



## Original Article

# The Variation of Position of Mental Foramen in Relation to Side and Sex in Northern Region of Bangladesh

Saian Fariya,<sup>1</sup> Fatima Jomrud Mohol,<sup>2</sup> Shahin Sharmin,<sup>3</sup> Most Ishita Khanom,<sup>4</sup> Saraban Tahura,<sup>5</sup> Abul Bashar Muhammad Reza,<sup>6</sup> Afrida Anzum<sup>7</sup>

### Abstract

**Background:** The mental foramen is an important anatomical landmarks during surgical intervention and anaesthetic nerve block procedure involving inferior alveolar nerve and mental nerve.

**Objectives:** The aim of this study was to determine the variation of position of mental foramen in relation to side and sex.

**Methods:** This cross-sectional type of descriptive study was conducted over a period of 1 year from January 2021 to December 2021 in the Department of Anatomy, Rajshahi Medical College, Rajshahi. This study was performed on 250 dry adult human mandibles (148 were male and 102 were female mandibles) which were collected from the students of Department of Anatomy, Rajshahi Medical College, Rajshahi as well as other Medical Colleges after fulfilling the inclusion criteria. Data were collected purposively with the help of a semi-structured questionnaire. All the measurements were performed using digital sliding Vernier calipers and the data were analyzed via SPSS software, version 24.0. Statistical significance was evaluated as appropriate probability level  $p < 0.05$  for all tests.

**Results:** The study revealed that 96% of mental foramens were oval in shape. Out of six morphometric parameters of mental foramen, four parameters (Distance from alveolar crest to upper margin, distance from lower border of mandible to lower margin, distance from symphysis menti to medial margin and horizontal diameter of mental foramen) were not statistically significant ( $p > 0.05$ ) but distance from posterior border of ramus of mandible to lateral margin and vertical diameter of mental foramen were statistically significant ( $p < 0.001$ ). Horizontal diameter of mental foramen of right halves and vertical diameter of mental foramen of both halves were higher in male than female and these were statistically significant ( $p < 0.05$ ). But horizontal diameter of mental foramen of left halves between male and female was statistically non-significant ( $p > 0.05$ ).

**Conclusion:** This study might help us in establishing a reference data-base in our country for the Anatomists in general, Dental Surgeons and Maxillofacial Surgeons.

**Key words:** Position of Mental Foramen, Mental Nerve and Mental Vessel.

TAJ 2023; 36: No-2: 193-200

### Introduction

The mandible is the strongest, largest and lowest bone of the face. It has a horizontally curved body which is convex anteriorly and has two broad rami

that ascend posteriorly. Within the alveolar process, the body of the mandible supports the mandibular teeth. The rami bear the coronoid and condylar processes and each condyle articulates with the adjacent temporal bone by the

<sup>1</sup> Lecturer, Department of Anatomy, Rajshahi Medical College, Rajshahi.

<sup>2</sup> Associate Professor and Head, Department of Anatomy, Rajshahi Medical College, Rajshahi.

<sup>3</sup> Associate Professor (CC), Department of Anatomy, Rajshahi Medical College, Rajshahi.

<sup>4</sup> Lecturer, Department of Anatomy, Rajshahi Medical College, Rajshahi.

<sup>5</sup> Lecturer, Department of Anatomy, Shaheed Suhrawardy Medical College, Dhaka.

<sup>6</sup> Lecturer, Department of Anatomy, Rajshahi Medical College, Rajshahi.

<sup>7</sup> Assistant Professor, Department of Anatomy, Ashiyan Medical College, Dhaka.

temporomandibular joint.<sup>1</sup> The mental foramen is a channel-like opening that is wide at the top and narrow at the base and situated on the anterolateral aspect of the body of mandible, midway between the inferior and the alveolar margins of the body.<sup>2</sup> It is present in a vertical line with the supraorbital notch between the premolars. It provides a passage for the exit of the mental nerve and the vessels from the mental canal.<sup>3</sup> Most of the mental foramina are oriented postero-superiorly. However, the mental foramen often varies in number, shape, position and even maybe absent.<sup>4</sup> Accessory mental foramen is usually located below the 1<sup>st</sup> molar teeth.<sup>5</sup> This accessory mental foramen may transmit the branches of the mental nerve.

