

Analysis of soft tissue facial profiles of Chinese students at W.R. Supratman 1 and 2 high schools in Medan using linear and angular measurements

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ABSTRACT

Background: Soft tissue analysis is essential in treatment planning to ensure proportional, balanced, and harmonious soft tissue at the end of treatment. Several factors influence the variations, such as age and gender. Soft tissue profile analysis is usually studied from a lateral view. **Purpose:** The study aimed to determine whether there were differences in the average values of linear and angular measurement of the soft tissue profiles of the middle and lower third of the face between Chinese males and females high school students using lateral photometry. **Methods:** The samples were 100 lateral photographs (50 male and 50 female) of Chinese high school students at W.R. Supratman 1 and 2 in Medan. All samples were collected based on the inclusion and exclusion criteria obtained from secondary data. The linear and angular measurements were measured using Software Corel Draw 2019 and analysed statistically using an independent t-test and the Mann-Whitney test. **Results:** The inferior facial third, length of the lower lip, and prominence of the upper lip were, on average, greater in males, whereas in the prominence of pogonion, nasolabial angles, and nasofrontal angles were greater, on average, for females. **Conclusion:** There were significant gender differences in Chinese high school students in the inferior facial third, length of the lower lip, prominence of the upper lip, nasolabial angle, and nasofrontal angle, whereas there is no significant difference between genders in the prominence of the pogonion.

Keywords: Chinese student; lateral photograph; soft tissue profile analysis

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INTRODUCTION

Facial appearance affects a person's self-esteem and self-image, which is directly related to their quality of life.¹ However, facial beauty standards vary widely and are related to the social environment.² Facial appearance could also be influenced by several factors such as age, gender, psychology, race and ethnicity.^{2,3} Variations in the length of the nose, the protrusion of the lips, and the chin's projection can change the alignment of the face and create a new visage, which has a different aesthetic perception.⁴ Related to age and gender, the most significant changes in soft tissue occurs earlier in women (10–15 years) than men (15–25 years).⁵ In addition, a study by Torlakovic et al.⁶ stated the ageing of the facial profile in men is ten years slower than in women and changes in the facial profile are more

significant in women than in men. The facial structure can be changed in some medical fields such as plastic surgery and orthognathics, orthodontics and prosthodontics.⁴

Soft tissue analysis is essential in treatment planning to ensure proportional, balanced, and harmonious soft tissue at the end of treatment. The connection of the nose, lips, chin and facial soft tissue, is an important consideration. A soft tissue evaluation to better understand aesthetics can be performed from the frontal view and the profile.⁵ These analyses are studied from a profile or lateral perspective, either by radiography or photography.⁴

Several studies examine facial soft tissue profiles with linear and angular measurements, such as the studies by Moskelgosha et al.⁴ (2015) on Persians, Diouf et al.⁷ (2011) on Senegalese and Moroccans, Leung et al.⁸ (2014) on southern Chinese. Previous studies have shown variations

in facial soft tissue analysis results with linear and angular measurements associated with influencing factors such as gender and ethnicity.²

Indonesia is a country with a variety of cultures and ethnic groups. This variety was influenced by trade relations with Indian, Arab, European, Dutch, Portuguese and Chinese peoples.^{9,10} The Chinese originally came to Indonesia, especially Palembang, which was the centre of trade for the Sriwijaya Kingdom, for economic and trade purposes.¹⁰ Therefore, this study aimed to determine whether there were differences in the average values of linear and angular measurement of the middle and lower third soft tissue profile of the face in Chinese male and female high school students using lateral photometry.

