

Original Article**Radiographic Study of Mental Foramen in Nepalese Population**Pragya Shrestha¹, Sneha Maskey¹, Dil Islam Mansur¹ and Manoj Humagain²¹Department of Anatomy, ²Department of Periodontics, Kathmandu University School of Medical Science, Dhulikhel, Kavre, Nepal

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DOI: <http://dx.doi.org/10.3126/jonmc.v8i1.24447>**Abstract****Background**

Mental foramen is the opening on the anterolateral surface of mandible that marks the termination of mandibular canal through which mental neurovascular bundle exit. This study is aimed at determining the location of mental foramen among Nepalese population.

Materials and Methods

A retrospective study was performed in panoramic radiographs (orthopantomograms) of the patients collected from Department of Oral Medicine and Radiology, Dhulikhel Hospital. Planmeca Promax machine was used to take the radiographs of the patient and Planmeca Roxemis software was used to analyze the digital radiographs. The horizontal position and vertical distance of the mental foramen was evaluated.

Results

The study revealed that the most common position of the mental foramen was between first and second premolar (bicuspid) 186 (54.7%) and the second common position was in line with second premolar 122 (35.9%). The mean distance between mental foramen and inferior border of mandible of male was 12.31 ± 1.64 and female was 10.83 ± 1.19. Significant difference in the distance between mental foramen and inferior border of mandible among male and female (P=0.00).

Conclusion

The most common location of mental foramen was between first and second premolar; however, the study revealed the anatomical variation in the positions. So, proper investigation of mental foramen is indispensable before treatment planning to prevent iatrogenic damage to neurovascular bundle.

Keywords: *Bicuspid, Dental Implants, Mandible*

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Introduction

Mental foramen is an important landmark located on the anterolateral surface of the body of mandible that marks the termination of mandibular canal. Through the foramen mental neurovascular bundle emerge to supply the lower lip and chin [1]. The foramen lies in between the first and second premolar or below the second premolar [2, 3]; midway between the upper and lower border of the mandible [4]. Inferior alveolar nerve is one of the branches of posterior division of mandibular nerve which enters the mandible through the mandibular foramen, traverses the mandibular canal, divides into mental nerve and incisive nerve [5]. Sensory disturbances can be caused by pressure on the mental nerve from a denture, implant placement or injections.

Nerve can be partially or totally transected in periapical surgeries or osteotomy procedures [6]. Clinicians should have a precise knowledge of the location of mental foramen to minimize inevitable cases. Panoramic radiograph provides the great area of soft and hard tissue coverage and continuity of the visualized area of mandible and maxilla [7]. Mental foramen is clearly visible in wide field of mandibular view in this radiograph [8]. Various authors have highlighted the racial variation in the horizontal and vertical position of MF [9, 10]. Very few studies regarding the location of MF is done in Nepalese population [11, 12]. So, this study aims to assess the location of MF in our population.

Material and Methods

The present study was the retrospective study which was conducted in the Department of Anatomy and Department of Oral Medicine and Radiology, Dhulikhel Hospital/Kathmandu University School of Medical Sciences (KUSMS) during the period of September 2018 to January 2019. Prior to study, the approval was taken from IRC-KUSMS. The panoramic radiographs of the patients used for this study were collected from Department of Oral Medicine and Radiology, Dhulikhel Hospital.

The Orthopantomogram (OPG) of the patients above 18 years with clearly visible mental foramen was included in the study. OPG of the patient with missing bicuspid, orthodontic or periodontal problems were excluded. Planmeca Promax machine was used to take the radiograph

of the patient and Planmeca Roxemis software version 3.1.1.R was used to analyze the data.

Horizontal Position of mental foramen was assessed as follows [13]:

- Position 1: Situated anterior to the first premolar
- Position 2: In line with the first premolar
- Position 3: Between the first and second premolar
- Position 4: In line with second premolar
- Position 5: Between the second premolar and first molar
- Position 6: In line with the first molar

Vertical distance of mental foramen was assessed as the distance between:

- i. Mental foramen and alveolar ridge
- ii. Mental foramen and inferior border of mandible

Results

The study was performed in 170 panoramic radiographs of the patients of which 69 (40.6%) were male and 101(59.4%) were female. The total of 340 mental foramen was analyzed from 170 radiographs. The age of the patients ranged from 18 years to 85 years with the mean of 29.4 years. The most common position of the mental foramen was between first and second premolar 186 (54.7%). The second common position was in line with second premolar 122 (35.9%). But there were cases of presence of mental foramen anterior to premolar and in line with first molar as well [Table 1].

