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Description of Clinical Facial Analysis of Minangkabau Ethnics Students Using Rhinobase Software

Al Hafiz Djosan[1]*, Dolly Irfandi[1], Jacky Munilson[1], Hafni Bachtiar[2], Ricko Mariza Putra[1], Latifah Hanum[3]

[1]Department of Otorhinolaryngology Head and Neck Surgery, Faculty of Medicine, Andalas University, Padang, Indonesia; [2]Department of Public Health, Faculty of Medicine, Andalas University, Padang, Indonesia; [3]Department of Medical Education, Faculty of Medicine, Andalas University, Padang, Indonesia

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***Correspondence:** Al Hafiz Djosan, Department of Otorhinolaryngology Head and Neck Surgery, Faculty of Medicine, Andalas University, Padang Indonesia. E-mail: alhafizdjosan@gmail.com
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Abstract

BACKGROUND: Facial analysis is influenced by several factors including age, gender, race, body shape, and personality. The anatomical characteristics of Asians are highly varied. The differences of these characteristics have become a reference for several researchers to get the basic value of each individual facial profile from certain regions or countries.

AIM: The aim of the study was to determine the clinical facial analysis of students from the Minangkabau ethnic group.

MATERIALS AND METHODS: A descriptive-analytic study with a cross-sectional design was carried out on 100 students of the Faculty of Medicine, Andalas University, ethnic Minangkabau aged 18–29 years who met the criteria. Facial analysis using Rhinobase Software, the results obtained were analyzed using the Statistical Package for the Social Sciences version 22.

RESULTS: This study showed that there were significant differences ($p < 0.05$) in 8–21 facial anthropometric parameters. Those parameters were lower face height, SM, Mf-Mf, Al-Al, mentocervical angle, NT, tip Powell projection, and mentolabial sulcus.

CONCLUSION: The vertical facial assessment revealed that men have a longer lower facial height than women. The horizontal facial assessment found that men have a wider bridge of nose and nostrils than women.

Introduction

The face is the most important factor affecting the physical appearance of a person [1]. The most important factors of facial attractiveness are averageness, sexual dimorphism, youthfulness, and symmetry [2]. Clinical facial analysis (CFA) is a method used by doctors to evaluate and assess a patient's face, to determine proportion, volume, appearance, symmetry, and deformity. This is obtained from physical examination, clinical photos, and imaging *X-ray* conventional and computerized [3].

Rhinobase software is an easy and safe indirect method for facial analysis developed by Apaydin. In the study conducted by Meruane, Rhinobase provides evidence of high reliability for several nasofacial measurements. The nasofacial analysis allows accurate pre-operative evaluation, surgical planning, and analysis of outcomes in rhinoplasty, and it can be a useful tool for both novice and experienced rhinoplasty surgeon [4].

Facial analysis is influenced by several factors including age, gender, race (ethnicity), body shape, and personality [5]. At present, race and ethnicity are considered before performing cosmetic surgery, especially rhinoplasty surgery. The study of cosmetic surgery and ethnic standardization is becoming a background for modern medicine and beauty culture [6].

There are a lot of variations in the anatomical characteristics of Asians [7]. These differences in characteristics have become a reference for several researchers to get the basic value of each individual facial profile from certain regions/countries. The study by Gao *et al*. has compared current objective esthetic criteria between Caucasian and East Asian women with regards to four facial features (overall facial form and proportions, eyes, nose, lip, and chin). This study concluded that the patient's expectation is the most important goal rather than the objective criteria in esthetic surgery. Although, if esthetic standards have changed over the years due to the influence of Western culture, Asian women still want to preserve their ethnic identities by refining their Asian features rather than totally Westernizing their appearance. The surgeon performing cosmetic surgeries has to understand the patient's ethnic esthetic characteristics to get the satisfactory surgical result [8].

Indonesia has diverse cultures, tribes, and races. Ecological, geographical, racial, age, and gender factors can influence the physical dimensions of the human body; measured by physical anthropometry [9]. Irsa *et al*. conducted research on variations of facial shapes in several tribes in West Sumatra, such as the Nias, Mentawai, and Minangkabau tribes using the cephalometric method to determine the kinship relationship between the three tribes [10]. The data obtained are incomplete in describing the 21 parameters of facial analysis in the Minangkabau ethnicity. It is important to know the reference of facial proportion of a certain ethnic group as a guideline for treatment planning [11]. Based on this evidence, this present study aimed to find out the values of CFA in the Minangkabau ethnic group. The findings of this study could provide anthropometric characteristics of the Minangkabau ethnic face and provide useful reference points in facial reconstruction in plastic surgery and other interdisciplinary fields.