The surgeon must take care to protect the neurovascular bundle exiting through the mental foramen when performing surgeries close to it, including the installation of endo-osseous implants, root end surgery, surgical removal of impacted teeth, cysts, and tumors. A safe distance of 2 mm must be kept between endo-osseous implants and the mental foramen.<sup>6,7</sup> For both diagnostic and clinical purposes, the exact location of mental foramen is important. In terms of diagnosis, a disease close to the apices of the premolar teeth can be misinterpreted for a mental foramen. From a clinical aspect, the exact location of the nerve and presence/absence of anterior loop is important to prevent any nerve injury with its postoperative complications.<sup>8</sup> The most common position of mental foramen is between the apices of first and second premolar or below the apex of second premolar teeth.<sup>9</sup> The position of mental foramen is influenced by age, gender, ethnic background, tooth loss and subsequent ridge resorption.<sup>10</sup> Injury to the mental nerve may be responsible for sensory disturbance in the lower lip, skin and surrounding mucosa.<sup>11,12</sup> Several methods, including manual identification, direct inspection during surgery, panoramic or periapical radiography, magnetic resonance imaging (MRI), computed tomography (CT), and cone beam computed tomography (CBCT), have been proposed to reliably discover the mental foramen. The majority of these techniques are expensive,

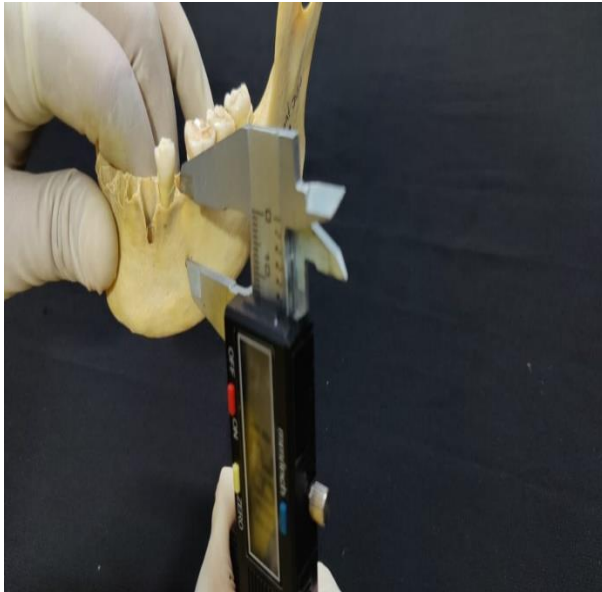
risky when magnified, and involve excessive radiation.<sup>13</sup>

So, knowledge of position, size, shape of mental foramen and presence of accessory mental foramen is important to perform elevation of mucoperiosteal flaps, anesthetic block prior to clinical procedures in lower anterior teeth and to preserve integrity of the mental nerve trunk in surgical interventions.<sup>14</sup> As the mental foramen is an important anatomical landmark to facilitate surgical, local anesthetic and other invasive procedures, the present study was aimed at assessing the variation of position of mental foramen in relation to side and sex.