Table 1: Horizontal Position of Mental Foramen

	Male n (%)	Female n (%)	Total n (%)
Anterior to PM1	-	1 (0.5)	1 (0.3)
In line with PM1	-	3 (1.5)	3 (0.9)
Between PM1 and PM2	83 (60.1)	103 (51.0)	186 (54.7)
In line with PM2	42 (30.4)	80 (39.6)	122 (35.9)
Between PM2 and M1	11 (8.0)	15 (7.4)	26 (7.6)
In line with M1	2 (1.4)	-	2(0.6)

*PM1: First premolar, PM2: Second premolar, M1: First molar

The mean distance between alveolar crest and mental foramen was 15.53 2.19 mm and the mean distance between the mental foramen and inferior border of mandible was 11.43 1.57 mm [Table 2].

Table 2: Vertical distance of mental foramen

	Range	Mean Distance
Mental foramen to alveolar crest	9.6-22.2	15.53
Mental foramen to the inferior border of mandible	7.8-15.9	11.43



The mean distance between mental foramen and alveolar crest of male was 12.31 ± 1.64 mm and female was 10.83 ± 1.19 mm. Significant difference in vertical distance between mental foramen and alveolar crest among male and female ($P=0.05$). The mean distance between alveolar crest and mental foramen of male was 15.81 ± 2.57 mm and on female was 15.34 ± 1.86 mm. Significant difference in vertical distance between mental foramen and inferior border of mandible among male and female ($P=0.00$) [Table 3].

Table 3: Vertical distance of mental foramen among different sexes

Vertical distance	Male	Female	P value
Mental foramen to alveolar crest	12.31±1.64	10.83±1.19	0.05
Mental foramen to the inferior border of mandible	15.81±2.57	15.34±1.86	0.00

Discussion

The present study explores the most common location of mental foramen relating to the apparent landmarks using digital panoramic radiographs. The study illustrates the horizontal position of mental foramen between the root of first and second premolar. An effort was made to identify any significant variation of its position with the inferior border of mandible based on gender.

The study showed the most common horizontal position of mental foramina was between the first and second premolar and the second most common position was in line with the second premolar. The result of the present study is in accordance with the research done by Ghimire among Nepalese population and Al Shayyab among Iraqi population [11,14]. However, Kadel and Soheilifar have interpreted the common horizontal position in line with the second premolar, followed by the area between the first and second premolar [14,15].

Interestingly our investigation showed the location of mental foramen anterior to first premolar (0.6% on right side) as well as in line with the first molar (0.6% both on right and left sides). This least common location of the mental foramina can lead to failure of mental nerve block during anesthesia or nerve injury during surgical procedures leading to paresthesia [16]. So, the clinicians should be aware of this uncommon location of MF to prevent any iatrogenic damage to mental nerve.

The present study showed the mental foramen lies closer to the inferior border of the mandible than the alveolar crest which was similar to the study by Amorim [16]. But Oguz reported the location of foramina in between the alveolar crest and inferior border [4]. The knowledge about the location of MF is necessary to give mental and incisive block to anesthetize the lower lip and chin region [7]. This study aims to provide a guideline for the surgeons to place the needle for mental nerve block. The distance between mental foramen to alveolar crest is known as safety zone and the distance of 2 mm safety zone is desirable for implant placement. The panoramic radiographs provide the guide for the calculation of the safety zone [17].

The investigation highlights a significant gender based variation between the distance of mental foramen and inferior border of the mandible; showing higher distances in males than females. Previous studies have also unveiled the similar gender based variation [18]. The knowledge of gender based position of the canal might be considered as an alternative parameter in identification of human remains in forensic medicine and anthropology [19].

The study framework, however, solely pertains to the radiographs of the patients of Dhulikhel hospital. It falls short of representing the whole sample of different regions of Nepal. The inherent magnification and distortion in panoramic radiographs could not be controlled. Further study about correlating the clinical findings with other extensive investigations like Cone Beam Computed Tomography is to be done in the coming days.

Conclusion

The study has revealed the most common position of mental foramen is between the first and second bicuspid. Proper investigation is mandatory when dental implants or other surgical procedures are to be conducted in this region in order to prevent damage to the mental neurovascular bundles. The vertical distance of location of mental foramen can also be used a parameter for sex determination for the forensic investigations.



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