Methods

This research is a descriptive-analytic study with a cross-sectional design. The study was conducted from October 2017 to October 2018 at the ENT-HNS clinic of M. Djamil Central Public Hospital, Padang. There are 100 people that were taken by consecutive sampling. The research sample was students of the Faculty of Medicine, Andalas University, ethnic Minangkabau in three generations aged 18–29 years, with normal body mass index (18.5–24.9), and never had history of surgery in the facial area or facial fractures. There was no history of moderate-severe persistent allergic rhinitis <18 years, no persistent nasal obstruction, not currently under orthodontic treatment, and no complex craniofacial disorders.

Data were obtained through history taking, general physical examination of the face, and ENT-HN examination. Samples that meet the criteria were then marked with facial anthropometry. The face of the respondent was photographed in three positions: Frontal, lateral, and basal. The photos were processed using Rhinobase software ver.1.1 and the results obtained were analyzed using the Statistical Package for the Social Sciences version 22.

Ethical consideration

Ethical approval for this study was obtained from the Health Research Ethics Committee, Faculty of Medicine, Andalas University, Padang, Indonesia. Research approval was requested from respondents after obtaining an explanation related to the objective, procedure, benefits, and risks of the study. The respondents who agreed to participate in the study then were required to sign an informed consent.

Results

Characteristics of the research sample

In Table 1, the distribution of the sample based on gender was mostly female at 66%, and based on age, the most found at 23 years by 33%.

Table 1: Distribution of samples by age and sex

Age	Gender				Total	%
	Man	%	Woman	%		
21	2	2	3	3	5	5
22	3	3	14	14	17	17
23	11	11	22	22	33	33
24	12	12	20	20	32	32
25	2	2	4	4	6	6
26	1	1	1	1	2	2
27	2	2	2	2	4	4
28	1	1	0	0	1	1
Total	34	34	66	66	100	100

Comparison of facial anthropometry values by gender

The results of the student-t-test of Minangkabau ethnic students' anthropometric values in Table 2 showed that there were significant differences ($p < 0.05$) in 8 of 21 parameters, namely, lower face height (LFH), SM, Mf-Mf, Al-Al, mentocervical angle (MCA), NT, Tip Powell projections, and mentolabial sulcus.

Table 2: Comparison of facial anthropometry values of Minangkabau ethnic

No	Parameter	Man		Woman		Different	p-value
		mean	SD	Mean	SD		
1	UFH (mm)	71.98	9.00	71.45	9.71	0.54	0.790
2	Middle face height (mm)	80.70	8.04	79.54	9.39	1.16	0.541
3	Lower face height (mm)	85.34	9.96	77.51	8.14	7.84	0.000054
4	ULL (mm)	18.47	3.47	17.56	2.96	0.91	0.172
5	SM (mm)	55.86	7.26	50.31	6.19	5.55	0.000121
6	En-En (mm)	42.43	5.16	41.72	4.04	0.70	0.457
7	Mf-Mf (mm)	30.14	2.57	28.70	1.91	1.44	0.002
8	Al-Al (mm)	52.14	4.71	48.40	3.92	3.74	0.000056
9	Nasofrontal angle (°)	132.65	7.78	136.70	7.20	4.05	0.11
10	Nasofacial angle (°)	35.31	2.87	35.03	3.43	0.28	0.681
11	Nasolabial angle (°)	97.58	11.03	99.44	11.98	1.86	0.453
12	Mentocervical angle (°)	101.92	6.61	96.24	6.49	5.68	0.000078
13	Nasomental angle (°)	130.94	3.80	130.62	4.49	0.32	0.723
14	Angle of Curvature of the Face (°)	8.74	4.63	10.73	4.92	1.99	0.53
15	NT (mm)	42.73	2.91	39.97	3.12	2.76	0.000043
16	Sn-C (mm)	8.99	1.69	8.49	1.43	0.50	0.659
17	Simons Tip Projection	0.63	0.11	0.64	0.13	0.01	0.565
18	Tip Powell-Modified Baum. Projection	3.03	0.20	3.15	0.27	0.11	0.034
19	Columella Show (mm)	5.38	1.55	5.26	1.42	0.12	0.709
20	Mentolabial Sulcus (mm)	5.27	0.98	4.31	1.23	0.96	0.000160
21	Lobul-Basal Comparison	0.85	0.05	0.87	0.05	0.02	0.090

Comparative analysis of the proportions on the faces of Minangkabau ethnic

Vertical face assessment

The vertical face assessment according to the Neoclassical Canon is divided into three equal parts (*Horizontal Third*): Upper face height (UFH), face center height (middle face height [MFH]), and LFH.