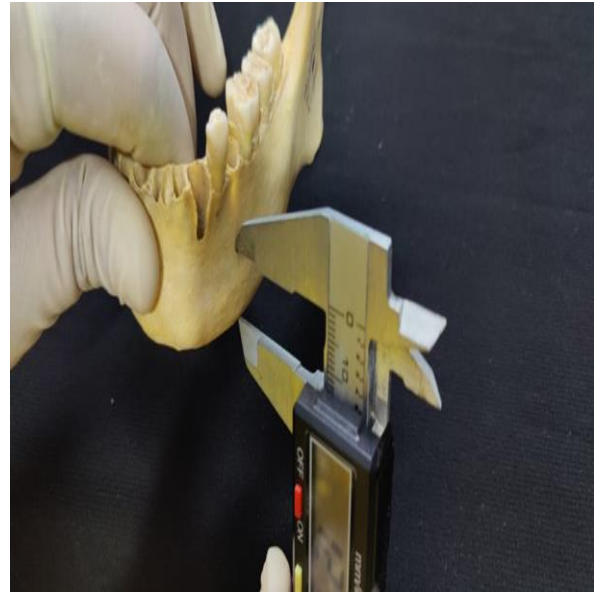
## Materials and Methods

This cross-sectional descriptive study was conducted in the Department of Anatomy, Rajshahi Medical College over a period of one year from January 2021 to December 2021. This study was performed on dry adult human mandible bones which were collected from the students of Department of Anatomy of Rajshahi Medical College as well as from the different Medical Colleges (Islami bank Medical College, Rajshahi; Barind Medical College, Rajshahi; Rangpur Medical College, Rangpur; North Bengal Medical College, Sirajgonj; Kushtia Medical College, Kushtia; Pabna Medical College, Pabna; Shahid Ziaur Rahman Medical College, Bogra; Kumudini Women's Medical College, Tangail) of Bangladesh after fulfilling the inclusion criteria. However, deformed bones / damaged bones, malformed bones, bones with congenital anomalies were excluded from the study. A total of 250 mandibles were included in the study by purposive sampling technique. Data were collected by a semi-structured questionnaire and sliding Vernier calipers. The sex of mandibles was determined by observation of different sex determination variables. The shape of mental foramen was determined by observation and their size (horizontal and vertical diameter) were measured. All the measurements were performed using digital sliding Vernier calipers of 0.1 mm accuracy.





**Fig 1: AC-Distance from alveolar crest to upper margin of mental foramen.**



**Fig 2: BD-Distance from lower border of mandible to lower margin of mental foramen.**



**Fig 3: WY-Distance from symphysis menti to medial margin of mental foramen.**



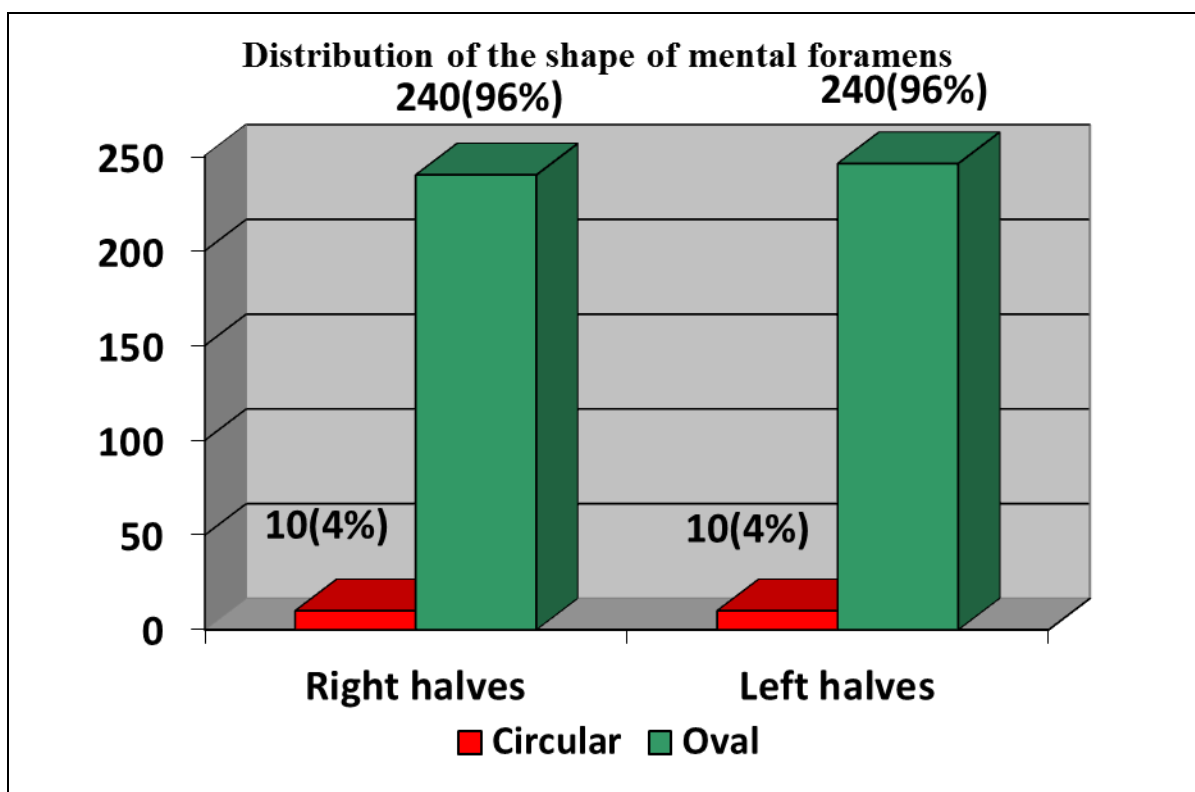
**Fig 4: XZ-Distance from posterior border of ramus of mandible to lateral margin of mental foramen.**

