MORPHOMETRIC FACIAL ANALYSIS OF TURKISH ADULTS

YETİŞKİN TÜRK BİREYLERİN MORFOMETRİK YÜZ ANALİZİ

Ömür Karaca[1], Burak Gülcen[1], Murat Abdulgani Kuş[2], Ferhan Elmalı[3], İlter Kuş[1]

[1]Department Of Anatomy, Faculty of Medicine, University of Balikesir, Balikesir, [2]Health of Collage, Mehmet Akif Ersoy University, Burdur, [3]Department Of Biostatistics, Faculty of Medicine, University of Erciyes, Kayseri, Turkey

Yazışma Adresi:
Yrd. Doç. Dr. Ömür Karaca, PhD
Anatomi Anabilim Dalı, Tıp Fakültesi,
Balıkesir Üniversitesi, Balıkesir, 10145,
Türkiye
Tel: 507 2163882
Fax: 266 6121412
e-mail: omurkaraca@balikesir.edu.tr

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ÖZET

Amaç: Bu çalışma, cinsiyete göre, yüzün antropometrik normlarının ortalama değerlerini belirlemek ve yetişkin Türk bireylerin nazal indeksini tanımlamak amacıyla yapıldı.
Gereç ve yöntemler: Bu çalışma, 20-35 yaş aralığında bulunan, toplam 200 sağlıklı (100 kadın, 100 erkek) yetişkin birey üzerinde yapıldı. Antropometrik landmarklar kullanılarak, milimetrik kumpas ile yüz üzerinden horizontal ve vertikal direk ölçümler alındı.
Bulgular: Bulgular nazal index ile karşılaştırıldı. Her iki grup değerlendirildiğinde, alt ve üst dudak kalınlığı hariç tüm parametreler erkeklerde daha yüksek bulundu. Cinsiyetler karşılaştırıldığında, üst yüz genişliği, göz genişliği, burun ucu yüksekliği, alın yüksekliği I ve II hariç tüm diğer parametrelerde anlamlı bir fark gözlendi (P<0.05). Nazal indeks kadınlarda 64.17, erkeklerde ise 66.12 olarak tespit edildi.
Sonuç: Yüzün vertikal ve horizontal ölçümlerinin kantitatif analizine göre elde edilen bulgular, rekonstrüktif ve estetik operasyonların hazırlığında, yetişkin Türk bireylerin yüzünün değerlendirilmesinde cerrahlara rehber olacaktır.

Anahtar Sözcükler: Fasiyal antropometrik normlar, Kraniyofasiyal antropometri, Nazal indeks, Yüz

SUMMARY:

Objective: This study has aimed to determine the average values of facial anthropometric norms according to sex and to establish nasal index of Turkish adults.
Materials and methods: In this research, a total of 200 healthy adults (100 females, 100 males) 20 to 35 years of age were examined. Using anthropometric landmarks, horizontal and vertical direct measurements were made on the faces with a sliding caliper.
Results: Results have been compared with nasal index. It has been viewed in the research that, in the total evaluation of both groups, all the parameters were higher in the males except upper and lower lip height. Compared with both sexes, a significant difference has been found in all measurements except the upper face width, eye-fissure width, nasal tip protrusion, forehead height I and II (P<0.05). The nasal index obtained in this study is 64.17 mm in female, 66.12 mm in male.
Conclusion: Our results, based on quantitative analysis of the main vertical and horizontal measurements of the face, offers surgeons guidance in judging the faces of Turkish adults in preparation for reconstructive and aesthetic surgery.

