



## MORPHOMETRIC STUDY OF DRY ADULT HUMAN MANDIBLE USING MINIMUM RAMUS BREADTH AND MANDIBULAR ANGLE IN MAHAKAUSHAL REGION

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### ABSTRACT

Proper analysis of human skeletal remains is very essential for medico legal and anthropological work. The mandible is the largest and the strongest bone of face. Mandible retains its shape better than other bones, so, it plays an important role for forensic osteology and anthropological works, hence, aim of present study to measure and compare the measurement of mandibular ramus and to assess the utility of mandibular ramus as aid in gender determination. 52 dry and adult human mandibles of known sex (29 male and 23 female) were used in this study. Measurement of the ramus and angle of the mandible were measured by sliding Vernier caliper and with the help of protector and the result was statistically analyzed using IBM SPSS software.

In results it is found that angle of mandible in 29 male & 23 female mandibles of right side, mean & SD is  $122.24 \pm 6.71$  &  $124.61 \pm 5.33$  respectively and "P" value is 0.1734. Similarly in case of left side mean & SD is  $121.59 \pm 6.65$  &  $124.17 \pm 5.87$  respectively and "P" value is 0.1489. While measuring minimus ramus breadth it is noticed that mean & SD for right side in male and female are  $31.44 \pm 2.68$  &  $29.22 \pm 3.04$  respectively and the "P" value is 0.0073, on the other that, mean & SD for left side in male and female are  $31.56 \pm 2.47$  &  $29.31 \pm 3.53$  respectively and the "P" value is 0.0095

Measurement of mandibular ramus may be used to differentiate between male and female bones and to determine the position of mandibular foramen and canal by maxillofacial and plastic surgeons to preserve the neurovascular bundles of mandible during surgeries.

**KEYWORDS** : Mandible, Minimus Ramus Breadth, Angle of Mandible

### INTRODUCTION

Mandere means to chew; which is the origin of the word Mandible. The mandible is the largest, strongest and lowest bone in the face. For identification of gender, age and race from human remains, Mandible is the next bone used after pelvis<sup>1,2</sup>. Pelvis and skull are the most reliable source for sex determination. In absence of complete pelvis, mandible becomes an important tool for sex determination. Mandible is the most durable facial bone that retains its shape better than others<sup>3</sup>. Its morphological features show changes with reference to age, sex and race. It is the platform for dental surgeons to work with<sup>4</sup>. Dimorphism in mandible is reflected in its shape and size<sup>5</sup>. Male bones are generally bigger and more robust than female bones<sup>6</sup>. The relative development (size, strength, and angulations) of the muscles of mastication is known to influence the expression of mandibular dimorphism as masticator forces exerted are different for males and females<sup>7</sup>. Knowledge of mandible and its variations in age, sex and race may help physicians, surgeons, medico-legal experts and anthropologists to provide accurate interpretations relating to the results of diagnostic procedures in living<sup>2,8</sup>. With keeping above facts in mind present study was planned to see the angle of mandibles and minimus ramus breadth of different genders in Mahakaushal region.

### MATERIAL METHODS

52 dry and adult human mandibles of known sex (29 male and 23 female) were used in this study. Bones without any damage and of the age group approximately between 18 to 60 years were included in the study. Angle of mandibles was measured with the help of protector; and minimus ramus breadths were measured with the help of sliding Vernier caliper.

#### Angle of mandible:

It was taken with the help of a protractor as the angle between the base and a tangent drawn along the posterior border of the ramus, touching the posterior-most point on the condyle and the posterior-most point on the posterior border.

#### Minimum ramus breadth:

Minimum anteroposterior breadth of ramus was measured with the help of sliding Vernier calipers.

Results were statistically analyzed to see the significance of the observations made under this study.

### RESULTS

**Table-1 Angle of Mandibular (Right)**

Details of measurements	Male	Female
No. of Bones	29	23
Range	104° -130°	108°-130°
Mean $\pm$ SD	122.24 $\pm$ 6.71	124.61 $\pm$ 5.33
"T" Value	1.381	
"P" Value	0.1734	

In the present study it is noted that angle of mandible in 29 male mandibles of right side is having range 104°-130° with an average 122.24° with standard deviation of 6.71 while the angle in female mandibles of right have range 108°-130° with an average of 124.61° with standard deviation of 5.33. The "P" value is 0.1734 so there is no significant difference in angles of right side in between male and female.

**Table-2 Angle of Mandibular (Left)**

Details of measurements	Male	Female
No. of Bones	29	23
Range	107°-130°	107°-130°
Mean $\pm$ SD	121.59 $\pm$ 6.65	124.17 $\pm$ 5.87
"T" Value	1.466	
"P" Value	0.1489	

In case of left side, 29 male angles have ranged between 107°-130° with an average of 121.59° and SD of 6.65, while the angle in female mandibles have ranged between 107°-130° with an average of 124.17° and SD of 5.87. The "P" value is 0.1489 which shows that there is no significant difference in left side too.