Based on Table 3, the proportion of faces vertically UFH and MFH, men were shorter than women, but after the independent sample t test analysis there was no significant difference. Meanwhile, there was a significant difference ($p < 0.05$) in lower facial height (LFH) between men and women, where men have longer LFH than women.

Table 3: Vertical proportion of faces by gender

Parameter	Gender (%)		p-value
	Man	Woman	
Upper face height	30.23	31.22	0.079
Middle face height	33.95	34.84	0.130
Lower face height	35.82	33.94	0.000256
Total	100%	100%	

Horizontal face assessment

The horizontal face assessment according to the neoclassical canon is divided into five equal (Vertical Fifths) so that it is obtained the width of the eyes, the distance of the epicanthus and the width of Ala Nasi are the same. Parameters that can be assessed in this study are epicanthus distance (En-En), nose bridge width (Mf-Mf), and Ala Nasi width (Al-Al).

Based on the parameters in Table 4, there was a significant difference ($p < 0.05$) in the width of the bridge of the nose (Mf-Mf) and the width of the ala nasi (Al-Al) between men and women of Minangkabau ethnicity. Men have a wider nose bridge and ala nasi than women.

Table 4: Horizontal distribution of facial anthropometry

Parameter	Man		Woman		Different	p-value
	Mean	SD	Mean	SD		
En-En (mm)	42.43	5.16	41.72	4.04	0.70	0.457
Mf-Mf (mm)	30.14	2.57	28.70	1.91	1.44	0.002
Al-Al (mm)	52.14	4.71	48.40	3.92	3.74	0.000056

Based on Table 5, the nose length (NT) of men was 2.76 mm longer than women, after being analyzed by the independent sample t-test there is a significant difference ($p < 0.05$) between the nose length of men and women of Minangkabau ethnicity.

Face aesthetic angle

Based on the facial esthetic angle parameters after being analyzed by independent sample t-test was found that the MCA had a significant difference ($p < 0.05$) between men and women. While the other angles nasofrontal angle (NFA), nasofacial angle (NfcA), nasolabial angle (NLA), and nasomental angle (NMA) were no significant differences.

Table 5: Anthropometric distribution for nose analysis

Parameter	Man		Woman		Different	p-value
	Mean	SD	Mean	SD		
UFH (mm)	71.98	9.00	71.45	9.71	0.54	0.790
MFH (mm)	80.70	8.04	79.54	9.39	1.16	0.541
LFH (mm)	85.34	9.96	77.51	8.14	7,84	0.000054
Al-Al (mm)	52.14	4.71	48.40	3.92	3,74	0.000056
NT (mm)	42.73	2.91	39.97	3.12	2,76	0.000043
Sn-C (mm)	8.99	1.69	8.49	1.43	0,50	0.659
Proyeksi tip simons	0.63	0.11	0.64	0.13	0,01	0.565
Tip powell-modified baum projection	3.03	0.20	3.15	0.27	0.11	0.034
Columella show (mm)	5.38	1.55	5.26	1.42	0.12	0.709
Lobul-basal comparison	0.85	0.05	0.87	0.05	0.02	0.090

The angle of curvature of Minangkabau women's face is 10.73^{o} and men's face is 8.74^{o}. Although there were differences in values between men and women, both were still within the normal range. In this study, the mentolabial sulcus of men was found to be deeper than Minangkabau women, after analyzing there was a significant difference ($p < 0.05$).

Discussion

This study was conducted to obtain basic data on the facial characteristics of the Minangkabau ethnic group. The results obtained from 100 samples were grouped by gender (34 male students and 66 female students). The age distribution of the sample is between 21 and 28 years with the most age at 23 years.

This study found that there were significant differences in 8–21 parameters, namely, LFH, SM, Mf-Mf, Al-Al, MCA, NT, Tip Powell projections, and Mentolabial sulcus. Elfiah *et al*. conducted a study to describe the profile of the Indonesian face and found that there were statistically significant differences between men and women at 21 measurement points in five facial regions [12].