The mental foramen can be located by measuring the following distances: AC- Distance from alveolar crest to upper edge of mental foramen (Fig. 1); BD- Distance from lower border of mandible to lower margin of mental foramen (Fig. 2).; WY- Distance from symphysis menti to medial margin of mental

foramen (Fig 3); XZ- the distance between the lateral margin of the mental foramen and the posterior border of the ramus of the mandible using sliding vernier caliper (Fig. 4). Though the surface were irregular and the measurement were taken with the help of digital calipers, the values were taken at the straight measurements in mm.

## Results

The shape of the mental foramens of both halves had similar pattern (96% oval & 4% circular in shape) (Figure-I).



**Figure-I: Distribution pattern of shape of the mental foramens (n = 250).**

Comparison of morphometric parameters of mental foramen between right and left halves revealed that out of six parameters, four parameters (Distance from alveolar crest to upper margin, distance from lower border of mandible to lower margin, distance from symphysis menti to medial margin and horizontal diameter of mental foramen) were not statistically significant ( $p > 0.05$ ) but distance from posterior border of ramus of mandible to lateral margin and vertical diameter of mental foramen were statistically significant ( $p < 0.001$ ) (Table-01).

**Table-01: Comparison of morphometric parameters of mental foramen between right and left halves (n=250).**

Morphometric parameters of mental foramens (Both halves)	Statistical measurements						t-value
	Halve	Mean± SD	Median	Mode	Min	Max	p-value
Distance from alveolar crest to upper margin of mental foramen (mm)	Right	13.90 ± 1.91	13.72	13.92	10.19	18.69	1.01
	Left	13.84 ± 1.88	13.76	15.71	9.40	18.48	> 0.05
Distance from lower border of mandible to lower margin of mental foramen (mm)	Right	13.19 ± 1.46	13.06	12.95	9.71	17.55	0.68
	Left	13.23 ± 1.66	13.29	11.03 <sup>a</sup>	9.18	18.88	> 0.05
Distance from symphysis menti to medial margin of mental foramen (mm)	Right	25.38 ± 1.76	25.36	24.13 <sup>a</sup>	21.33	32.31	1.36
	Left	25.50 ± 1.48	25.50	23.50 <sup>a</sup>	21.53	31.95	> 0.05
Distance from posterior border of ramus of mandible to lateral margin of mental foramen (mm)	Right	63.55 ± 4.17	63.62	59.70 <sup>a</sup>	53.40	73.42	1.97
	Left	63.05 ± 4.29	63.50	60.89 <sup>a</sup>	51.24	74.88	< 0.001
Horizontal diameter of mental foramen (mm)	Right	2.76 ± 0.56	2.73	2.07 <sup>a</sup>	1.24	4.17	0.25
	Left	2.75 ± 0.65	2.69	1.97 <sup>a</sup>	1.30	6.12	> 0.05
Vertical diameter of mental foramen (mm)	Right	2.15 ± 0.41	2.08	1.73	1.14	3.34	4.62
	Left	2.28 ± 0.42	2.24	2.06 <sup>a</sup>	1.42	4.47	< 0.001

Horizontal diameter of mental foramen of right halves and vertical diameter of mental foramen of both halves were higher in male than female and these were statistically significant ( $p < 0.05$ ). But horizontal diameter of mental foramen of left halves between male and female was statistically non-significant ( $p > 0.05$ ) (Table-02).

