

## Review Article

### Evaluation of Mental Foramen Location - A Review Article

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#### **ABSTRACT:**

The mental foramen is considered an important anatomical structure in the mandible. The importance come because it represents the anatomical orifice of inferior alveolar canal on both sides of the mandible. The neuro-vascular bundles exiting from the foramen have a significant role in the neurovascular supply to lower lip the skin of the chin and muscles, the related mucosa and gingiva next to the mandibular premolars. Therefore, the knowledge of the mental foramen location considers a very important for dentists to avoid damaging this vital structure during the dental practicing in this area, as in dental surgery, dental anesthesia and endodontic procedures. **The aim of the study:** The study to evaluate the location of the mental foramen to the mandibular premolars, based on the cone-beam tomographic and panoramic images. **Materials and Method:** The current study included the most previous published article for the years from 1997 till 2019, regarding the location of mental foramen in adults and elderly patients, regardless of the gender. These studies were based on either the cone-beam computed tomographic images or the panoramic radiographs for imaging the mental foramen. **Result:** According to the results got from these previously published articles, the statistical analyses showed that the first common location of mental foramen was under the apices of mandibular second premolar teeth in the rate of 49.99%, the second most second location of mental foramen was between the apices of the mandibular first and second premolar teeth in the rate of 42.30%. **Conclusion:** The mental foramen located frequently under the apices of mandibular second premolars and then between the apices of the mandibular first and second premolars.

**Keywords:** Mental foramen, Mandible, Mental nerve, Mental artery, Inferior alveolar canal.

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#### **INTRODUCTION:**

Mental foramen is a funnel shaped orifice of the mental canal existing on the bilateral side of the mandible. Philp the mental nerve is merging from the inferior alveolar canal on this orifice. The mental artery emerges together with the mental nerve, which is a division of the inferior alveolar artery.<sup>[1][2]</sup> These neurovascular bundle supply the gum next to the premolars, alveolar mucosa in addition to the skin of chin and lower lip. High precautions must be taken during dental surgery practice to avoid damaging of these vital structures by using the suitable imaging techniques.<sup>[3][4]</sup> Damaging of the mental nerve during the dental practice or due to other causes will lead to problems in sensation of the lower lip and neighboring

soft tissues and skin 5,6 Many anatomical variations in the size, shape and local of mental foramen.<sup>[7-9]</sup>

The most common location of mental foramen was either beneath the apices of mandibular second premolars.<sup>[10-12]</sup> Or between the apices of mandibular first and second premolars.<sup>[13]</sup> In addition, many variations regarding the location of mental foramen were registered.

Many conditions have a direct effect on the location of the mental foramen as tooth loss, gender, age, bone resorption and race.<sup>[14]</sup> The precise detection of the MF location still the most challenging for dentist planning to work on or near the mental foramen. The imaging techniques used to examine the MF location as “Periapical radiograph, Panoramic radiograph O.P.G,

Computed tomography (CT), Magnetic Resonance Imaging (MRI), Cone-Beam Computed Tomography(CBCT)".<sup>[15]</sup> Panoramic radiographs have limitation on the MF location, especially in the buccolingual dimension in addition to magnification in vertical and horizontal planes. CT exhibits good improvements in the visualization of anatomy and location of dental structures.<sup>[16]</sup> Nowadays, CBCT considered the most precise imaging technology that used to detect the accurate position of the mental foramen, in addition, the path of the nerve through the inferior alveolar canal.<sup>[17]</sup>

**MATERIALS AND METHODS:**

The current study included the most previous published articles regarding the location of mental foramen in adults and elderly patients, regardless of gender, which were conducted in different countries around the world for the years from 1997 to 2019, which were based on the cone-beam computed tomographic or panoramic images for imaging the mental foramen, in order to evaluate the location of the mental foramen to the apices of mandibular premolars. **Table 1.**



**Figure 1.** Panoramic radiographs (O.P.Gs) showing location of the mental foramen in the vertical line in relative to premolars apices; A = The mental foramen is located coronal to the apex; B = The mental foramen located at the apex; C = The mental foramen is located apical to the apex.<sup>[61][62]</sup>