Keywords: Facial anthropometric norms, craniofacial anthropometry, nasal index, face

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bsbd@balikesir.edu.tr
www.bau-sbdergisi.com

Introduction

The appearance of the face, the most variable part of the human body, is influenced by age, sex, race and ethnicity. Surgical correction of craniofacial anatomic structures depends knowledge of the craniofacial norms of the patient's ethnic groups.[1,2] Surgeons must consider the specific facial structures of the patients when planning maxillofacial and reconstructive surgery.[3] Obtaining measurements of the soft tissues of the face is important in terms of achieving aesthetic criteria.[4] Aesthetic results from clinical treatments thus depend on the anatomic structures present. When anthropometric methods were used into clinical practice to quantify changes in the craniofacial structures, features distinguishing various races/ethnic groups were discovered.[2] A number of studies have investigated facial profiles by measuring the angles and separation of the soft tissues using cephalographs, two-dimensional photogrammetry or direct measurements.[5-7] Anthropometry uses direct measurements to analyze the size of the soft tissues in

the face.[3] Anthropometric studies in various populations have detailed the relationships between the landmarks of the face.[1-3] The aim of the present work was to determine some relevant facial parameters, particularly in relation to sex, and to establish nasal index of Turkish adults.

Materials and Methods

In this study, a population of 100 female and 100 male volunteer Turkish young adults was examined. The subjects were all healthy students and staff from Nevsehir University. The students and staff were come from different regions of Turkey in order to represent the variant facial properties.

Table 1: Craniofacial anthropometric landmarks

No	Measurement Names	Landmarks	
1	Forehead width	frontotemporal- frontotemporal	ft-ft
2	Biocular width	exocanthion-exocanthion	ex-ex
3	Eye-Fissure Width (right)	exocanthion-endocanthion	ex-en
4	Intercanthal Distance	endocanthion -endocanthion	en-en
5	Eye-Fissure Width (left)	exocanthion-endocanthion	ex-en
6	Upper face Width	zygion-zygion	zy-zy
7	Nose Width	alare-alare	al-al
8	Mouth Width	cheilion-cheilion	ch-ch
9	Lower face width	gonion-gonion	go-go
10	Forehead Height I	trichion-glabella	tr-g
11	Forehead Height II	trichion-nasion	tr-n
12	Nose Length	nasion-subnasale	n-sn
13	Protrusion of the nasal	subnasale-pronasale	sn-prn
14	Special Face Height	endocanthion-gnathion	en-gn
15	Lower Face Height	subnasale-gnathion	sn-gn
16	Upper vermillion height	labiale süperius-stomion	ls-st
17	Lower vermillion height	stomion-labiale inferius	st-li
18	Special Upper Face Height	glabella-subnasale	g-sn
19	Upper face depth	tragion–nasion	t-n
20	Middle face depth	tragion – subnasale	t-sn
21	Lower face depth	tragion-gnathion	t-gn
22	Ear width (right)	preaurale- postaurale	pra-pa
23	Ear Length (right)	subaurale- superaurale	sa-sba

This study was approved by the Etic Committee, Erciyes University, Turkey. Informed consent was obtained from all participants.

Subjects included in the study were required to be 20 through 35 years of age to minimize the effects of aging on the facial measurements. Other inclusion criteria consisted of no histories concerning plastic or reconstructive surgery, major trauma, craniofacial syndromes and body mass index of 20-25 (calculated as weight in kilograms divided by the square of height in meters) for both sexes. Firstly, the anthropometric landmarks had been identified on the face. Afterwards 13 horizontal and 10 vertical direct measurements were performed by using a sliding caliper. The measurements were taken with subjects sitting on a chair in a relaxed mood. Twenty-three standard anthropometric measurements were obtained (Table 1) (Figs.1-3). Standard anthropometric methods were used for all measurements. Linear measurements were reported as millimeters.

Figure 1: Anthropometric measurements (1:* Forehead Width *(ft-ft), 2: Biocular Width (ex-ex), 3: Eye-Fissure Width (right) (ex-en), 4: Intercanthal Distance (en-en), 5: Eye-Fissure Width (left) (ex-en), 6: Upper Face Width (zy-zy), 7: Nose Width (al-al), 8: Mouth Width (ch-ch) 9: Lower Face Width (go-go)).