**Table-02: Comparison of horizontal and vertical diameter of mental foramens between male and female bones (Male=148, Female=102).**

Variables	Halves	Sex of Mandibles	Mean±SD	t	p
<b>Horizontal diameter of mental foramen (mm)</b>	Right	Male	2.83±0.56	2.51	<0.05
		Female	2.65±0.55		
	Left	Male	2.77±0.52	0.76	>0.05
		Female	2.70±0.81		
<b>Vertical diameter of mental foramen (mm)</b>	Right	Male	2.25±0.41	5.37	< 0.001
		Female	1.99±0.37		
	Left	Male	2.35±0.34	3.17	< 0.05
		Female	2.17±0.50		

## Discussion

Understanding the position of the mental foramen is crucial during clinical and surgical operations close to the mental foramen to prevent injury to the neurovascular bundle. The mental foramen is a strategically significant landmark during osteotomy procedures.

In present study, both halves of the mandible had similar pattern of shape of the mental foramens, 96% oval & 4% circular. The findings are similar to Subramanian et al.<sup>15</sup>, Udhaya et al.<sup>16</sup>, Budhiraja et al.<sup>17</sup> and Igbibi and Lebona<sup>10</sup>.

In present study, paired sample t-test revealed that on an average among six parameters, most of the right and left halves parameters difference of all mandibles were statistically not significant ( $p > 0.05$ ) except distance from posterior border of ramus of mandible to lateral margin of mental foramen and vertical diameter of mental foramen, which were statistically significant ( $p < 0.001$ ).

In this study mean horizontal and vertical diameter of mental foramen of right halves were  $2.75 \pm 0.56$  mm and  $2.15 \pm 0.41$  mm respectively and for left halves were  $2.75 \pm 0.65$  mm and  $2.28 \pm 0.42$  mm,

respectively. The mean horizontal diameter of mental foramen just near to findings of Oguz and Bozkir.<sup>18</sup> But much lower than the findings of Subramanian et al.<sup>15</sup>, Budhiraja et al.<sup>17</sup> and Igbibi and Lebona.<sup>10</sup> The mean vertical diameter similar to the study of Budhiraja et al.<sup>17</sup>, Igbibi and Lebona<sup>10</sup> and Oguz and Bozkir.<sup>18</sup>

In the present study, the morphometric parameters of mental foramens of the adult dry mandibles reveals that mean distance from alveolar crest to upper margin of mental foramen were  $13.90 \pm 1.91$  mm in right halves & for left halves  $13.84 \pm 1.88$  mm. Again mean distance from lower border of mandible to lower margin of mental foramen were  $13.19 \pm 1.46$  mm for right halves &  $13.23 \pm 1.66$  mm for left halves. The study findings just near or similar to Igbibi and Lebona<sup>10</sup> and Oguz and Bozkir<sup>18</sup>, a bit dissimilar to Subramanian et al.<sup>15</sup> and Budhiraja et al.<sup>17</sup>.

In the current study, mean distance from symphysis menti to medial margin of mental foramen of right halves was  $25.38 \pm 1.76$  mm & for left halves was  $25.50 \pm 1.48$  mm, which were almost similar to Igbibi and Lebona<sup>10</sup> and Budhiraja et al.<sup>17</sup>.

The mean distance between the lateral margin of the right halves of the mental foramen and the posterior edge of the mandibular ramus was  $63.55 \pm 4.17$  mm for left halves was  $63.05 \pm 4.29$  mm, which were lower than the findings of Subramanian et al.<sup>15</sup>, Budhiraja et al.<sup>17</sup> and Igbibi and Lebona<sup>10</sup>.

An independent samples t-test was used to compare the mean difference of all morphometric parameters of the adult mental foramens between male (n=148) and female (n=102) bones showed male measurement values were higher than female measurement values, which were statistically highly significant for both halves ( $p < 0.001$ ) except the left halves where mean difference of horizontal diameters of mental foramen of the adult mandibles between male and female bones was statistically not significant ( $p > 0.05$ )

The parameters difference found among different studies because the measurements had taken different ethnic groups, races as well as measuring techniques were different. There were several parameters and relationship between different morphometric variables of mental foramen of adult dry mandibles in the present study which were not compare with other studies due to lack of published scientific literature with similar pattern.

Prior to implant placement in the foraminal region, the location of mental foramen is needed to be considered. The foramen's position may vary and radiographs may be misleading due to its precise location and the presence of an anterior loop of the mental nerve. So, injuries to this nerve during implant placement can be avoided if the mental foramen is located and evaluated and this information is used to help guide surgical procedures.

