MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.4.313.316

OPEN ACCESS

**Key Words**
Mandible, Skull, Anatomy, Anthropometry

**Corresponding Author**
Aprajita Awasthi,
Department of Anatomy, M.G.M. Medical College, Indore, Madhya Pradesh, India
aprajitaawasthi@gmail.com

**Author Designation**
[1]Asssistant Professor
[2]PG Student
[3]Professor and Head

**Received:** 31 December 2023
**Accepted:** 16 February 2024
**Published:** 27 February 2024

**Citation:** Arpan Dubey, Pankaj Mahawar, Ameet Julka and Aprajita Awasthi, 2024. An Anatomical Study of Metric Parameters of Ramus of Mandible. Res. J. Med. Sci., 18: 313-316, doi: 10.59218/makrjms. 2024.4.313.316



# An Anatomical Study of Metric Parameters of Ramus of Mandible

[1]Arpan Dubey, [2]Pankaj Mahawar, [3]Ameet Julka and [4]Aprajita Awasthi

*[1-4]Department of Anatomy, M.G.M. Medical College, Indore, Madhya Pradesh, India*

**ABSTRACT**

The mandible is the only movable bone of skull. It consists of a horizontal horse-shoe shaped body and two broad and oblong rami. The medial surface of the ramus presents the mandibular foramen, through which the inferior alveolar neurovascular bundle passes. The anterior part of the ramus can be used as donor site for reconstruction of small bone defects in the oral and maxillofacial region. A relatively short mandibular ramus may be an important unfavourable anatomical factor in difficult laryngoscopy. Therefore, the present study was done to determine and analyse the metric parameters of ramus of mandible. It was done on 40 adult human mandibles selected from the Department of Anatomy. The condylar height, notch height, minimum ramus breadth of both sides were measured using digital vernier calliper and analysed. It was performed using the paired 't'-test, p-value <0.05 was considered statistically significant. The mean condylar height was 60.27 mm. The mean notch height was 44.63 mm. The mean minimum ramus breadth was 31.56 mm. The dimensions of the mandibular ramus in the present study showed bilateral symmetry. The present study may prove to be very useful in anatomical, anthropological, forensic, anesthetic domain and also in plastic and maxillofacial surgeries.

## INTRODUCTION

The mandible forms the lower jaw and is the only movable bone of the skull. It is the largest and strongest bone of the face and consists of a horizontal horse-shoe shaped body and two broad and oblong rami[1]. The medial surface of the ramus presents, a little above the centre, the mandibular foramen, through which the inferior alveolar neurovascular bundle passes to gain access to the mandibular canal[2].

The anterior part of the ramus can be used as donor site for reconstruction of small bone defects in the oral and maxillofacial region[3]. A relatively short mandibular ramus may be an important unfavourable anatomical factor in difficult laryngoscopy[4].

The role of mandible in chewing exposes it to various masticatory forces, (depending on the diet in different geographical regions) and results in inter- and intrapopulation variations in its shape and size[5].

Hence dimensions of the mandible are highly significant for the anatomists, anthropologists, forensic experts, anesthetists, plastic surgeons and maxillofacial surgeons.

Therefore, the present study was done to determine and analyze the metric parameters of ramus of mandible.

## MATERIALS AND METHODS

After taking approval from Institutional Review board and Ethics and Scientific Review Committee, a sample of 40 adult human mandibles were selected from the Department of Anatomy. Mandibles with complete dentition and intact ramus were included and fractured, deformed, pathological and mandibles with developmental disturbances were excluded.

The following dimensions of the mandible were measured by digital vernier calliper.

- **CH-condylar height:** Straight distance from gonion to the highest point on the mandibular condyle (Fig. 1)[5]
- **NH-notch height:** Straight distance from gonion to the mandibular notch (Fig. 2)
- **B-minimum ramus breadth:** Least breadth of the mandibular ramus measured perpendicular to height of ramus (Fig. 3)[5]

The data obtained was tabulated and statistical analysis was done. A comparison of the mean values between the sides was performed using the paired 't'-test, p-value <0.05 was considered statistically significant.