MATERIALS AND METHODS

The methodology used was an analysis study with a retrospective cross-sectional approach. Samples were lateral photographs of Chinese high school students at W.R. Supratman 1 and 2 in Medan, collected using a purposive sampling method based on the inclusion and exclusion criteria. The inclusion criteria were Chinese ethnicity, 15–18 years old, had complete permanent teeth except for M3, had a profile photo, and had a class 1 dental occlusion. The exclusion criteria included a history of facial

asymmetry or plastic surgery or corrupted photographic data. The photographic data were the secondary data taken in the natural head position (NHP). The subjects were sitting in a chair 0.75 m in front of a wall covered with a 1.2 1.5 m white cloth. The camera, a Canon g7x, was placed 1.5 m in front of the subject's chair. They sat facing left to show a lateral view to the camera. The same operator took all the photographs.¹¹ This study had permission from the Research Ethics Committee of Universitas Sumatera Utara (Number 116/KEP/USU/2021).

After collecting the photographs, landmarks were added using Corel Draw 2019 software (Corel Corporation, Ottawa, Canada), as shown in Table 1.⁴ They were subnasal, labial superior, stomion inferior, supramental, pogonion, menton, glabella, pronasal, and columella. Parameters used in this study are: the inferior facial third (Figure 1a) was constructed by drawing a line from subnasal (Sn) to menton (Me); the length of the lower lip (Figure 1b) was made by drawing a line from stomion inferior (Sti) to supramental (Sm); the prominence of the upper lip (Figure 1c) was achieved by drawing a line from labial superior (Ls) to Canut's line (subnasal (Sn) to supramental (Sm)); the prominence of pogonion (Figure 1d) was constructed by drawing a line from Pogonion (Pg) to Canut's line (subnasal (Sn) to supramental (Sm)); the nasofrontal angle (Figure 1e) was calculated by drawing an angle from nasion (N) to glabella (G) and pronasal (Prn); the nasolabial angle (Figure 1f)

Table 1. The landmarks were used in the middle and lower third soft tissue profile analysis in this study⁴

Landmarks	Definition
subnasal	the point where the upper lip borders the columella
labial superior	the point showing the mucocutaneous border of the upper lip
stomion inferior	the most superior point of the lower lip
supramental	the innermost point of the inferior sublabial concavity
pogonion	the most anterior point of the chin
menton	the most inferior point of the inferior edge of the chin
glabella	the most anterior point of the midline of the forehead
pronasal	the most prominent point at the tip of the nose
columella	the most inferior and anterior point of the nose

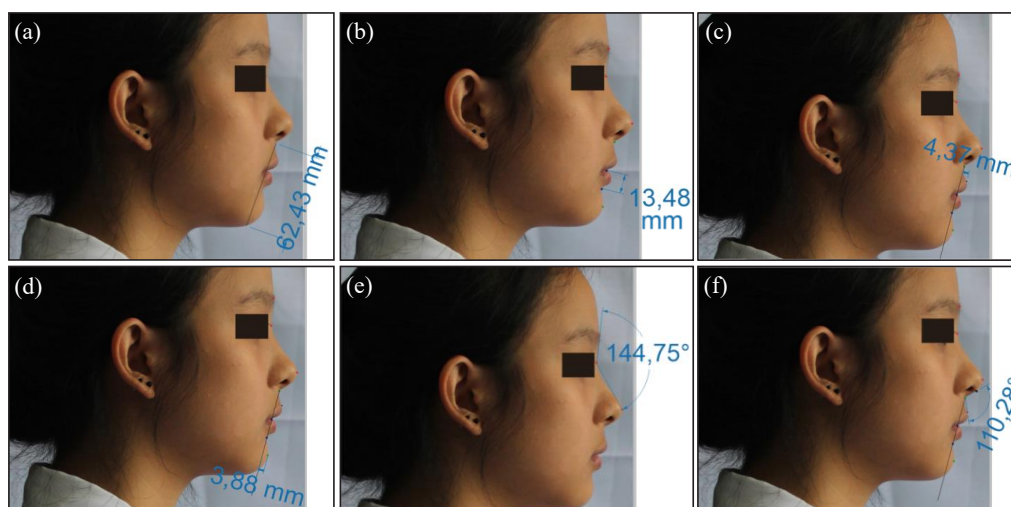


Figure 1. (a) inferior facial third; (b) length of the lower lip; (c) prominence of the upper lip; (d) prominence of pogonion; (e) nasofrontal angle; (f) nasolabial angle.

was made by drawing an angle from columella (Cm) to subnasal (Sn) and labial superior (Ls). Then, the lines and angles were measured using the same software. Each face's middle and lower third soft tissue profile was derived from lines and angles obtained by connecting the landmarks.