**Table-3 Minimus Ramus Breadth (Right)**

Details of measurements	Male	Female
No. of Bones	29	23
Range	26.4 – 37.7 mm	25.3 – 39.5 mm

Mean $\pm$ SD	31.44 $\pm$ 2.68 mm	29.22 $\pm$ 3.040 mm
"T" Value	2.799	
"P" Value	0.0073	

On measuring the minimum ramus breadth it is observed that in case of Right half in 29 male mandibles range is 26.4 to 37.7 mm and mean is 31.44 mm with SD of 2.68. In 23 female, data of right half reveals the range between 25.3 - 39.5 mm and mean is 29.22 mm with SD of 3.04. On analyzing the values statistically it is found that the "T" value is 2.799 and "P" value is 0.0073; which shows that the result is statistically significant.

**Table-4**  
**Minimus Ramus Breadth (Left)**

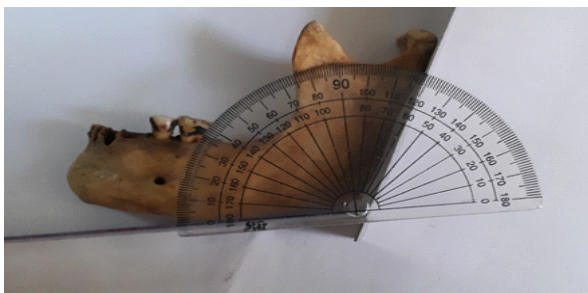
Details of measurements	Male	Female
No. of Bones	29	23
Range	26.3 – 36.5 mm	25.7 – 38.0 mm
Mean $\pm$ SD	31.56 $\pm$ 2.47 mm	29.31 $\pm$ 3.53 mm
"T" Value		2.697
"P" Value		0.0095

Minimum Ramus Breadth of left half in 29 male mandibles ranged between 26.3 - 36.5 mm and mean is 31.56 mm with SD 2.47. In case of 23 female, it ranged between 25.7 - 38.0 mm and mean is 29.31 with SD 3.53. On analysis the "T" value came to 2.697 and the "P" value as 0.0095 which denotes that the result is statistically significant.

#### Photographs:



**Photograph-1: Measuring the minimus ramus breadth**



**Photograph-2: Measuring the angle of mandible**

#### DISCUSSION

Sex determination based on morphological markers is subjective and probably inaccurate, but, methods based on measurements and morphometry are accurate methods and may be used in determination of sex<sup>9</sup>. Measurements of mandibular ramus tend to show higher sexual dimorphism and differences between the genders are generally more marked in the mandibular ramus than in the mandibular body<sup>10</sup>. Giles reported mandibular ramus height, maximum ramus breadth, and minimum ramus breadth as highly significant factors with classification accuracy of 85% in American whites and Negroes.<sup>11</sup> In the study conducted by previous workers in 2009<sup>12</sup> minimum ramus breadth is measured on right and left sides

for all the mandibles; minimum ramus breadth (MRB) was 3.28  $\pm$  0.34 cm in males and 3.14  $\pm$  0.31 cm in females. Ranganath et al. showed that mean for minimum ramus breadth in males was 3.17 cm and for females it was 3.11 cm. Standard deviation for male was 0.48 and for females 0.38<sup>13</sup>.

In the present study, it is observed that the mean of Minimus Ramus Breadth for Right side is 31.44  $\pm$  2.68 in male and 29.22  $\pm$  3.04 in female and "P" value is 0.0073, further mean of Minimus Ramus Breadth for left side is 31.56  $\pm$  2.47 in male and 29.31  $\pm$  3.53 in female and "P" value is 0.0095. From the "P" value for both the analysis it is noticeable that the results are statistically significant.

In case of angle of mandible according to textbook of anatomy in elderly subjects the angle of the mandible is 140° and is lesser in adults<sup>14</sup>. Rai et al. in their study found that the mean mandibular angle was greater in female (121°) than that of males (118°) in adult subjects<sup>15</sup>. Eversion of angle is characteristic of male and inversion is that of female<sup>16</sup>. Male mandibles have well developed and flaring gonial regions.<sup>17</sup> Mean value of mandibular angle was more in females (123.00) than males (118.60)<sup>18</sup>. According to study conducted by Vinay G et al mandibular angle of male mandible varies from 111° – 136° with an average of 121°  $\pm$  6° and that of female mandible varies from 97° – 137° with an average of 122°  $\pm$  7°. The gender differences in mean values of Mandibular angle of male and female is not statistically significant (p=0.99) for mandible.<sup>19</sup>

In present study it is found that angle of mandible in 29 male mandibles of right side is ranged between 104°-130° with an average of 122.24° with SD of 6.71°, while, the angle in female mandibles of right side is having ranged between 108°-130° with an average of 124.61° with SD of 5.33°. The "P" value is 0.1734. Similarly, in case of left side, the 29 male samples have an angle range of 107°-130° with an average of 121.59° with SD 6.65, while, the angle in female mandibles have range from 107°-130° with an average of 124.17° with SD of 5.87°. The "P" value is 0.1489. Hence, from "P" values of both left and right side it is found that there is no significant difference in male and female results.

#### CONCLUSION

In the present study, two parameters i.e. angle and minimum ramus breadths were used. As angle of mandible is the most common site of fracture in mandible, measurement of mandibular ramus may be used to determine the position of mandibular foramen and canal by maxillofacial and plastic surgeons to preserve the neurovascular bundles of mandible during surgeries. Present study may also be used by Anthropologist and forensic experts to differentiate between male and female bones between different geographical areas especially in Mahakaushal region. During study, it is also felt that, there is a need of further study on the subject in Mahakaushal region with larger sample size.

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