Fig. 1: Measurement of condylar height

Fig. 2: Measurement of notch height

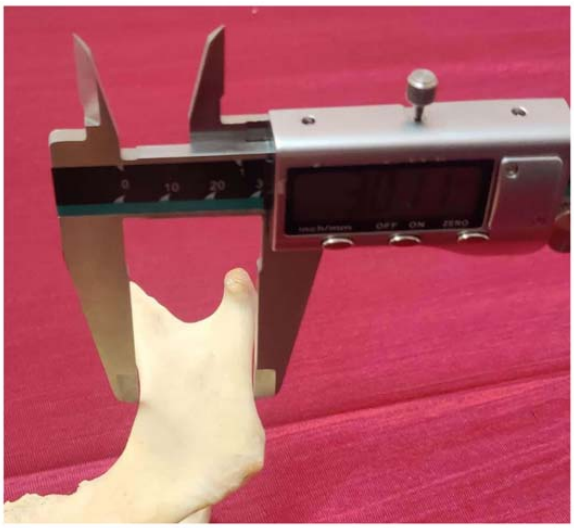

Fig. 3: Measurement of minimum ramus breadth

Table 1: Comparison of morphometric parameters of mandibular ramus along with p-value

| Dimensions | Right side (Mean±SD) | Left side (Mean±SD) | p-value |
|---|---|---|---|
| CH | 60.60±5.82 mm | 59.94±5.56 mm | 0.60 |
| NH | 44.49±5.24 mm | 44.78±5.05 mm | 0.80 |
| B | 31.36±3.10 mm | 31.77±3.0 mm | 0.54 |

## RESULTS

The condylar height (CH), Notch height (NH), Minimum ramus breadth (B) of both right and left sides were compared and findings along with p-value are shown in the Table 1.

The differences between condylar height (CH), notch height (NH), minimum ramus breadth (B) of mandibular ramus on both sides was statistically not significant (all p-values<0.05).

Therefore, considering the bilateral differences to be negligible in measurements of mandibular ramus, in the present study, mean condylar height (CH) was 60.27 mm. The mean notch height (NH) was 44.63 mm. The mean minimum ramus breadth (B) was 31.56 mm.

## DISCUSSION

Morphometric parameters of ramus of mandible show geographical and racial variations. The present study compares the measurements of mandibular ramus with other studies carried out in different geographical areas and different populations (Table 2).

Mean condylar height in the present study was 60.27 mm. It is consistent with studies by Punarjeevan Kumar *et al*.[6] on Andhra Pradesh population, Nagraj *et al*.[7] on Telangana population, Haque *et al*.[8] on Bangladesh population, Deepa *et al*.[9] on Karnataka population, but differed from Saini *et al*.[5] on North Indian population, Mbajiorgu *et al*.[10] on Zimbabwe population, Yassir *et al*.[11] on Iraqi population, Dave *et al*.[12] on Gujarati population and Abu-Taleb *et al*.[13] on Egyptian population (Table 3).

Mean notch height in present study was 44.63 mm. The finding was consistent with Keros *et al*.[14] on North Croatia population, Nagraj *et al*.[7] on Telangana population, Haque *et al*.[8] on Bangladesh population, but differed from findings of Rupa *et al*.[15] on Mangalore population and Deepa *et al*.[9] on Karnataka population (Table 4).

Mean minimum ramus breadth in the present study was 31.56 mm. The finding was consistent with Punarjeevan Kumar *et al*.[6] on Andhra Pradesh population, Nagraj *et al*.[7] on Telangana population, Haque *et al*.[8] on Bangladesh population, Deepa *et al*.[9] on Karnataka population, Dave *et al*.[12] on Gujarati population, but differed from Keros *et al*.[14] on North Croatia population.

Bilateral symmetry was also established, substantiating the facial symmetry, as the morphometric measurements on both right and left sides showed negligible difference.

Table 2: Condylar height of different populations studied by various authors

| Authorities | No. of mandibles observed | Race/Region | Condylar height (mm) |
|---|---|---|---|
| Mbajiorgu *et al*.[10] | 23 male | Zimbabwe | Male-77.8 |
| | 9 female | | Female- 72.3 |
| Kumar *et al*.[6] | 80 | Andhra Pradesh | 61.98 |
| Yassir *et al*.[11] | 41 male | | Male-51.41 |
| | 54 female | Iraq | Female- 45.08 |
| Haque *et al*.[8] | 185 | Bangladesh | 64.13 |
| Abu-Taleb *et al*.[13] | 105 male | Egypt | Male-84.3 |
| | 86 female | | Female-72.9 |
| Deepa *et al*.[9] | 50 | Karnataka | 64.25 |
| Nagraj *et al*.[7] | 81 | Telangana | 60.31 |
| Dave *et al*.[12] | 300 | Gujarat | 51.62 |
| Saini *et al*.[5] | 245 male | North India | Male- 57.68 |
| | 140 female | | Female- 52.63 |
| Present study | 40 | Central India | 60.27 |