RESULTS

In this study, we found that the average value of the inferior facial third, the length of the lower lip, and the upper lip's prominence was greater in males than females. In contrast, the average value of prominence of the pogonion, nasolabial angle and nasofrontal angle was more significant in females than males (Table 1).

When analysed statistically using the Shapiro-Wilk test, the data showed almost all parameters were distributed normally except the inferior facial third and upper lip length. The normally distributed data were analysed using an independent t-test, whereas the Mann-Whitney test was used for the data that were not normally distributed (Table 2).

From Table 2, the results of measuring the inferior facial third, the length of the lower lip, prominence of the upper lip, nasolabial angle, and nasofrontal angle all indicated significant gender differences. In contrast, the results of measuring the prominence of pogonion showed there were no gender differences. The previous study measurements were collected as a comparative study and showed in Table 3.

Table 2. The measurement of the middle and lower third soft tissue profile of the face on Chinese male and female students at W.R. Supratman 1 and 2 high schools in Medan

Parameter	Gender	n	Min	Max	Mean	SD	p-value
A. Lower third of the face							
Inferior facial third	Males	50	52.54 mm	88.70 mm	68.08 mm	7.05	0.001*
	Females	50	49.33 mm	86.63 mm	63.70 mm	8.71	
Length of lower lip	Males	50	12.01 mm	28.71 mm	17.93 mm	2.72	0.001*
	Females	50	11.70 mm	23.34 mm	16.28 mm	2.61	
Prominence of upper lip	Males	50	3.19 mm	9.63 mm	6.01 mm	1.56	0.002*
	Females	50	2.75 mm	8.47mm	5.07 mm	1.33	
Prominence of pogonion	Males	50	-4.72 mm	7.95 mm	1.41 mm	2.50	0.225
	Females	50	-1.97 mm	6.36 mm	1.97 mm	2.09	
Nasolabial angle	Males	50	72.18°	120.20°	95.46°	8.94	0.001*
	Females	50	77.35°	114.57°	100.21°	8.58	
B. Middle third of the face							
Nasofrontal angle	Males	50	120.85°	145.60°	131.94°	6.33	0.008*
	Females	50	132.29°	146.04°	139.62°	3.33	

*p-value = significant

Table 3. The measurement of the middle and lower third soft tissue profile of the face on previous studies

	Moshkelgosha et al. ⁴	Leung et al. ⁸	Diouf et al. ⁷
Sample	110 Persian females and 130 Persian males	South China (259 males and 255 females)	138 subjects consisting of Senegalese and Moroccan males and females
A. Lower third of the face			
Inferior facial third	Males = 64.70 ± 6.36 mm, Females = 61.1 ± 4 mm		Males (Senegales) = 74.13 ± 7.78 mm, Female (Senegales) = 67.58 ± 5.33 mm Males (Moroccan) = 75.58 ± 7.10 mm, Females (Moroccan) = 64.46 ± 5.91 mm
Length of lower lip	Males = 18.71 ± 2.26 mm, Females = 16.2 ± 1.5 mm		Males (Senegales) = 22.89±3.30 mm, Female (Senegales) = 19.51±3.13mm Males (Moroccan) = 20.31±2.98 mm, Females (Moroccan) = 18.71±2.31 mm
Prominence of upper lip	Males = 3.79 ± 1.64 mm, Females = 3.7 ± 1.2 mm		
Prominence of pogonion	Males = 6.84 ± 1.96 mm, Females = 4.6 ± 1.3mm		
Nasolabial angle	Males = 107.28° ± 11.96, Females = 111.2° ± 7.9	Males = 99.03° ± 11.52, Females = 99.05° ± 10.24	
B. Middle third of the face			
Nasofrontal angle	Males = 138.2° ± 7.86, Females = 140° ± 5.1	Males = 143.94°± 4.97, Females = 144.68°± 4.51	

