Rudi Satria Darwis, Analysis of Anterior Facial Height Dimension Based on Skeletal Classification of Cimahi West Java Indonesia Population
e-ISSN 2807-3126
Vol. 04 No. 01: pp. 57-68

ANALYSIS OF ANTERIOR FACIAL HEIGHT DIMENSION BASED ON SKELETAL CLASSIFICATION OF CIMAHI WEST JAVA INDONESIA POPULATION

(ANALISIS DIMENSI TINGGI WAJAH ANTERIOR BERDASARKAN KLASIFIKASI SKELETAL PADA POPULASI CIMAHI JAWA BARAT INDONESIA)

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JHDS.unjani.ac.id/jite
Doi: 10.54052/jhds.

Article History
Received:25/03/2024
Accepted:18/04/2024

ABSTRACT

Dento-facial aesthetics is an essential aspect of contemporary orthodontics, reflected by increasing demands for many aspects of patient's aesthetic improvement. Facial vertical height determines an individual's aesthetics and is vital to establishing facial harmonies. One of the facial vertical problems is related to anterior facial height. Vertical facial height is strongly influenced by the vertical position of the maxilla and mandible, so that it can be affected by the relation between the skeletal jaw. This study aims to determine the difference between the anterior facial height and the skeletal jaw relation. Based on different skeletal classifications by Steiner skeletal analysis, measurements on

lateral cephalometric radiographs by comparing and connecting the anterior facial height. This research used an analytic-cross-sectional study with total sampling from 2019-2021. Fifty lateral cephalometrics between 18 and 41 years of age patients, with inclusion criteria, were included in this study. Each sample was analyzed using Steiner's skeletal classification, and the AFH and PFH were measured. The study result showed that 30% of the sample had skeletal class I malocclusion, 42% had skeletal class II, and 28% had skeletal class III. The mean score by skeletal classification for LAFH was 66.92 mm, the mean of UAFH was 50.22 mm, and the mean TAFH was 114.02. Based on the analysis results, there was no significant difference between anterior facial height (UAFH, LAFH, and TAFH) based on skeletal classification.

Keywords: cephalometry; classification; LAFH; skeletal; TAFH; UAFH

ABSTRAK

Tinggi vertikal wajah merupakan salah satu faktor penentuan estetika wajah individu serta memiliki peran penting dalam menghasilkan bentuk wajah yang seimbang. Permasalahan vertikal wajah memiliki keterkaitan terhadap tinggi wajah anterior. Tinggi wajah dalam arah vertical sangat dipengaruhi oleh posisi vertical maksila dan mandibular, sehingga dapat dipengaruhi oleh relasi skeletal rahang. Tinggi wajah terdiri atas tinggi wajah anterior (Anterior Facial Height, AFH), dan tinggi wajah posterior (Posterior Facial Height, PFH). Penelitian ini bertujuan untuk mengetahui perbedaan antara tinggi wajah bagian anterior dengan relasi skeletal rahang. Pengukuran dilakukan pada photo sefalometri lateral, dengan cara membandingkan dan menghubungkan tinggi wajah anterior berdasarkan klasifikasi skeletal yang berbeda di RSGM Unjani pada tahun 2019-2021. Penelitian ini merupakan penelitian analitik, jenis cross-sectional dengan menggunakan teknik total sampling dengan jumlah sampel 50 sefalometri lateral yang memenuhi kriteria inklusi di RSGM Unjani, usia 18 sampai 41 tahun. Hasil penelitian ini diperoleh bahwa terdapat 30%

memiliki skeletal kelas I, dan 42% memiliki skeletal kelas II, sedangkan skeletal kelas III terdapat 28%. Nilai rata-rata berdasarkan klasifikasi skeletal untuk LAFH adalah 66,92 mm, nilai rata-rata UAFH adalah 50,22 mm, dan nilai rata-rata TAFH adalah 114,02. Berdasarkan hasil analisa yang telah dilakukan, maka didapatkan kesimpulan bahwa tidak terdapat perbedaan yang signifikan antara tinggi wajah anterior (UAFH, LAFH, dan TAFH) berdasarkan klasifikasi skeletal.