Minangkabau women have a longer total face (228.50 mm), when compared to the results of other studies, such as Javanese (194.98 mm), Batak (183.55 mm), and Caucasian (180.10 mm) women. Minangkabau women have MFH > LFH > UFH values, same as Javanese women, but different from Javanese and Caucasian women who have LFH > MFH > UFH values. The Minangkabau and Javanese were included in the Deutro-Malay group, while the Batak was included in the Proto-Malay [13], [14].

The overall face proportion value had differences between the vertical proportions of Minangkabau, Javanese, Batak, Caucasian, and Neoclassical Canon faces. In proportion to Middle Height, the Minangkabau tribe was lower than the Javanese and Caucasian, but anthropometrically it was greater. This was because the total face height of Minangkabau women was longer than that of Javanese and Caucasian women. The proportion of Minangkabau women's faces was

closer to the Caucasian and Javanese values, while the Batak ethnicity was closest to the Neoclassical Cannon value [13], [14]. The average vertical facial anthropometry was found that Minangkabau women were longer in the measurement of UFH, MFH, LFH, ULL, and SM values compared to Javanese, Batak, and Caucasian tribes.

The results of facial anthropometry measurements of the Minangkabau ethnic mean value, when compared with other studies, found that Minangkabau women had the largest epicanthus distance (41.72 mm) among the Javanese (26.08 mm), Batak (35.171 mm), Bugis (24.040 mm), Makasar (24.790 mm), Toraja (20.194 mm) and other ethnic groups, where the smallest was the Mandar tribe (18.861 mm). When compared with others Deutro-Malay ethnic groups, the Minangkabau tribe was the largest in its group. The width of Ala Nasi in the Minangkabau tribe was 48.40mm which's the largest near Korea (45 mm), with the smallest being Caucasian (31.4 mm) [13], [14], [15].

The length of the nose of the Minangkabau women was 39.97 mm. The study anthropometric of the Bali Aga population obtained an average nose width of 38.79 mm, the average nose length of 45.49 mm.[16] When compared to the whole face, the proportion of nose length was 0.17 and compared to the width of Ala Nasi, which is 121%. The proportion of Minangkabau women's nose length was the same as that of Batak women (0.1786), but when compared to Javanese (0.2) and Caucasian (0.25), Minangkabau women were smaller. The proportion of Ala Nasi with a nose length in Minangkabau women was the same as Caucasian women (120%) and Batak (127%), Ala Nasi was wider than the length of the nose, while Javanese women (100%) are the same between the width of the Ala Nasi and the length of the nose [13], [14].

The facial angle represents an important interfacial relationship in the evaluation of rhinoplasty patients. The facial esthetic angles assessed were the NFA, NFcA, NMA, MCA, and also NLA. According to Powell and Humphrey, ideal value of esthetic angle of the face is NFA 115–130°, NFcA 30–40°, NMA 120–132°, MCA 80–95°, and NLA 90°–120°. The Minangkabau tribe has a NFA and MCA angle value that was higher than the ideal value, it is also the same with several other tribes such as Javanese, Batak, Bugis, Makasar, and Mandar. Minangkabau women's NFcA and NMA angles were still within the range of ideal values. The NLA in Minangkabau, Javanese, Batak, Bugis, Makasar, Mandar, Toraja, and Caucasian women was still within the range of ideal values [13], [14], [15].

The curvature angle of the face was used to assess protrusion or retrusion of the maxilla and to estimate the degree of prognathism and retrognathism. According to Wall, the normal value ranges from 8 to 16°. In this study, the average face curvature angle was 10.73°, while the Javanese (9.31°), and the Batak (17.39°) [13], [14], [17].

Conclusion

This study found that there were significant differences in deightof 21 parameters, namely, LFH, SM, Mf-Mf, Al-Al, MCA, NT, Tip Powell projections, and Mentolabial sulcus. The vertical facial assessment revealed that men have a longer lower facial height than women. The horizontal facial assessment found that men have a wider bridge of nose and nostrils than women.

Limitations

This study was conducted to determine the CFA of male and female students from the Minangkabau ethnic group. The limitations of this study are this study just provides basic anthropometric characteristic values of the Minangkabau ethnic face. This study could provide reference points in the facial reconstruction of Minangkabau ethnicity but still needs further research about ethnic esthetic characteristics to get satisfactory surgical result.

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