

# Evaluation of Positioning of the Mandibular Canal & Mental Foramen in Elderly Population on a Digital Panoramic Radiograph – A Cross Sectional Study

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## ABSTRACT

**Background:** Variation in the position and of mental foramen is common and hence can cause complications during surgical procedures. Thus it is important to have knowledge of the probable location the mental foramen on the basis of age gender and symmetry of the mental triangle. **Methods:** This is a prospective study done on 100 digital panoramic radiographs of age group ranging from 18-60 years of both sex in data provided by dept. of dentistry & department of anatomy in government medical college and attached groups of hospital, sikar, Rajasthan. The different position of the image of the mental foramen was recorded. SPSS version 17.0 statistical software program were used to undertake the statistical analysis. **Results:** Our study showed that the maximum percentage of participants was (35%) seen in group 3, followed by 28% in group 2, 24% in group 1 and 13% in group 4. Oval shaped mental foramen as maximum percentage 74% (37 cases) in male and 94% (47 cases) in female. Chi-square test was highly significant ( $P < 0.0001^{***}$ ) in male and female. Maximal percentage of mental foramen (40% & 42.5% respectively) was seen between first and second premolar in panoramic view radiograph in male and female. **Conclusion:** We concluded that our study may provide the necessary data of mental foramen among population and may be useful for the surgeons, anesthetists, neurosurgeons and dentists to carry out procedures without complications.

**Keywords:** Mental Foramen, Gender, Panoramic radiograph, Shaped.

## INTRODUCTION

The mental foramen (MF) is a funnel-like opening in the lateral surface of the mandible at the terminus of the mental canal. The mental foramen has been reported to vary in position in different ethnic groups.<sup>[1]</sup> The mental foramen may be round or oval in shape, it may be absent, unilateral, bilateral and in some cases may be multiple on one or both sides of the mandible. Also in most cases of normal adult mandibles with teeth, the mental foramen is located halfway between the lower margins of the mandible and alveolar crest in a vertical line with the supraorbital notch; in 50% of cases it is located at the edge of the second premolar root; in 20-25% it is between the first and second premolar, and in 24%, it is behind the second premolar.<sup>[2]</sup>

The radiographic appearance of the mental foramen may result in a misdiagnosis of a radiolucent lesion

in the apical area of mandibular premolar teeth. Based on its radiographic appearance, the mental foramen has been classified by Yosue and Brooks (1989) into four types:

**Type 1:** mental canal is continuous with the mandibular canal.

**Type 2:** foramen is distinctly separated from the mandibular canal.

**Type 3:** diffuse with a distinct border of the foramen.

**Type 4:** unidentified type, in which the mental foramen cannot be identified on panoramic radiographs under ordinary exposure and viewing conditions.<sup>[3]</sup>

Panoramic radiography generates a two-dimensional (2D) image that lacks information in the bucco-lingual direction and magnification in both the vertical and horizontal directions. Computed tomography (CT) provides more precise visualization of the anatomical structures in the oral region. However, panoramic radiographs are more economical and easier to perform and interpret. The image quality of panoramic radiography can be increased using digital panoramic radiography. In particular, visualization of the mental foramina can be further enhanced by evaluating digital panoramic radiographs with software programs.<sup>[4]</sup>

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Variation in the position and of mental foramen is common and hence can cause complications during surgical procedures. The knowledge of its position also aids in the administration of local anaesthesia for surgical, endodontic as well as diagnostic procedures. A number of studies have shown difference in the position of the mental foramen according to the ethnic group studied. The literature shows studies conducted on Asians, Africans, and Caucasians.<sup>[5]</sup>

The gender differences were also accessed to comment on the reliability of panoramic radiographs for sex determination in terms of mental foramen position. Furthermore, the results were compared with those reported for other populations in the literature.<sup>[5]</sup>

Thus it is important to have knowledge of the probable location the mental foramen on the basis of age gender and symmetry of the mental triangle.<sup>[6]</sup>

## MATERIALS AND METHODS

This is a prospective study done on 100 digital panoramic radiographs of age group ranging from 18-60 years of both sex in data provided by dept. of dentistry & department of anatomy in government medical college and attached groups of hospital, sikar, rajasthan.

### Inclusion criteria:

1. Age group of 18-60 years.
2. All dentate patients especially with erupted premolars and first molars.
3. Radiographs free from radiolucent or radiopaque lesions in the lower arch and showing no exposure or processing artifacts.
4. Only true radiographic MF (uppermost one), nearest to mandibular canal will be included.

### Exclusion criteria:

1. Radiographs of patients with drifted teeth
2. Radiographs of patients with crowded and spaced lower teeth
3. Previous orthodontic treatment
4. Digital panoramic radiographs where the MF could not be identified were excluded.

The different position of the image of the mental foramen was recorded as follows:

**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 mesio-buccal root of first molar

**Position 6:** In line with the mesio-buccal root of first molar

### Statistical analysis:

SPSS version 17.0 statistical software program were used to undertake the statistical analysis. Frequency distributions and cross tabulation were obtained, and chi-square test were used to perform analysis of the mental foramina's anterior-posterior position, shape and symmetry according to patients' age and sex.