DISCUSSION

Facial appearance plays an essential role in assessing a person's visual attractiveness and social environment.¹ Varied facial appearance can also be influenced by several factors such as age, gender, psychology, race, and ethnicity.^{2,3} Soft tissue analysis is generally performed during the clinical examination. Indirect measurements are also needed to record patient's data. This analysis is, interestingly, commonly studied from a lateral view, either by radiography or photography.⁴

In this study, the males had a more significant inferior facial third, longer lower lip, more protrusive upper lip, a more retrusive lower lip, a more tapered nasolabial angle and nasofrontal angle than females Chinese high school students at the W.R. Supratman 1 and 2 in Medan.

This study showed different average values from the survey conducted by Moshkelgosha et al.⁴ on 110 Persian females and 130 Persian males (Table 3). The mean of inferior facial third in males was greater than females. Compared to this study, Chinese high school students have an inferior facial third larger than the Persian group. The average length of the lower lip for Persian males was greater than females. The average upper lip prominence in males was greater than females. The average prominence of the pogonion in males was greater than females. The average nasolabial angle and nasofrontal angle was greater in females.⁴

This study showed differences from the values conducted by Leung et al.⁸ on 514 12-year-old children in south China (Table 3). This study of Chinese high school students had the more obtuse nasolabial angle and nasofrontal angle than the south Chinese population for both males and females.⁸

The research conducted by Diouf et al.⁷ on 138 subjects consisting of Senegalese and Moroccan males and females also showed different values from this study (Table 3). The average of the inferior facial third in both Senegalese and Moroccan males was greater than females. The average value of the length of the lower lip in both Senegalese and Moroccan males was greater than females.⁷ Compared to this study, the value of inferior facial third and length of the lower lip both Senegales and Moroccan was greater than Chinese high school students for both males and females.⁷

This study presented differences in average values in all parameters from any of the studies mentioned above. Ethnic factors could cause the difference in the measured values and ethnic variations that affect differences in facial soft tissue profiles in both linear and angular values. These are the primary factors that influence facial variation, in addition to genetic and environmental factors. The difference is also caused by gender, which shows differences in soft tissue growth between men and women.¹²

Similar to the result of the survey conducted by Moshkelgosha et al.⁴ on the Persian population, which

reported significant differences between men and women in the inferior facial third, the length of the lower lip, nasolabial angle, and nasofrontal angle. However, this was not in line on the prominence of the upper lip, which this study showed that there were significant differences between genders. The two studies differed on pogonion prominence where the Persians exhibited significant differences between genders.⁴

The results of this study were different from those of Leung et al.⁸ on 12-year-old children in southern China that showed no significant differences between genders for the nasolabial and nasofrontal angle. According to the Graber and Singh method, previous research conducted by Hartanto and Lubis¹¹ on Chinese students at W.R. Supratman 1 and 2 high schools in Medan showed the students had straight facial profiles. There were no differences between genders.

It can be concluded from this study that there were significant differences between male and female Chinese high school students in the inferior facial third, length of the lower lip, prominence of the upper lip, nasolabial angle, and nasofrontal angle. In contrast, there was no significant difference between genders in prominence of the pogonion. However, this study had limitations in determining who was Chinese without taking into subgroups. At the same time, a subgroup of Chinese people spread across Indonesia, such as the Hokkian, Hakka, Kanton, Tiochiu and dan Hainan.¹³ Therefore, it is necessary to do further research on the soft tissue profile of the middle and lower third of the face within each Chinese subgroup. Since this study used lateral photographs, further research with frontal photography for comparison is advised.

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