

**POSITION OF MANDIBULAR FORAMEN AND INCIDENCE OF ACCESSORY MANDIBULAR FORAMEN IN DRY MANDIBLES****RAGHAVENDRA V. P.\*<sup>1</sup> AND BENJAMIN W.<sup>2</sup>**<sup>1</sup>*Associate Professor, Department of Anatomy, JJM Medical College, Davangere, Karnataka, India.*<sup>2</sup>*Postgraduate, Department of Anatomy, JJM Medical College, Davangere, Karnataka, India.***ABSTRACT**

To determine the position of mandibular foramen (MF) from various parts of ramus of mandible and the incidence of accessory mandibular foramen (AMF) by studying on dry mandibles to assist dental surgeons to conduct dental procedures. Study was carried out on 100 dry mandibles of which 84 are dentulous and 16 are edentulous. The average distance of MF from the anterior boarder of mandibular ramus was  $16.21 \pm 2.12$  mm (right side) and  $16.67 \pm 2.34$  mm (left side), from posterior boarder of mandibular ramus was  $11.08 \pm 2.34$  mm (right side) and  $11.11 \pm 2.34$  mm (left side). The MF was located  $21.38 \pm 3.91$  mm (right side) and  $20.95 \pm 3.39$  mm (left side) from the mandibular notch. The distance of MF from angle of mandible was  $21.48 \pm 3.75$  mm (right side) and  $21.08 \pm 3.90$  mm (left side). AMF was present in 9% of mandibles. In 6% single AMF was present and in 3% double foramina were present. The complications such as hemorrhage and paresthesia during oral surgical procedures can be avoided by knowing the exact location of MF and AMF.

**KEYWORDS :** Mandible, Mandibular foramen, Accessory mandibular foramen.**RAGHAVENDRA V. P.**Associate Professor, Department of Anatomy, JJM Medical College,  
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## INTRODUCTION

The mandibular foramen (MF) is an irregular foramen which is located just above the centre of the medial surface of the ramus of the mandible<sup>1</sup>. The ramus of the mandible has anterior, posterior, superior and inferior borders and its surfaces are medial and lateral. The mandibular foramen curves downwards and forwards into the body of the mandible to form the mandibular canal which exit opens into mental foramen. The inferior alveolar nerve (IAN) and vessels pass through it which supplies the mandibular teeth<sup>2</sup>. Any other openings in the mandible other than mandibular foramen, sockets of teeth and mental foramen are labelled as accessory mandibular foramen (AMF)<sup>3</sup>. Accessory mandibular foramen may be associated with blood vessels which provide an easy route for the spread of infection<sup>4</sup>. The inferior alveolar nerve block is the commonest local anaesthetic technique which is used for dental procedures. The failure rate is high due to inaccurate localization of mandibular foramen. The present study was conducted to determine the exact position of the mandibular foramen in relation to the ramus of mandible such as anterior border, posterior border, from the mandibular notch and from the angle of the mandible. The incidence of accessory mandibular foramen were also studied. This study would help dental surgeons to improve their technique during inferior alveolar nerve block and other surgical procedures. As the dry mandibles were obtained from J.J.M. Medical college

davangere, this study gives the position of mandibular foramen in the local population.