***Kata kunci**: klasifikasi skeletal; LAFH; sefalometri; TAFH; UAFH*

INTRODUCTION

Characteristics of vertical, anteroposterior and transverse facial skeletal patterns reported correlate with anterior facial height. From the anatomic point of view, the anterior facial height is three parts: (1) lower facial height or LAFH (Lower Anterior Facial Height), (2) upper anterior facial height or UAFH, and (3) total anterior facial height or TAFH.[1–3]

For aesthetic reasons, measuring anterior facial height is an essential vertical evaluation in orthodontics. Facial height becomes vital in the growth and development of facial harmony and is also a significant factor in determining the facial profile. One factor distinguishing an individual's facial shape from others is the facial skeletal type, such as a class I (straight) skeletal typeface, versus individuals with a class II (convex) skeletal typeface will be different.[1,4]

Problems in this skeletal classification may be due to maxillary prominence, mandibular anteroposterior retroposition and or a combination of both..[5]

According to human natural metabolism, anterior facial height measurement occurs during growth and development. Growth spurts, as remarkable growth, have an essential rule for patient treatment planning. The growth spurt is an increase in the speed of growth that begins a period of accelerated growth and occurs in middle adolescence. Occasionally, the skeletal facial vertical height also plays the role of jaw disharmonies, which impacts malocclusion and facial aesthetics.

The prevalence of malocclusion in Indonesia is still very high, around 80% of the population and ranks third after caries and periodontal disease. The data regarding the prevalence of malocclusion, namely the prevalence of malocclusion based on the classification of skeletal malocclusions in skeletal class I with a presentation of 28.6%,

skeletal class II with a presentation of 34.3% and skeletal class III with a presentation of 37.1%.[7]

Based on the problems described, the authors are interested in conducting a study on using cephalometric radiographs to analyze anterior facial height based on the classification of skeletal malocclusions at the age of 18 years and over within the population.

METHOD

This study used ethical clearance permission of the Health Research Ethics Commission of the Faculty of Medicine, Jenderal Achmad Yani University, with the number 030/UM1.06/2021 dated June 24, 2021. This research is an analytic observational study with a cross-sectional design, using samples from one population and radiographs. Cephalometry was the primary research data, and a comparative analysis was taken. All samples that met the inclusion and exclusion criteria were included as research subjects. The subjects in this study were 50 cephalometric radiographs of patients at RSGM Unjani, Cimahi City, 18 to 41 years of age. The number of samples in this study was determined using the proportion estimation formula. Based on the calculation results, the minimum sample in this study was 28 samples. The sampling technique in this study used a consecutive sampling technique. Consecutive sampling is a technique where all subjects come and meet the selection criteria until the required number of subjects is reached.

RESULT

Based on the research results regarding facial height analysis based on skeletal classification. The sample consisted of cephalometric radiographs, which were followed by lateral cephalometric tracing and then several points and planes were determined to obtain skeletal classification and determination of upper anterior facial height (UAFH), lower anterior facial height (LAFH), and total anterior facial height (TAFH). The following is an overview of the sample characteristics.

Table 1. Age of respondents

	Mean (year)	**SD**	**Median**	**Min**	**Max**
Age	25.28	5.96	24.50	18.00	41.00

Table 2. Gender of respondents at RSGM Unjani, Cimahi

Gender	N	Percentage	Total
Female	38	76%	50
Male	12	24%	

Table 3. Skeletal malocclusion classification

Variable	N	ANB (º)	SD	Median (º)	Min (º)	Max (º)
Class I	15	2.13	0.83	2.00	1.00	3.00
Class II	21	5.90	2.10	5.00	4.00	11.00
Class III	14	-3.93	3.63	-2.50	-13.00	-1.00

Table 4. Overview of UAFH, LAFH, and TAFH

Variable	Mean (mm)	SD	Median	Min	Max
UAFH	50.22	6.08	50.00	33.00	64.00
LAFH	66.92	6.84	67.00	53.00	88.00
TAFH	114.02	10.82	111.50	83.00	137.00

Table 5. Analysis of UAFH, LAFH, and TAFH based on skeletal classification

	Skeletal Classification	Mean (mm)	SD	Median	Min	Max	P value
UAFH	Class I	48.40	5.49	50.00	33.00	56.00	0.588
	Class II	50.95	6.20	49.00	40.00	64.00	
	Class III	51.07	6.50	51.50	42.00	62.00	
UAFH	Class I	63.87	7.03	62.00	53.00	75.00	0.100
	Class II	68.76	7.45	67.00	58.00	88.00	
	Class III	67.43	4.36	68.00	59.00	78.00	
TAFH	Class I	109.67	10.55	109.00	83.00	125.00	0.285
	Class II	115.24	10.59	111.00	103.00	136.00	
	Class III	116.86	10.78	113.00	102.00	137.00	

DISCUSSION

Face type can describe the differences in the shape of each person's face. There are several classifications of facial types, namely: 1) Euriprosop (short face, wide): 80.0 – 84.9 mm; 2) Mesoprosop (medium face): 85.0–89.9 mm; 3) Leptoprosop (high face, narrow): 90.0–94.9 mm; 4) Hypo Euriprosop : > 80.0 mm; 5) Hyper Leptoprosop : > 94.9 mm.[8,9]