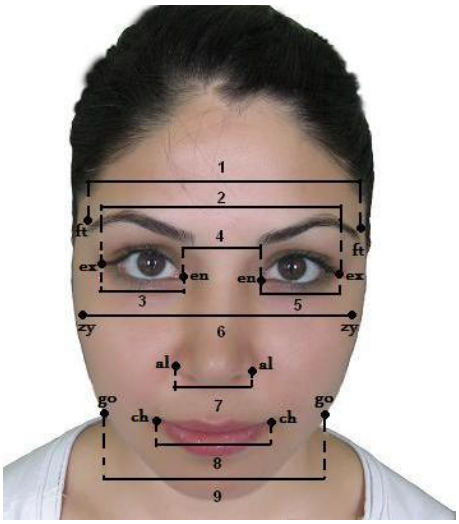


Figure 2: Anthropometric measurements (10: Forehead Height I (tr-g), 11: Forehead Height II (tr-n), 12: Nose Length (n-sn), 13: Protrusion of The Nasal Tip (prn-sn), 14: Special Face Height (en-gn), 15: Lower Face Height (sn-gn), 16: Upper Vermillion Height (ls-st), 17: Lower Vermillion Height (st-li)).

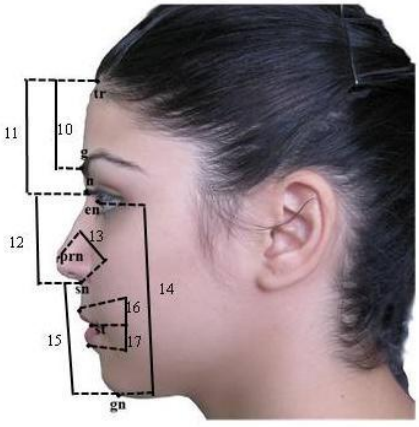
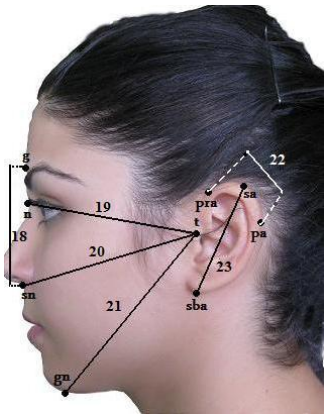


Figure 3: Anthropometric measurements (18: Special Upper Face Height (g-sn), 19: Upper Face Depth (n-t), 20: Middle Face Depth (sn-t), 21: Lower Face Depth (gn-t), 22: Ear Width (right) (pra-pa), 23: Ear Length (right) (sa-sba)).



The average measurements were compared with the nasal index. The nasal index (NI), were calculated according to the formulae: NI= Nasal width/Nasal height x 100.

Statistical Analysis

The findings of descriptive statistical parameters (Mean, Min. and Max. values, and SD) were calculated for the differences between in treated subjects (male and female entities). The differences between the two groups were submitted to t-test for independent samples (statistical package SPSS 15 for Windows). The statistical significance was set as P<0.05.

Table 2: The results of the craniofacial anthropometric measurements and independent samples t test results between sexes

Landmark	Female (100) (mm)			Male (100) (mm)			
	Min.	Max.	Mean±SD	Min.	Max.	Mean±SD	P.value*
ft-ft	99.33	126.82	113.59±5.27	104.48	137.66	118.34±6.15	[a]<0.000
ex-ex	88.06	112.43	96.51±4.73	84.42	111.07	99.74±5.47	[a]<0.000
ex-en(r)	28.23	38.06	33.50±1.95	26.89	38.59	33.89±2.51	<0.224
en-en	26.95	38.07	31.86±2.36	27.53	41.44	33.17±2.79	[a]<0.000
ex-en (l)	28.50	38.21	33.39±1.84	27.01	38.35	33.91±2.30	<0.082
zy-zy	111.19	141.58	127.20±6.54	115.06	145.45	129.06±7.08	<0.055
al-al	24.22	39.57	32.32±2.71	28.94	40.85	35.15±2.92	[a]<0.000
ch-ch	39.87	64.74	48.88±3.92	43.09	62.24	51.55±4.06	[a]<0.000
go-go	85.98	141.55	107.43±8.74	90.25	141.59	111.55±9.23	[a]<0.001
tr-gl	36.15	69.17	51.29±7.57	29.76	84.74	52.72±9.60	<0.224
tr-n	46.15	93.61	66.93±8.13	42.71	95.76	68.80±9.61	<0.140
n-sn	42.78	60.27	50.36±3.74	40.07	62.92	53.14±4.41	[a]<0.000
sn-prn	13.47	25.50	19.80±2.41	13.44	27.93	20.44±3.20	<0.111
en-gn	93.66	119.85	104.05±5.36	96.33	129.67	113.17±6.50	[a]<0.000
sn-gn	45.33	76.64	63.44±5.88	56.57	81.40	70.54±5.58	[a]<0.000
ls-sto	3.71	10.71	7.57±1.26	4.07	11.93	6.87±1.71	[a]<0.001
sto-li	5.88	13.10	9.68±1.38	4.54	14.16	9.23±1.75	[a]<0.046
gl-sn	58.03	79.84	69.21±4.51	61.42	87.60	73.46±5.13	[a]<0.000
t-n	106.88	129.08	118.17±4.28	110.11	137.68	126.70±5.17	[a]<0.000
t-sn	110.81	134.51	122.18±4.58	110.64	143.43	131.32±4.78	[a]<0.000
t-gn	120.48	149.40	135.63±6.58	125.12	170.00	147.32±5.89	[a]<0.000
pra-pa (r)	22.82	43.74	31.09±3.10	23.03	39.47	32.54±2.90	[a]<0.001
sa-sba (r)	49.39	70.55	58.81±4.29	50.56	70.79	61.49±4.80	[a]<0.000

