



## Comparison of Morphometric Variation of Ramus Length and Mandibular Corpus Length in Patients at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, Based on Gender

Mufida Muzakkie<sup>1\*</sup>, Muhammad Febriandi Djunaidi<sup>2</sup>, S.N.A Ratna Sari Devi<sup>3</sup>, Ziske Maritska<sup>4</sup>

<sup>1</sup>Department of Plastic Surgery, Aesthetics and Reconstruction, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia

<sup>2</sup>Specialized Residency Training, Department of Surgery, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia

<sup>3</sup>Department of Radiology, Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia

<sup>4</sup>Department of Medical Biology, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia

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#### \*Corresponding author:

Mufida Muzakkie

#### E-mail address:

[mufida.muzakkie@gmail.com](mailto:mufida.muzakkie@gmail.com)

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### ABSTRACT

**Introduction:** Planned mandibular reconstruction with the help of morphometry allows plastic surgeons to perform operations with greater precision. They can plan bone shifts and cuts more accurately, minimize damage to surrounding tissue, and achieve cosmetically and functionally better results. This study aimed to compare the morphometric variation of ramus length and mandibular corpus length in patients at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, based on gender. **Methods:** This study was a cross-sectional analytic observational study. A total of 96 research subjects participated in this study, where the length of the ramus and corpus of the mandibular was obtained by assessing the 3D CT scan of the mandibular. Data analysis was carried out using SPSS in a bivariate. **Results:** The length of the mandibular ramus dextra and sinistra shows that the male gender is longer than the female gender, where the p-values are 0.000 and 0.001, respectively ( $p < 0.05$ ). The length of the mandibular corpus dextra and sinistra did not show a statistical difference in length, where the p-value was  $> 0.05$ . **Conclusion:** There is a difference in the length of the mandibular ramus between men and women, but there is no significant difference between the length of the corpus mandibular between men and women.

### 1. Introduction

Morphometrics is a method in reconstructive plastic surgery used to measure and reconstruct the mandible, namely the lower jawbone. The goal of mandibular reconstruction is to restore the shape and function of the mandible that has been damaged by trauma, tumors, or other medical conditions. Morphometrics involves the use of scanning technologies such as computed tomography (CT) scan or cone beam computed tomography (CBCT) to obtain a three-dimensional view of the affected mandible. In this process, the scanned data is converted into a

digital model that can be manipulated using special computer software. After obtaining a digital mandibular model, the next step is to perform a virtual reconstruction. Plastic surgeons use special software to manipulate the digital model and plan optimal mandibular reconstruction. They can move, rotate, or resize the segment of bone involved to achieve the desired result.<sup>1-5</sup>

After the virtual planning is complete, the next step is to make a physical reconstruction of the mandible. In some cases, three-dimensional prints of digital models can be made using 3D printing technology.

This impression is then used as a guide to shape and cut the donor or replacement bone to be used in mandibular reconstruction. Planned mandibular reconstruction with the help of morphometry allows plastic surgeons to perform operations with greater precision. They can plan bone shifts and cuts more accurately, minimize damage to surrounding tissue, and achieve cosmetically and functionally better results. The use of morphometry in mandibular reconstruction is an example of how virtual scanning and planning technologies have changed the approach to reconstructive plastic surgery. This allows surgeons to understand detailed patient anatomy better, better plan surgical procedures, and improve patient outcomes.<sup>6-11</sup> This study aimed to compare the morphometric variation of ramus length and mandibular corpus length in patients at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, based on gender.

## 2. Methods

This study was an analytic observational study with a cross-sectional approach and used primary data obtained from radiological images in the form of a 3D CT scan of the mandible at the radiology installation of Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. A total of 96 research subjects participated in this study, where the research subjects met the inclusion criteria. The inclusion criteria were patients who did a mandibular 3D CT scan at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, for the period April 2022 – April

2023, aged  $\geq 20$ , and had no anatomical abnormalities or defects or fractures of the mandible. This study was approved by the medical and health research ethics committee at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

This study observed the length of the ramus and the length of the corpus of the mandibular, then compared the length of the ramus and the length of the corpus of the mandibular between the male and female genders. Data analysis was carried out using SPSS software version 25. Data analysis was performed using univariate and bivariate methods. Univariate analysis was performed to present the distribution of each data variable descriptive test. Bivariate analysis was performed to provide a comparison of the mean corpus length and mandibular ramus length of the study subjects,  $p < 0.05$ .