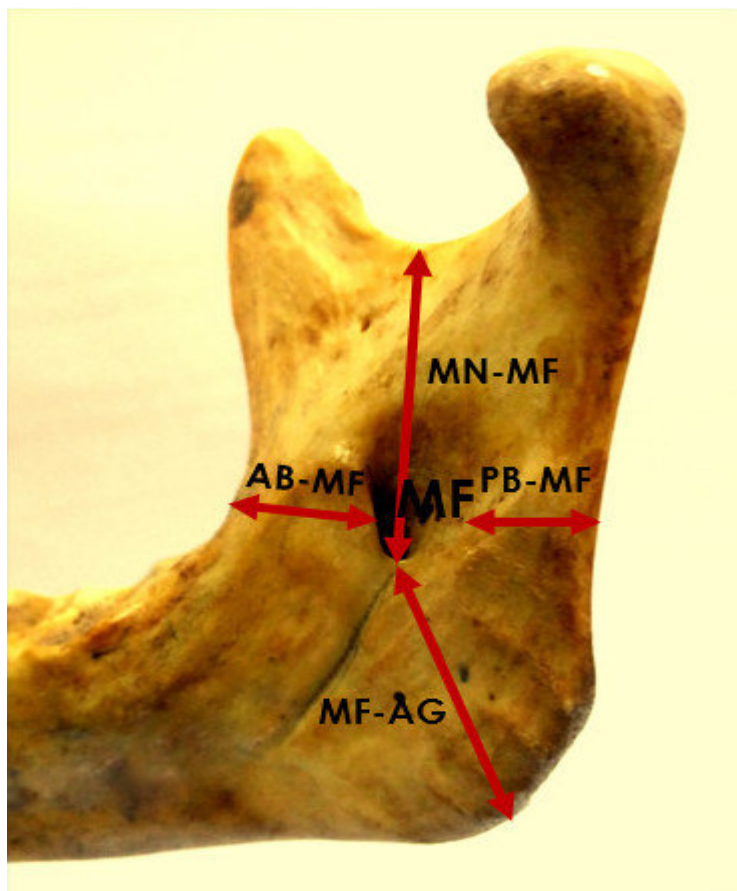
## MATERIALS AND METHODS

A total of 100 human dry mandibles was obtained from the Department of Anatomy, J. J. M. Medical College, Davangere, out of which 84 were dentulous and 16 were of edentulous. Vernier calipers of 1/20mm accuracy had been used for taking measurements. On both sides the position of the centre of the mandibular foramen was measured from various landmarks like,

1. Distance from the midpoint of the anterior margin of mandibular foramen to the nearest point on the anterior border of mandibular ramus.
2. Distance from the midpoint of the posterior margin of mandibular foramen to the nearest point on the posterior border of mandibular ramus.
3. Distance from the lowest point of mandibular notch to the inferior limit of mandibular foramen.
4. Distance from the inferior limit of mandibular foramen to the angle of the mandible.

All the measurements were recorded in millimeters. The mean and standard deviation for each distance were calculated separately for right and left sides. The mandibles were further observed for the presence of Accessory Mandibular foramen on the medial surface of the mandibular ramus.

**Position of mandibular foramen from various mandibular landmarks**



**Figure 1**

**Picture showing measurements of mandibular foramen (MF) from various mandibular landmarks like, a) anterior boarder of ramus (AB-MF), b) posterior boarder of ramus (PB-MF), c) lowest point of mandibular notch (MN-MF) and d) angle of the mandible (MF-AG).**

**RESULTS**

1. The average distance from the midpoint of the anterior margin of MF to the nearest point on the anterior border of mandibular ramus (AB-MF) was  $16.21 \pm 2.12$  mm (right side) and  $16.67 \pm 2.34$  mm (left side).
2. The average distance from the midpoint of the posterior margin of MF to the nearest point on the posterior border of mandibular ramus (PB-MF) was  $11.08 \pm 2.34$  mm (right side) and  $11.11 \pm 2.34$  mm (left side).
3. The average distance from the lowest point of mandibular notch to the inferior limit of

- mandibular foramen (MN-MF) was  $21.38 \pm 3.91$  mm (right side) and  $20.95 \pm 3.39$  mm (left side).
  4. The average distance from the inferior limit of mandibular foramen to the angle of the mandible (MF-AG) was  $21.48 \pm 3.75$  mm (right side) and  $21.08 \pm 3.90$  mm (left side).
- Accessory Mandibular Foramen (AMF) was present in 9% of mandibles. In 6% single AMF was present and in 3% double foramina were present.

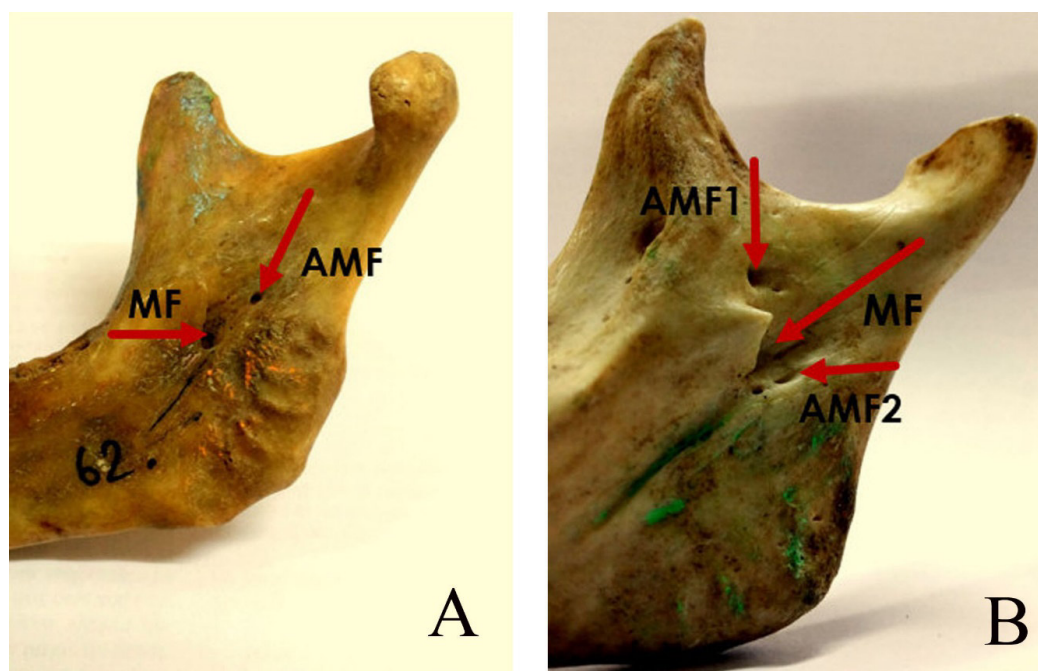
**Table 1**  
**Distance of mandibular foramen (MF) from various mandibular landmarks in mm.**

