle blunt nasal base, parallel to the nasolabial groove, narrow oval nostril (Fig. 3).

The nostril models of males found were: 12 (21.42%) model I, 21 (37.50%) model II, five (8.92%) model III, 15 (26.78%) model IV, and three (5.35%) model V.

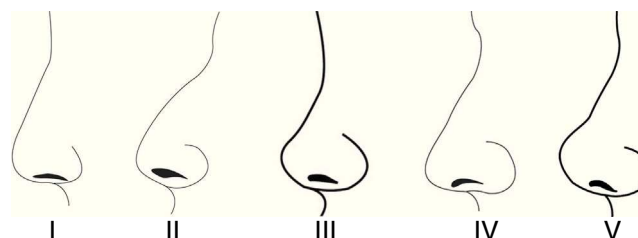
Researchers should observe the shape of the dorsum of the nose, which can be straight, concave, convex, or curved. In addition, the shape of the tip of the nose, nose wing shape and height should be examined carefully. Nose profiles of measured subjects were as follows.

Female nose profiles:

- I Long nasal dorsum, high nasal root, forward sloping nasal tip, and horizontal nasal base.
- II Long nasal dorsum, deep nasal root, upward sloping nasal tip, and upward sloping nasal base.
- III Short nasal dorsum, middle nasal root, upward sloping nasal tip, and upward sloping nasal base.
- IV Middle nasal dorsum, middle nasal root, upward sloping nasal tip, and horizontal nasal base.
- V Middle nasal dorsum, middle nasal root, upward sloping nasal tip, and upward sloping nasal base (Fig. 3).



**Figure 3** Nostril models in young Turkish females.



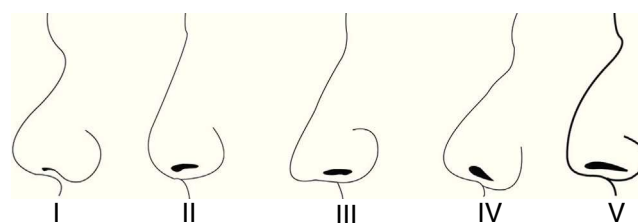
**Figure 4** Nasal profiles in young Turkish females.

The female nose profiles found were: 16 (27.11%) profile I, ten (16.94%) profile II, seven (11.86%) profile III, 16 (27.11%) profile IV and ten (16.94%) profile V.

Male nose profiles:

- I Short nasal dorsum, deep nasal root, upward sloping nasal tip, and forward/upward sloping nasal base.
- II Long nasal dorsum, high nasal root, downward sloping nasal tip, and forward/upward sloping nasal base.
- III Long nasal dorsum, middle nasal root, forward/downward sloping nasal tip, and horizontal nasal base.
- IV Middle nasal dorsum, deep nasal root, upward sloping nasal tip, and forward/upward sloping nasal base.
- V Long nasal dorsum, deep nasal root, forward/upward sloping nasal tip, and forward/upward sloping nasal base (Fig. 4).

The nose profiles of males found were: 12 (21.42%) profile I, eight (14.28%) profile II, six (10.71%) profile III, 20 (35.71%) profile IV and ten (17.85%) profile V (Fig. 5).



**Figure 5** Nasal profiles in young Turkish males.

**Table 3** Comparison of nasal angles of females and males in the present study and other races.

Author	Race	Sex	n	NFA (°)	NTA (°)	NLA (°)	ASA (°)
Rhee, 2004	Korean	F	22			103.43	
	Japan	F	15			99.87	
	Chinese	F	16			113.51	
	Western	F	18			106.52	
Husein, 2010	Indian American	F	102	138.20		97.20	
	NAW	F	200	134.30	67.40	104.20	59.40
Choes KS, 2006	Korean American	F	72	136.80	78.50	92.10	81.90
Aung SC, 2000	Chinese	F	45	139.09	83.87	97.91	90.89
Dong Y, 2011	Chinese (Han)	F	143	144.04	96.16	103.42	
Milosevic AS, 2008	Croatian	F	58	139.11	84.12	109.39	
Sforza C, 2011	Italian	F	66		93.84		75.43
Present study	Turkish	F	59	133.16	77.91	98.91	80.89
Porter, 2004	African American	M	109	126.90		83.10	
Nguyen and Turley, 1998	Caucasian	M	116	137.30	80.60		
Aung SC, 2000	Chinese	M	45	137.43	82.55	99.91	89.07
Dong Y, 2011	Chinese (Han)	M	146	138.19	94.16	104.30	
Sforza C, 2011	Italian	M	126		94.99		74.45
Present study	Turkish	M	56	123.85	82.16	97.91	85.98

n, number; NFA, nasofrontal angle; NTA, nasal tip angle; NLA, nasolabial angle; ASA, alar slope angle; NAW, North American white; F, female; M, male.

## Discussion

The midline area of the face is of crucial importance for the judgment of attractiveness.<sup>15</sup> Lying in the middle of the face, the nasal pyramid plays a noticeable cosmetic role in the appearance of the whole face; it provides harmony and balance to the face. The appreciation of facial attractiveness, especially of the nose, depends on various factors such as gender and the individual observer.<sup>16</sup>

Detailed information was not found in the literature on the comparison of nasal angles, nose types, nostril models, and nasal profile in young Turkish females and males. Standards for analysis of the Turkish male and female nasal shapes and angle measurements are lacking, especially considering that the concept of facial attractiveness is a complex assimilation of innate perceptions and cultural stereotypes.