**Table 1.** Mental foramen positions according the previous studies in different populations.

Study	Location of mental foramen	Population
Madiha Khalid et al. 2019. <sup>[39]</sup>	The first most common location was under the apices of mandibular first premolars. The second most common location was under the mandibular second premolars.	Pakistani
Ewa Z-P, et al 2019. <sup>[40]</sup>	The first most common location was under the apices of mandibular second premolars. The second most common location was in the apices plane of mandibular second premolars.	Polish
ALRahabi, M. & Zafar, M. 2018. <sup>[41]</sup>	Most commonly positioned in a plane with the long axis of the mandibular second premolar and to a lesser extent was in a plane with the long axis of mandibular first premolar.	Saudi
Bhagat J, et al. 2018. <sup>[42]</sup>	The most common location was under the apices of the mandibular second premolar in adults	Indian
H. Yeşilyurt, et al., 2008. <sup>[37]</sup>	The most common location was in a plane with the long axis of the mandibular second premolars.	Turkish
Halwani et al, 2017. <sup>[43]</sup>	The first most common location was between the mandibular first and second premolars and the second most common location was under the apices of mandibular second premolars.	Saudi
Pasquali et al 2017. <sup>[44]</sup>	The most common location was close to the apex of the mandibular second premolar.	Brazilian
J. Popović et al., 2017. <sup>[45]</sup>	The most common location was mesial and under the apices of the mandibular second premolars.	Serbian
Kabak, et al 2017. <sup>[46]</sup>	The most common location was in between the mandibular first and second premolars.	Belarusian
Al-Mahalawy H, 2017. <sup>[47]</sup>	The most common location was under the apices of mandibular second premolars and followed by the location between mandibular first and second premolar	Saudi
Srivastava 2017. <sup>[48]</sup>	The most common location was located at apices of mandibular second premolar.	Indian
Currie et al 2016. <sup>[49]</sup>	The most common location was between the first and second mandibular premolar teeth;	UK

Soheilifar et al 2016. <sup>[50]</sup>	The most horizontal level of mental foramen was on a plane with the mandibular second premolar teeth, followed by the location between the mandibular first and second premolar.	Iranian
Saito et al, 2015. <sup>[51]</sup>	Mostly located in the plane of the apices of the mandibular second premolars,	Brazilian
Babshet M, et al. 2015. <sup>[52]</sup>	The most common location was between the mandibular first and second premolars and followed by the location in the plane with the mandibular second premolars.	Indian
Zhang et al 2015. <sup>[53]</sup>	Most commonly positioned in a plane with the long axis of the mandibular second premolar.	Chinese
Sekerçi, et al 2013. <sup>[54]</sup>	The most common location was in a plane with the long axis of the mandibular second premolar, followed by that between the mandibular first and second premolars.	Turkish
S.A. Adejuwon, etal 2012. <sup>[55]</sup>	The most common location was in a plane of the apices of mandibular second premolar teeth.	Nigerian
Luay, et al 2010. <sup>[56]</sup>	The most commonly location was under the apex of the mandibular second premolar teeth.	Iraqi
Oliveria J E M, etal 2009. <sup>[57]</sup>	The most common location was between the mandibular first and second premolars and under the mandibular second premolar on the right side and it was frequently located between the mandibular first and second premolars on the left side.	Japanese
Ilayperuma I et al 2009. <sup>[24]</sup>	The most common location was in line with the long axis of the mandibular second premolar followed by the location between mandibular first and second premolars.	Sri Lankans
Taiseer AK, etal 2007. <sup>[58]</sup>	The mental foramen was seen most commonly under and between the mandibular premolars.	Jordanians
Fabian FM, 2007. <sup>[12]</sup>	The most common location was between under the apices of the mandibular second premolars and between the mandibular second premolar and mandibular first molar.	Tanzanians
Igbigbi PS and Lebona S. 2005. <sup>[14]</sup>	The vertical plane of mental foramen was mostly located approximately under the midway between the alveolar margin and the lower border of mandibular jaw.	Malawians
Neiva RF, et al 2004. <sup>[19]</sup>	The most common location was between mandibular first and second premolars.	Caucasians
Mbajiorgu EF, et al 1998. <sup>[59]</sup>	The most common location was under the mandibular second premolar on the right side and between mandibular second premolars and first molars on the left side.	Zimbabweans
Ikiz T and Erem, 1997. <sup>[60]</sup>	The most common location was between the mandibular first and second premolars on the right side, while it was in line with the mandibular second premolars on the left side.	Byzantiums