AB-MF	Dentulous mandibles				Edentulous mandibles			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Left	8.55	22.17	16.85	2.23	10.02	21.01	15.69	2.86
Right	11.36	21.69	16.39	1.95	11.40	21.23	15.20	2.68

PB-MF	Dentulous mandibles				Edentulous mandibles			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Left	4.68	17.59	11.22	2.37	6.97	13	10.47	2.05
Right	5.97	17.16	11.27	2.35	6.82	13.88	10.09	2.08

MN-MF	Dentulous mandibles				Edentulous mandibles			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Left	11.78	28.70	20.93	3.41	13.19	26.79	21.06	3.32
Right	13.42	31.24	21.40	3.93	13.53	26.48	21.24	3.87

MF-AG	Dentulous mandibles				Edentulous mandibles			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Left	11.33	29.86	20.96	4.02	14.92	26.94	21.66	3.16
Right	12.49	30.38	21.34	3.91	16.94	27.20	22.14	2.73

**Accessory mandibular foramen****Figure 2**

**A.** Picture showing mandibular foramen (MF) and a single accessory mandibular foramen (AMF). **B.** Picture showing mandibular foramen and multiple accessory mandibular foramina (AMF1, AMF2).

**DISCUSSION**

The position of MF has been found to be variable. The variability of the position of MF makes it difficult to anaesthetize the inferior alveolar nerve<sup>5,6</sup>. In south Indian mandibles the average distance of MF was 16 mm & 13 mm from the anterior, posterior borders of mandibular ramus and 20-25 mm from the mandibular notch (Verma et al.)<sup>7</sup>. In dry mandibles of east India ethnic origin, the MF was found to be located at the anteroposterior midpoint of the ramus halfway between the lower surface of the mandible and the mandibular notch<sup>5</sup>. In a study done on Thai mandibles, the MF was located 23.60±5.6 mm from the mandibular notch and 25.01±4.5mm from the angle of the mandible<sup>8</sup>. The presence of AMF could be associated with additional branches of the inferior alveolar nerve given before the nerve enters the mandibular foramen. The additional branches of IAN may arise in the infratemporal fossa and may enter the mandible through the accessory foramen to

supply molar teeth<sup>9</sup>. Developmentally the presence of double mandibular canals can be explained as the incomplete fusion of three inferior alveolar nerves that develops initially to innervate three groups of mandibular teeth<sup>10</sup>. Accessory foramina may provide a route for spread of infections and tumor following radiotherapy<sup>4</sup>. In a study conducted on south Indian population the AMF was present in 16.4% mandible. A single AMF was found in 9 cases and double in 2 cases<sup>11</sup>. A study done by Samanta PP et al., showed that AMF was present in 16.66% of mandibles. A single AMF was present in 10% mandibles and in 6.66% mandibles, double AMFs were observed<sup>12</sup>. In the present study AMF was present in 9% mandibles. In 6% single AMF was present and in 3% double AMFs were present. All the AMF were present on the medial surface of the mandibular ramus which is in accordance with the previous authors<sup>9,12</sup>.

**Table 2**  
**Comparison of studies on mandibular foramen by various authors.**

Authors	Side	AB-MF (mm)	PB-MF (mm)	MN-MF (mm)	MF-AG (mm)
Oguz et al. (2002)	Right	16.90	14.09	22.37	-
	Left	16.78	14.37	22.17	-
Kilarkaje et al. (2005)	Right	18.50±1.90	-	21.60±3.10	25.10±4.20
	Left	18.50±2.00	-	21.60±3.40	24.70±4.40
Prado et al. (2010)	Right	19.20±3.60	14.20±2.40	23.60±3.10	-
	Left	18.80±3.80	13.90±2.60	23.10±3.00	-
Shenoy V et al. (2012)	Right	16.10	11.70	23.60	-
	Left	16.30	11.30	23.60	-
Samanta PP et al. (2013)	Right	15.70±2.90	13.20±1.70	22.70±3.00	21.50±2.90
	Left	16.20±2.80	12.70±2.00	22.20±2.90	21.10±3.43
Present study (2014)	Right	16.21±2.12	11.08±2.34	21.38±3.91	21.48±3.75
	Left	16.67±2.34	11.11±2.34	20.95±3.39	21.08±3.90

## CONCLUSION

The present study gives a fair knowledge of the position of mandibular foramen in the local population. The precise location will increase the success rate of dental anaesthesia and also would help dental surgeons to avoid injury to the neurovascular bundles followed by complications like paresthesia and hemorrhage.

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