As with other parts of the body, the external nose angles, nose shape, the head, and face development rapidly during adolescence. It is very important to know the pattern of development and timing of maturity to determine the best time for the reconstruction nasal deformities.<sup>17</sup> Farkas<sup>18</sup> reported that the angles of the nose essentially stop growing at the age of 12 in women and at age 14 or 15 in men, and the size and shape of the external nose is less likely change after maturity. Thus, the present study selected healthy young Turkish males and females aged between 18 and 30 years old and performed an anthropometric study to provide reliable reference data during reconstruction of secondary nasal deformity after cheiloplasty, nasal reconstruction, and repair of nasal defects and rhinoplasty in Turkish adults. This study's results of angles were compared with the studies available in literature.

The mean result of the nasofrontal angle in the present study for females (133.16°) was smaller than Indian American<sup>2</sup> (138.20°), North American White<sup>2</sup> (134.30°),

Korean American<sup>12</sup> (136.80°), Chinese<sup>13</sup> (Han) (144.04°), Croatian<sup>19</sup> (139.11°), and Chinese<sup>20</sup> females (139.09°). The Turkish female mean nasal tip angle value (77.91°) was greater than North American White<sup>2</sup> (67.40°), and smaller than Korean American<sup>12</sup> (78.50°), Chinese (Han)<sup>13</sup> (96.16°), Croatian<sup>19</sup> (84.12°), and Chinese<sup>20</sup> females (83.87°). The mean result of Turkish female nasolabial angle (98.91°) was narrower than North American White<sup>2</sup> (104.20°), Korean<sup>10</sup> (103.43°), Japanese<sup>10</sup> (99.87°), Chinese<sup>10</sup> (113.51°), Western<sup>10</sup> (106.52°), Chinese<sup>13</sup> (Han) (103.42°), and Croatian<sup>19</sup> females (109.39°); and wider than Indian American<sup>2</sup> (97.20°), Korean American<sup>12</sup> (92.10°), and Chinese<sup>20</sup> females (97.71°). The Turkish female alar slope angle (80.89°) was smaller than Korean American<sup>12</sup> (81.90°) and Chinese<sup>20</sup> females (90.89°), and greater than North American White<sup>2</sup> females (59.40°).

The mean result of the nasofrontal angle in the present study for males (123.85°) was smaller than Caucasians<sup>7</sup> (137.30°), African American<sup>9</sup> (126.90°), Chinese<sup>13</sup> (Han) (138.19°), and Chinese males<sup>20</sup> (137.43°). The Turkish male mean nasal tip angle value (82.16°) was greater than Caucasian<sup>7</sup> (80.60°) and Croatian males<sup>19</sup> (79.85°); and smaller than Chinese<sup>13</sup> (Han) females (96.16°), Chinese<sup>20</sup> (82.55°), and Italian<sup>21</sup> (93.84°). The Turkish male mean nasolabial angle (97.91°) was narrower than Chinese<sup>13</sup> (Han) (104.30°), Croatian<sup>19</sup> males (105.42°), and Chinese<sup>20</sup> (99.91°); and wider than African American<sup>9</sup> males (83.10°). The Turkish female alar slope angle value (80.89°) was wider than Italian females (74.45°).<sup>21</sup> The mean of the Turkish male alar slope angle (85.98°) was smaller than Chinese<sup>20</sup> males (89.07°), and larger than Italian<sup>21</sup> males (75.43°) (Table 3).

In general, surgeons decide the surgical method of external nose reconstruction based on their clinical practice experience, which combines subjective and objective factors.<sup>22</sup> The subjective factor of nasal esthetics varies with ethnic background and geographical and cultural

differences.<sup>20</sup> Springer et al.<sup>16</sup> reported that there were gender related effects with respect to the assessment of nasal shape in women as compared to men, who are more critical in assessing the appearance of their own nose as opposed to the noses of other people. Farkas et al.<sup>23</sup> indicated that the neoclassical esthetic standard developed during the European Renaissance is not completely suitable for Asian and African ethnic groups. Similarly, there are still some differences between the esthetics of the people of Turkey and other countries. Whites generally have narrow or medium noses, Asians usually have medium noses, and Blacks often have wide nose. Blacks living in the Congo and Guinea<sup>14</sup> have especially wide noses, with nose indexes over 100. In the present study, narrow noses predominated: 46 (78%) females, 39 (70%) males, and 85 (74%) among all subjects. Facial analysis, using anthropometric proportions as a guide, is paramount for planning cosmetic and reconstructive facial surgery.

## Conclusion

The present study shows that statistically significant differences between the mean values of the nasofrontal angle, nasal tip angle, and alar slope angle in young Turkish males and females, who had mostly narrow noses, among five different nostril models and nose profiles. The Turkish females had mostly nasal profile I and nostril model I, and the Turkish males had mostly nasal profile IV and nostril model II. Average values of the nasal angles, nose types, nostril models, and nasal profiles in this population may be used as a guide to plan corrective esthetic–cosmetic surgery and for burn scars of the nose.

## Funding

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## Conflicts of interest

The authors declare no conflicts of interest.

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