## RESULTS

**Table 1: Distribution of participants according to age group**

Age Group (Yrs)	Frequency	Percentage
Group 1 (18-28)	24	24%
Group 2 (29-39)	28	28%
Group 3 (40-50)	35	35%
Group 4 (51-60)	13	13%
Total	100	100%

**Table 2: Shows the comparison of shape of mental foramen in left side in male and female**

Shape	Male	Female	Chi-square test	P-value
Round	10(20%)	2 (4%)	27.85	P<0.0001***
Oval	37 (74%)	47(94%)		
Other	3(6%)	1(2%)		
Total	50 (100%)	50 (100%)		

**Table 3: Frequency of location of mental foramen by gender.**

Location	Male		Female		Chi-square test	P-value
	Frequency	%	Frequency	%		
1	0	0	0	0	2.352	>0.05
2	1	2%	0	0%		
3	20	40%	21	42%		
4	19	38%	18	36%		
5	10	20%	11	22%		
6	0	0	0	0		

Our study showed that the maximum percentage of participants was (35%) seen in group 3, followed by 28% in group 2, 24% in group 1 and 13% in group 4 [Table 1]. Oval shaped mental foramen as maximum percentage 74% (37 cases) in male and

94% (47 cases) in female, followed by round shape 20% (10 cases) in male and 4% (2 cases) in female. Chi-square test was highly significant (P<0.0001\*\*\*) in male and female [Table 2].

Maximal percentage of mental foramen (40% & 42.5% respectively) seen between first and second premolar in panoramic view radiograph in male and female, followed by 38% & 36% mental foramen situated in line with second premolar, 20% & 22% between the second premolar and mesio-buccal root of first molar respectively in male and female [Table 3].

## DISCUSSION

Mental foramen is a key factor in many of the surgical as well as clinical procedures in routine clinical practice.<sup>[7]</sup> Mental foramen represents the termination of the mental canal.<sup>[8]</sup> The mental nerve passes through the mental foramen, supplying sensory innervation to the lower lip, buccal vestibule, and gingiva mesial to the first mandibular molar.<sup>[9]</sup> The mental foramen has been reported to vary in position in different ethnic groups.<sup>[10]</sup> Knowing the site of the mental foramen allows for accurate delivery of local anesthesia of terminal incisive branches of the inferior alveolar nerve. The mental bundle can be traumatized during surgical procedures, such as periapical surgery, extraction of impacted teeth, enucleation of cyst or tumor, and so on, resulting in paresthesia or anesthesia in the area innervated by the nerve.<sup>[11]</sup> It also aids in interpreting anatomical landmarks in oral pathology and forensics.<sup>[12]</sup> Although it is often possible to identify the mental foramen radiographically, knowing the normal range of possible locations is essential. The location of the mental foramen has been studied in different populations.

P.S. Lgbigbi and S. Lebona (2005),<sup>[2]</sup> they found that majority of mental foramen are oval in shape. Another study done by Isurani Ilayperuma (2009),<sup>[13]</sup> shows a majority of cases, the mental foramen was oval in shape (59%) and its usual direction of opening was in a postero-superior direction (49.01%). Which was compatible with our results, oval shaped mental foramen as maximum percentage 74% (37 cases) in male and 94% (47 cases) in female.

Lumnije Kqiku, Andreas Weiglein, et al (2013),<sup>[14]</sup> found that majority of mental foramen was oval in shape and the most frequent radiographic appearance was the separated type. A conflict our results with Ukoha Ukoha Ukoha et al (2013),<sup>[15]</sup> found that Round shaped foramen was more prevalent (75.76%) than the oval shaped foramen (25.24%).

A present study showed that maximal percentage of mental foramen (40% & 42.5% respectively) seen between first and second premolar in panoramic view radiograph in male and female, followed by 38% & 36% mental foramen situated in line with second premolar, 20% & 22% between the second premolar and mesio-buccal root of first molar

respectively in male and female. A similar results found by various authors such as Kahraman Gungor, Mustafa Ozturket al (2006),<sup>[16]</sup> found 71.5%, Sina Haghanifar, Mehrak Rokouei (2009),<sup>[11]</sup> found 47.2% of patients, S.Rupesh et al (2011),<sup>[3]</sup> found that 47.6%. Sneha Ketan Gada, Suhasini J. Nagda (2014),<sup>[17]</sup> most common position was found to be between the two premolars (63% cases).

A conflict our results by Rahul Rai, Shailaza Shrestha, Sudha Jha (2014),<sup>[18]</sup> found that most common position was between the 2<sup>nd</sup> premolar and 1<sup>st</sup> molar on the right (P5 65%) and between 1<sup>st</sup> and 2<sup>nd</sup> premolars on the left side (P3 40%).

Saritha Maloth, Shrinivas TR, et al (2015) found that radiographically in 48.96% of cases, the mental foramen was located in line with the second premolar and was common in age group of 25- 35 years and in 40.83% was in between the first and second premolars. They concluded that the knowledge of the most common position of the mental foramen among Indian population may enable effective regional anesthesia during dental procedures.<sup>[19]</sup>

## CONCLUSION

The following study suggests that clinicians should carefully identify mental foramen thus minimizing complications during implant, orthognathic surgery and treatment of maxillofacial injuries. Hence, our study may provide the necessary data of mental foramen among population and may be useful for the surgeons, anesthetists, neurosurgeons and dentists to carry out procedures without complications.

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