*Independent t-test, (p<0.05)
[a] Statistically significant difference
(r): Right, (l): Left

Results

In this study, in the total evaluation of both groups, all the parameters were higher in the males except upper and lower lip height. Compared with both sexes, a significant difference has been found in all measurements except the upper face width, eye-fissure width, nasal tip protrusion, forehead height I and II (P<0.005) (Table 2).

The nasal index obtained in this study is 64.17 mm in female, 66.12 mm in male. Turkish people has low nasal index value that describes a nose as narrow or leptorrhin.

Discussion

The human face shows differences among age, races and genders. The anthropometric analysis of the face is a important step for approaching to the patient who subjected to for craniofacial plastic reconstructive

surgery.[6] Results of this study can assist in the diagnosis and planning of facial plastic and reconstructive surgery or orthognathic surgery for Turkish adults.

Racial and ethnic differences in the facial traits of American and European Caucasian, Afro-American, Malaysian Indian, Arabians and Chinese have been reported by several authors.[2,8-10] In our study all the parameters were higher in the males except upper and lower lip height. Compared with both sexes, a significant difference has been found in all measurements except the upper face width, eye-fissure width, nasal tip protrusion, forehead height I and II (P<0.05). Facial soft tissue measurements for different regions (face, nasal, orolabial) of various ethnic groups studied in the literature and our results are summarized in Table 3.

Table 3: Comparison of the craniofacial anthropometric norms between Malaysian Indian, North American Caucasian and Turkish adults (this study).

	Mean ± SD (mm)					
	Female			Male		
Landmark	Turkish	Malaysian Indian[7]	North American Caucasian[8]	Turkish	Malaysian Indian[7]	North American Caucasian[8]
ft-ft	113.59±5.2			118.34±6.1		
ex-ex	96.51±4.7	89.4±3.2	87.6±4.0	99.74±5.4	92.1±4.1	90.7±3.8
ex-en(r)	33.50±1.9			33.89±2.5		
en-en	31.86±2.3	30.5±1.7	32.5±2.1	33.17±2.7	31.7±1.9	32.9±2.7
ex-en (l)	33.39±1.8	29.6±1.4	30.7±1.8	33.91±2.3	30.7±1.6	31.3±1.4
zy-zy	127.20±6.5	126.7±3.9	131.1±5.3	129.06±7.0	136.3±4.8	139.1±6.3
al-al	32.32±2.7	35.3±2.8	31.9±1.0	35.15±2.9	39.5±2.6	34.8±2.7
ch-ch	48.88±3.9	45.9±3.0	49.8±3.2	51.55±4.0	47.3±3.3	53.5±3.6
go-go	107.43±8.7			111.55±9.2		
tr-g	51.29±7.5			52.72±9.6		
tr-n	66.93±8.1			68.80±9.6		
n-sn	50.36±3.7	50.4±3.2	49.2±2.9	53.14±4.4	51.9±3.6	53.2±3.3
sn-prn	19.80±2.4	18.7±1.6	19.4±1.7	20.44±3.2	19.5±1.9	20.6±2.2
en-gn	104.05±5.3			113.17±6.5		
sn-gn	63.44±5.8	61.0±3.8	64.3±4.0	70.54±5.5	67.7±3.5	72.6±4.5
ls-st	7.57±1.2	8.6±0.9	8.6±1.6	6.87±1.7	9.2±1.3	9.5±1.5
st-li	9.68±1.3	10.9±1.0	10.0±1.5	9.23±1.7	11.5±1.6	11.0±1.2
g-sn	69.21±4.5			73.46±5.1		
t-n	118.17±4.2			126.70±5.1		
t-sn	122.18±4.5			131.32±4.7		
t-gn	135.63±6.5			147.32±5.8		
pra-pa (r)	31.09±3.1	31.8±2.2	34.1±2.6	32.54±2.9	34.7±2.7	35.9±2.2
sa-sba (r)	58.81±4.2	60.3±2.8	59.0±3.6	61.49±4.8	64.6±4.0	62.4±3.7