Table 3: Notch height of different populations studied by various authors

| Authorities | No. of mandibles observed | Race/Region | Notch height (mm) |
|---|---|---|---|
| Keros *et al*.[14] | 100 | Northern Croatia | 44.79 |
| Haque *et al*.[8] | 185 | Bangladesh | 46.28 |
| Rupa *et al*.[15] | 19 | Mangalore | 52.9 |
| Deepa *et al*.[9] | 50 | Karnataka | 39.85 |
| Nagraj *et al*.[7] | 81 | Telangana | 44.7 |
| Present study | 40 | Central India | 44.63 |

Table 4: Minimum ramus breadth of different populations studied by various authors

| Authorities | No. of mandibles observed | Race/Region | Minimum ramus breadth (mm) |
|---|---|---|---|
| Keros *et al*.[14] | 100 | Northern Croatia | 24.87 |
| Kumar *et al*.[6] | 80 | Andhra Pradesh | 30.50 |
| Haque *et al*.[8] | 185 | Bangladesh | 30.39 |
| Deepa *et al*.[9] | 50 | Karnataka | 29.45 |
| Nagraj *et al*.[7] | 81 | Telangana | 31.24 |
| Dave *et al*.[12] | 300 | Gujarat | 30.93 |
| Present study | 40 | Central India | 31.56 |

## CONCLUSION

The morphometric measurements in the present study showed relative consistency within the population of the Indian subcontinent while differing from that of other geographical regions like Iraq and Zimbabwe. This corroborates the variation in the facial features of the population in these regions as compared to the Indian population at large. The results of present study may prove to be very useful in anatomical, anthropological, forensic, anaesthetic domain and may also be utilised in planning and management of plastic and maxillofacial surgeries. Further studies with assistance of radiological techniques and larger sample size will help in quantification of morphometric data of ramus of mandible.

## REFERENCES

1. Dutta, A.K., 2009. Essential of Human Anatomy: Head, Neck and Brain 5th Ed., Current books international, Kolkata, Pages: 40.
2. Standring, S., 2008. Grey's Anatomy: The anatomic basis of clinical practice. 40th Edn., Churchill Livingstone Elsevier, London, Pages: 530.
3. Güngörmüs, M. and M.S. Yavuz, 2002. The ascending ramus of the mandible as a donor site in maxillofacial bone grafting. J. Oral Maxillofacial Surg., 60: 1316-1318.

4. Chou, H.C. and T.L. Wu, 1993. Mandibulohyoid distance in difficult laryngoscopy. Br. J. Anaesth., 71: 335-339.
5. Saini, V., A. Chowdhry and M. Mehta, 2022. Sexual dimorphism and population variation in mandibular variables: A study on a contemporary Indian population. Anthropol. Sci., 130: 59-70.
6. Kumar, M.P. and S. Lokanadham, 2013. Sex determination & morphometric parameters of human mandible. Int. J. Res. Med. Sci., 1: 93-96.
7. Nagaraj, S., N. Gayatri and A.R. Sherke, 2017. Study of mandibular ramus by metric parameters. Int. J. Anat. Res., 5: 3358-3361.
8. Hoque, M.M., S. Ara, S. Begum, A.M. Kamal and S. Sayeed, 2015. Morphometric analysis of dry adult human mandibular ramus. Bangladesh J. Anat., 12: 14-16.
9. Deepa, G. and B.H. Shrikrishna, 2016. Morphometric analysis of dry adult human mandibular ramus. Indian J. Anat., 5: 179-183.
10. Mbajiorgu, F.E., S. Zivanovic, S.A. Asala and G. Mawera, 1996. A pilot study of the mandibular angle in black Zimbabweans. Cent. Afr. J. Med., 42: 285-287.
11. Yassir, Y.A., 2013. Ramus height and its relationship with skeletal and dental measurements. J. Oral Dent. Res., 1: 4-8.
12. Dave, U.H., S. Gupta and R.B. Astik, 2019. Morphometric analysis of the mandibular ramus and its clinical and medicolegal significance. Int. J. Res. Med. Sci., 7: 3235-0.
13. Abu-Taleb, N.S. and D.M.E. Beshlawy, 2015. Mandibular ramus and gonial angle measurements as predictors of sex and age in an Egyptian population sample: A digital panoramic study. J. Forensic Res., Vol. 6 .10.4172/2157-7145.1000308.
14. Keros, N.J., J. Panduric and K.D. Buntak, 1997. Some anatomical and anthopological measures of mandibular ramus in our population. Coll.Antropol, 21: 203-210.
15. Rupa, L. Chatra, P. Shenai, K. Veena, P. Rao and R. Prabhu, 2015. Gonial angle and ramus height as sex determinants: A radiographic pilot study. J. of Cranio-Maxillary Dis., 4: 111-116.