The assessment of facial proportions was divided into three parts: the height of the upper face, the middle face, and the height of the lower face. Upper anterior facial height is the distance from the hairline border (trichion) to the point between the two eyebrows (glabella). The midpoint of the anterior face is the distance from the point between the two eyebrows (glabella) to the nose floor (subnasal). The lower anterior facial height points were from the nose's (subnasal) base to the chin's (menton) base. The ideal face height proportion ratio is 1/3:1/3:1/3. The lower anterior third of the face is divided into three sections, namely the upper third from the subnasal to the stomion, the middle third from the stomion to the labiomental fold, and the

lower third from the labiomental fold to the mentone. These three sections are defined as the upper lip, lower lip, and chin. In cephalometry, lower anterior facial height (LAFH) is defined as the vertical distance from the anterior nasal spine (ANS) to the menton point (Me). Total anterior facial height (TAFH) was defined as the vertical distance from the nasion point (N) to the menton point (Me). Upper anterior facial height (UAFH) was the vertical distance from the nasal (N) to the anterior nasal spine (ANS).[10–14]

Skeletal malocclusion is a deviation of the relationship of the maxilla and mandible to the cranium caused by a disproportion of the size, shape or position of the jaws. There are two terms for skeletal malocclusion in the sagittal direction, namely: 1) Prognathic/proposition/protrusion (maxillary or mandibular) is a term that expresses more anteriorly than average; 2) Retrognathia/retroposition/retrusion (maxillary or mandibular) is a term that expresses more backwards than average. The classification of skeletal malocclusions was three classes, namely skeletal class I is the relation of the maxilla and mandible to the normal (straight) cranium; class II skeletal is the relationship of the upper jaw more anteriorly than the lower jaw (convex), and class III skeletal is the mandibular relationship. more anterior to the maxilla (concave). The angle used to determine the sagittal relationship between the mandibular base and the maxillary base is the ANB angle. If it is known that the ANB angle is 4°, there tends to be a class II malocclusion, whereas if it is less than 0°, it means that there is a class III malocclusion. The greater the angle of the ANB, the greater the difference in the position of the maxilla and mandible.[15,16]

In this study using cephalometric analysis according to Steiner, cephalometric analysis according to Steiner is an analytical method whose measurements focus on hard and soft tissue to obtain esthetic value in patients.[17]

The study measured on hard tissue. The first measurement of the SNA angle evaluates the anteroposterior position of the maxilla concerning the cranial anterior. The SNA standard is 82°±2°. If a patient's SNA is higher than 84°, it can be interpreted as protrusive to the maxilla. If the SNA is less than 80°, it is retrusive to the maxilla. The same applies to the SNB angle used to evaluate the anteroposterior position, where the standard is 78±2°. This interpretation of the SNB is only valid if the SN plane is in a position different from the actual horizontal line and the N position is normal. The difference between SNA and SNB (ANB angle) represents Steiner's skeletal jaw as a

point of measurement. Although some respond that the jaw may be in an abnormal position, as in most theories in the book, what matters is the angle of inclination that occurs in the jaw that must be considered in treatment, and this is what is called the measurement of the ANB angle. Two factors influence the slope of the ANB Angle. The first is the height of a person's face; when the vertical distance of the nation and point A and point B increases, the ANB angle will decrease. The second is that if the anteroposterior position of the nasion is not normal, then the angle size will be affected. In addition, when the SNA and SNB became wider, and the jaw became more protruded, even though the horizontal position did not change, this was considered a large ANB angle.[18]

Facial height consists of anterior facial height (AFH) and posterior facial height (PFH). The anterior facial height is divided into three parts, namely the lower anterior or Lower Anterior Facial Height (LAFH), the upper anterior or Upper Anterior Facial Height (UAFH), and the total anterior facial height or Total Anterior Facial Height (TAFH). Face height is one of each individual's facial aesthetic factors. There is a problem regarding the lower anterior facial height. The upper part and the total facial height are very influential, especially the problem with the lower anterior facial height, namely the state of being bitten. In general, the depth of a bite is inversely proportional to the lower anterior facial height, meaning that the deeper a bite (deep bite), the lower the lower anterior facial height. The lower/smaller the bite (open bite), the higher the lower anterior face.[19–21]

Table 1 shows that the average age of the respondents is 25.28 years, with a standard deviation of 5.96 years. The youngest is 18 with three people (6.0%), and the oldest is 41 with two people (4.0%). This study uses an age range of 18 years and over, following research conducted by Lindawati in 2016 on FKG students in Aceh, namely measuring anterior facial height, which should be done when the growth and development period has stopped. Physical growth stops at different ages between men and women. Research conducted by Goldstain (1996) in Sweden shows that the growth and development of women stop at the age of 17.5 years and the age of 19.2 years in men, according to research by Taranger & Hagg cit. Artaria, men in the United States with upper-middle socioeconomic status achieved maximum growth at 21 years and women at 18. Growth and development are significant for orthodontic treatment; growth is age-dependent and highly variable. In this study, facial height measurements were carried out

when the growth and development period had stopped following a study conducted by Susiana in 2009 to treat class III skeletal malocclusion during growth at FKG Maranatha Bandung. Where the growth period stops at the age of 18 to 20 years.[22]