(r): Righ, (l): Left

Date adapted and summerized from ref.7 and ref.8.

Twenty-three anthropometric measurements related with facial soft tissue were compared with those reported by Farkas et al.[9] for American–Caucasian adults, Ngeow.et al.[8] for Malaysian Indian people. The mean result of Biocular width (ex-ex) in our study (96.51 mm in female, 99.74 mm in male) is longer than Malaysian Indian (89.4 mm in female, 92.1 mm in male) and American–Caucasian (87.6 mm in female, 90.7 mm in male). In addition another notable finding is that the eye-fissure width (left) (ex-en) is longer in Turkish adults than from American–Caucasian and Malaysian Indian people.

The nose is important criterion used for purposes of racial classification. The mean result of the nasal width (al-al) in our study (32.32 mm in female, 35.15 mm in male) is shorter than African American[10] (43.5 mm), Chinese[11] (39.20 mm), Japanese[12] (36.3 mm), Canadian Caucasian[13] (36.9 mm), African[14] (45.9 mm), Malaysian Indian[8] (37.4 mm). But the nasal width of Turkish adults is bigger than American Caucasian adults (31.9 mm in female, 34.8 mm in male).[9] The nose was very or extremely significantly wide in both sexes of Asian and Black ethnic groups.[2]

The mean result of the nose length (n-sn) in male (53.14 mm) in our study was similar to mean results of Chinese[11] mean values (53.50 mm) and American Caucasian[9] mean values (53.2 mm). The mean nose lenght in female (50.36 mm) in our study similar to mean rusults of Malasian Indian female (50.4 mm).[8] But it is longer than the nose length of American Caucasian female (49.2 mm).[9] Also the mean result of nose length in current study was different result of another study for Turkish people in the

Black sea region.[15] Because the people living in the black sea region have the long nose as characteristic feature.

The nasal index obtained in this study is 64.17 mm in female, 66.12 mm in male. According to a study, the nasal index was 76.6 mm in Malaysian Indian male, 70.3 mm in females.[8] In another study the nasal index in American Caucasians is 65.8 mm for males and 65.1 mm in females.[9] The mean nasal index for males and females were 86.09 mm and 90.16 mm respectively in the Nigeria people.[16] From this index, we can see that the Turkish people and North American Caucasians have low nasal index value that describes a nose as narrow or leptorrhin. The result of nasal index in current study was similar to result of another study for Turkish adults.[15]

In the present study, we measured the average craniofacial anthropometric values of the young Turkish adults on 200 subjects and compared with the results found in the literature. Our results have shown that craniofacial anthropometric measurements in the literature of the other ethnic and racial groups were not valid for our population.

As a conclusion, to achieve maximum facial aesthetic results after plastic or orthognathic surgery, the facial anatomy of the patient must be understood. The knowledge of the most striking facial characteristic of Turkish people is essential to preparation of the corrective surgery or analysis of postoperative results.

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