**RESULTS:**

The statistical analyses of the reviewed articles showed that the most common location of mental foramen was under the apex of mandibular second premolar in the rate of 49.99%, the most second most location of mental foramen was between the apices of the mandibular first and second premolars in the rate of 42.30%, followed by the location at the line of mandibular first premolar apices in the rate of 4.11%, the next location was between the mandibular second premolar and the mandibular first molar in the rate of 3.84%, and a very little ratio was slightly above the apices of mandibular second premolar.

**DISCUSSION**

Numerous studies have focused on the study of the mental foramen. These studies have varied according to their shape, dimensions, and location. Many

differences have been found have been found in this regard. Clinically, The anatomical location of the mental foramen is very important, so any dental procedure near this foramen must take into consideration the location of this foramen because any damage to the neurovascular bundle existing from the foramen may lead to temporary or permanent paralysis to the supplied region depending on the severity of the damage. Therefore, knowing the precise anatomical location of the foramen is a necessary procedure for such cases before starting any action near the mental foramen. For example, during the mental block anesthesia increased the possibility of hitting the vital structures in the mental foramen, as well during the root filling treatment of mandibular premolars, the danger of injury to mental nerve is very likely, especially in the people with the location of the foramen near or directly on the apices of the

mandibular premolars, mostly mandibular second premolars. In addition to that the dental implants in the mandibular premolars area have a very critical situation due to the location of mental foramen, the same consideration must be taken when the surgical flap is planning on or near the mental foramen. All these circumstances must undergo radio-graphic evaluation before taking any procedure in or near this foramen.

Different imaging technologies used to visualize the mental foramen as periapical radiography, panoramic radiography, computed tomography and cone-beam computed tomography. The last two technologies considered the most accurate imaging systems compared to the other technologies. Cone-beam computed tomography improve the visualization of the dental and maxillofacial structures, so it provides more precise image in these regions than computed tomography.

Studies of mental foramen had found wide variations of mental foramen regarding the age, gender and race.<sup>[18]</sup> For example, in the Caucasian population the mental foramen was found between the mandibular first and second premolar teeth.<sup>[7]</sup> While in the Mongoloids population was found close to the apices of the mandibular second premolar teeth.<sup>[19][20]</sup>

The current study reviewed most previous studies regarding the location of the mental foramen and it was mostly under the apices of mandibular second premolars (44.99%),

In most population of Korea, Iraq and India found that the most location of mental foramen was under the apices of the mandibular first and second premolars/ first molars in the rates of 62.5%, 60.1, 72.2%, respectively.<sup>[21][22][23]</sup> The location of mental foramen was also mostly identified in a line with the long axis of the mandibular second premolars in Sri Lankan,<sup>[24]</sup> Nigerian,<sup>[25]</sup> Saudi,<sup>[13]</sup> Kenyan,<sup>[26]</sup> Chinese.<sup>[27][28]</sup> **Figure 1.**

The most second most location of mental foramen in this review was between the apices of the mandibular first and second premolars (42.30%).

Many studies have reported that the most frequent location of the mental foramen between the mandibular premolar teeth, using panoramic radiographs,<sup>[29][30][31]</sup> and Cone-Beam computed tomography.<sup>[32][33]</sup> In addition, studies in Turkish and Asian population showed high rates of mental foramen location between the mandibular premolar teeth (71.50% and 63%), respectively.<sup>[34][31]</sup>

The high variation of mental foramen location in the stated studies also belongs to the racial differences in the populations. This is agrees with the Green's conclusion.<sup>[35]</sup> **Table 1.**

The variation in the location of mental foramen reported to be genetically as a result of the rise of

mandibular size along the growth duration.<sup>[36]</sup> Environmental factors as habits of eating or changing in the consistence of food.<sup>[37][38]</sup> and dystrophy of the muscles.<sup>[37]</sup> All these factors had reported to affect the position of mental foramen.

**CONCLUSION:** The mental foramen located frequently under the apices of mandibular second premolars and then between the apices of the mandibular first and second premolars.

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