There were some limitations of the study such as sampling technique was purposive and sample size was only 250.

## Conclusion

Measuring the morphometric parameters of mental foramen and identification of sex of mandible is the first step in creating a biological profile of the skeletal remains. Based on findings from above

study revealed that 96% of mental foramens were oval in shape. The morphometric parameters of mental foramen of both halves were higher in male mandibles than female.

**Conflict of interest:** None declared

## References

1. Drake R, Vogl AW, Mitchell AWM. Gray's anatomy for students E-book. books.google.com; 2009.
2. Fenwick CG. Tratado de Direito International Publico. Vol. I. By Hildebrando Accioly. Rio de Janeiro: 1956. pp. xxiv, 665. Index. American Journal of International Law. 1956; 50(1):973–974
3. Agthong S, Huanmanop T, Chentanez V. Anatomical variations of the supraorbital, infraorbital, and mental foramina related to gender and side. J Oral Maxillofac Surg. 2005 Jun;63(6): 800–804.
4. Santini A, Land M. A comparison of the position of the mental foramen in Chinese and British mandibles. Cells Tissues Organs. 1990; 137(3): 208-12.
5. Çağırankaya LB, Kansu H. An accessory mental foramen: A case report. J Contemp Dent Pract. 2008 Jan;9(1):98–104.
6. Walton JN. Altered sensation associated with implants in the anterior mandible: a prospective study. J Prosthet Dent. 2000 Apr; 83(4):443-9.
7. Wismeijer D, van Waas MA, Vermeeren JI, Kalk W. Patients' perception of sensory disturbances of the mental nerve before and after implant surgery: a prospective study of 110 patients. Br J Oral Maxillofac Surg. 1997 Aug; 35(4):254–259.
8. Ngeow WC, Yuzawati Y. The location of the mental foramen in a selected Malay population. J Oral Sci. 2003 Sep; 45(3): 171–175.
9. Fabian FM. Position, shape and direction of opening of the mental foramen in dry mandibles of Tanzanian adult black males. Ital J Anat Embryol. 2007;112(3): 169–177.
10. Igbibi PS, Lebona S. The position and dimensions of the mental foramen in adult Malawian mandibles. West Afr J Med. 2005 Jul-Sep; 24(3):184-9.
11. Greenstein G, Tarnow D. The mental foramen and nerve: clinical and anatomical factors related to dental implant placement: a literature review. J Periodontol. 2006 Dec; 77(12):1933–1943.
12. Dreiseidler T, Rothamel D, Richter U. Evaluation of the course of the inferior alveolar nerve in the mental foramen by cone beam computed tomography. Int J Oral Maxillofac Implants. 2012 Sep-Oct; 27(5):1014-21.
13. Aminoshariae A, Su A, Kulild JC. Determination of the location of the mental foramen: a critical review. Journal of endodontics. 2014Apr;40(4):471-5.



14. Cutright B, Quillopa N, Schubert W. An anthropometric analysis of the key foramina for maxillofacial surgery. J Oral Maxillofac Surg. 2003 Mar;61(3):354–357.
15. Subramanian B, Anthony SN, Mubbunu L. Anthropometrics analysis of mental foramen and accessory mental foramen in Zambian adult human mandibles. Scientific World Journal. 2019 Jul 16; 2019:9093474.
16. Udhaya K, Saraladevi KV, Sridhar J. The morphometric analysis of the mental foramen in adult dry human mandibles: a study on the South Indian population. J Clin Diagn Res. 2013 Aug 1;7(8):1547–1551.
17. Budhiraja V, Rastogi R, Lalwani R. Study of position, shape, and size of mental foramen utilizing various parameters in dry adult human mandibles from north India. ISRN Anat. 2013 Dec; 17(2): 1-5.
18. Oguz O, Bozkir MG. Evaluation of location of mandibular and mental foramina in dry, young, adult human male, dentulous mandibles. West Indian Med J. 2002 Mar; 51(1):14–16..

All correspondence to  
**Dr. Saian Fariya**  
Lecturer  
Department of Anatomy  
Rajshahi medical college, Rajshahi  
Mobile No: 01717866831  
Email: bob.zone016@gmail.com