## 3. Results

Table 1 presents a comparison of the length of the ramus and the length of the corpus of the mandibular. The length of the mandibular ramus dextra and sinistra shows that the male gender is longer than the female gender, where the p values are 0.000 and 0.001, respectively ( $p < 0.05$ ). The length of the corpus mandibular dextra and sinistra did not show a statistical difference in length, where the p-value was  $> 0.05$ , although on average, the male gender has a longer mandibular corpus length than the female gender.

Table 1. Comparison of the length of the ramus and the length of the corpus of the mandibular.

Variable	Gender		p-value
	Male	Female	
The length of the mandibular ramus dextra	6,243±0,536	5,766±0,588	0,000 <sup>a*</sup>
Mandibular ramus length sinistra	6,3 (4,82 – 7,48)	5,885 (4,62-6,82)	0,001 <sup>b*</sup>
The length of the mandibular corpus dextra	8,232±0,389	8,026±0,669	0,131 <sup>a</sup>
Mandibular corpus length sinistra	8,082±0,665	7,93±0,735	0,305 <sup>a</sup>

a: Independent t-test; b: Mann Whitney test; \* $p < 0,05$ .

#### 4. Discussion

The results of this study are in line with several other studies which state that the length of the mandibular ramus in males is longer than in females. This is because men are usually taller, while women are shorter. In addition, women also have a higher ratio between the corpus of the mandible and the ramus. However, the length of the mandibular rami in males and females varies between individuals. Therefore, sometimes the length of the mandibular ramus in women can be longer than that of men. However, overall, the mandibular rami of females tend to be shorter than those of males. This can influence facial posture and facial bone ratio composition. Therefore, gender differences tend to be very influence facial shape and structure.<sup>12-14</sup>

The faces of men and women have different structural compositions. This has an impact on the physical characteristics as well influence the personality and appearance of a person. This is caused by differences in the hormones needed to make bones. Women produce the hormone estrogen, which affects bone growth and causes the mandible to shorten. Men produce the hormone testosterone, which affects bone growth and causes the mandible to grow longer. This difference in mandibular bone structure significantly influences the shape and structure of the face, thus distinguishing male and female faces.<sup>15-17</sup>

Another difference is in the dimensions of the face. Women tend to have rounder and softer faces, while men have stronger and sharper faces. In addition, women also have stronger jaws and more facial fat. The different bone structures of the mandible can lead to differences in the capacities of the different jaw muscles between males and females. Men tend to have stronger jaw muscles, so they have sharper, more contoured jaws. Meanwhile, women can have a softer jawline and more facial fat. Significant differences in mandibular bone structure influence the shape and structure of the face, which distinguishes the face of men and women. The bone structure of the male mandible is thicker and slimmer than that of the

female. This leaves more space for the jaw muscles, which are bigger and stronger in males.<sup>18,19</sup>

In addition, there is also more room for facial fat and more space for connective tissue spaces in women's faces. This makes a woman's face appear softer and gentler than a man's. The bony structure of the male mandible also has more protrusion, which means that the male neck is longer and more rigid. This allows males to achieve higher and more powerful voices. In addition, the bone structure of the male mandible also results in a stronger and more stable jaw so that males can chew food more effectively. For example, the jaws of males are usually longer and more muscular, so males can chew food better than females. It also means that males tend to have more vocal pitch choices because they can reach higher voices easily. In addition, this stronger and more stable mandibular bone also helps males chew food more effectively, improving their digestion. It can also help them eat healthier and maintain their weight.<sup>20,21</sup>

#### 5. Conclusion

There is a difference in the length of the mandibular ramus between men and women, but there is no significant difference between the length of the corpus of the mandibular between men and women.

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