Table 2 shows that there are 12 male patients, or 24.0%, and 38 or 76.0% female patients. This study is following Yolanda's 2017 study in Makassar, which stated that the prevalence of skeletal malocclusion by sex was more significant in women, at around 57.1%, and men, at 42.9%.[7]

Based on table 3 shows that from a total of 50 samples studied, as many as 15 samples (30%) had skeletal class I malocclusion with an average ANB angle of 2.13°, and 21 samples (42%) had skeletal class II malocclusion. In comparison, 14 samples (28%) had skeletal class III malocclusion. This study follows the 2018 study of Yemitan et al. in a population of young descendants in Nigeria who stated that the prevalence of skeletal malocclusion in class II was greater, namely 55%. Meanwhile, a study conducted by Almasyhur et al. in 2015 said that cases of skeletal class III malocclusion were more common in the Asian population (15-23%). According to research conducted by Hillda and Sahla in 2015, the prevalence of malocclusion in Cimahi City was highest in class I malocclusion.[3,23]

Table 4 shows that the average value of LAFH is 66.92 mm with a standard deviation of 6.84. The mean upper anterior facial height was 50.22 mm with a standard deviation of 6.08, and the average total anterior facial height was 114.02 mm with a standard deviation 10.82. The results of this study follow the research conducted by Yemitan et al. in 2018 in the Nigerian population, which stated that the results of the lower anterior facial height measurement (LAFH) had a higher average value of 66.40 mm, while (UAFH) was 46.0 mm. The average value for TAFH is 112.3.[3]

Table 5 shows that the highest mean anterior lower facial height (LAFH) was in the skeletal class II classification group, 68.76 ± 7.4 and the lowest average LAFH was in the skeletal classification group. Class I is 63.87 ± 7.03. The highest mean upper anterior facial height (UAFH) was in the skeletal class III classification group, 51.07 ± 6.50. The lowest average UAFH value was in the skeletal class I classification group, 109.67 ± 10.55. The highest mean total anterior facial height (TAFH) was in the skeletal class III classification group, 116.86 ± 10.78. The lowest average TAFH value was in the skeletal class I classification group, 109.67 ± 10.55.

The P value in numerical data uses the ANOVA test, the alternative LAFH

variable, and the Kruskal Wallis test, the UAFH and TAFH variables. The results of statistical tests in the research group above-obtained information on the P value of the LAFH, UAFH, and TAFH variables greater than 0.05 (P value> 0.05), which means that it is not statistically significant. Thus, there is no significant difference in mean statistics between LAFH, UAFH and TAFH variables in the skeletal classification group.

The results of this study follow the results of previous studies conducted by Yemitan et al. in 2018 in the Nigerian population, who stated that there was no significant difference between the results of UAFH, LAFH, and TAFH measurements based on different skeletal classifications because previous researchers reported that differences in anterior facial height were associated with variations in the anterior cranial base. Hayashi stated that the morphology of the cranial base affects the mandible's position and mandibular rotation.[3,14]

The vertical height of the face can be influenced by several factors, one of which is the rotation of the mandible. Bjork stated that the rotation of the mandible during growth had a significant impact on the mandible. The clockwise rotation of the mandible will increase the proportion of anterior facial height, and mandibular growth tends to be more vertical, so individuals tend to have long faces. On the other hand, counterclockwise rotation of the mandible will reduce the proportion of anterior facial height, thereby decreasing the anterior facial height.[24]

CONCLUSION

Based on the results of the research that has been carried out, there is no significant difference between upper anterior facial height (UAFH), lower anterior facial height (LAFH), and total anterior facial height (TAFH) based on different skeletal classifications. Based on the research that has been done, some suggestions are needed for further study, so it is hoped that the results obtained will be better. The researchers propose the following suggestions: analyzing differences in anterior facial height based on age and gender and differences in posterior facial height (PFH) based on different classifications of skeletal malocclusions.

CONFLICT OF INTEREST

There is no conflict of interest in the writing of this article.

ACKNOWLEDGEMENT

Acknowledgements to the Funding Assistance for the Independent Study

Policy Research Program Independent Campus and Community Service (MBKM) Based on Private Higher Education Research Results, Universitas Jenderal Achmad Yani (UNJANI).

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