

ASSESSMENT OF COURSE AND VISIBILITY OF MANDIBULAR CANAL AND POSITION OF MENTAL FORAMEN ON PANORAMIC RADIOGRAPHS.

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ABSTRACT

AIM : Aim of this study is to assess the course of mandibular canal and mental foramen.

INTRODUCTION :

Before undergoing any surgery on the posterior mandible, the mandibular canal is a crucial landmark that needs to be taken into account. The mental foramen (MF) is a bilateral orifice in the jaw through which matching arteries and veins, as well as the mental nerve and a branch of the inferior alveolar nerve, exit. **MATERIALS AND METHOD :**

About 40 Panoramic Images were taken for the study. Visual determination was done to check whether the mandibular canal was clearly visible, probably visible, or invisible, the visibility of this canal from the first to third molar region was assessed. It was checked with OPG and results were analyzed. **RESULTS :** Position of mental foramen it is mostly 33% found inferior to the premolar roots and another 33% immediately below the inferior second premolar.

Keywords : Mandibular canal, Mental foramen, Third molar, Panoramic images

INTRODUCTION :

The lower portion of the face is made up of the mandible, an asymmetrical bone with uneven edges. It is made up of a body and two rami that project from the back ends of the body [1]. Beginning with the mandibular foramen, the mandibular canal (MC) runs through the

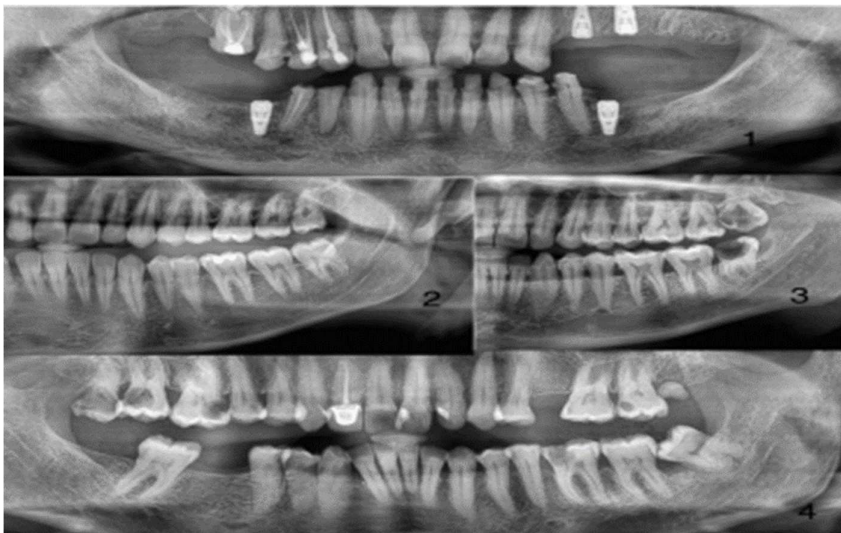
mandible's body and toward the median plane (1). The mandibular foramen is where the inferior alveolar vasculo nervous bundle travels(2). The MC can be seen in panoramic X-ray pictures as a dark radiolucent band bordered by multiple radio lines Another small canal emerges from the mandibular canal and terminates in the foramina (MF). The Mandibular canal is used as a point of reference during surgery (3).Before doing any surgery on the posterior jaw, it is vital to take into account the mandibular canal as a significant landmark(4). In order to avoid difficulties during any surgical treatments, preoperative radiological diagnosis can pinpoint the exact location of the mandibular canal(5). Numerous investigations have looked into the mandibular canal's path, and it has been discovered that the inferior alveolar nerve's intrabony course frequently exhibits anatomic differences(6,7). The mandibular canal might also show differently on radiographs. Even within the same person, the mandibular canal's visibility might vary greatly. Because it carries the segment of the mandibular nerve that innervates the inferior lip and teeth, the MC is particularly significant for dentists and other oral professionals(1,7). Certain procedures in this area call for extra caution since a lesion to the nearby blood vessels could result in excessive damage and a lesion to essential structures. Pain and changes in the patient's sensibility are possible side effects of inferior alveolar nerve lesions. When performing interventions on the mandible, it's crucial to understand the morphology and topography of the mandibular canal in order to protect the anatomical components that travel through it. Successful local anesthesia in the inferior alveolar nerve terminal branches, for example, depends on more than just local anatomical understanding of the area (8,9) An important anatomical marker is the mental foramen(10,11). Gaining local anesthetic and performing surgery both require knowledge of the anatomy of the mandible and any potential changes in the position, course, and type of emergence of its neurovascular bundle. Due to the requirement for precise preoperative surgical planning for the placement of mandibular implants, this issue has recently once again returned to the forefront of attention. The margin of the mental foramen should be 2-mm away from the implant, according to recommendations(12). The mental foramen is situated above and lateral to the mental tubercle on the anterolateral surface of the mandible(13). It induces a mild depressive state of mind. It allows the mental nerve and vessels to pass(14,15).According to (14,16,17)the radiopaque border is evident in some instances but is reasonably frequently disturbed in radiographic pictures.Only a few mandibles have a small layer of cortical bone, which is often constituted by a thin trabecular bone with several circumferentially distributed holes. Radiological studies have revealed a connection between the mandibular canal wall's existence and the quality of the alveolar bone. But it might also have a role in minimizing the risk of problems during surgeries including osteotomies and mandibular implant positioning, as well as paresthesia and hemorrhage incidence(6). Prior research has demonstrated that mandibular canal course and mental foramen position may differ amongst various groups(18,19) In this regard, few studies have been conducted on Chileans, and precise statistics are required for this community(20). Over the past three decades, panoramic radiographs have become more and more popular. This method has several benefits over intraoral radiography, including extensive coverage of both soft and hard tissues, continuity of

the visualized area, and speed at which the view is formed(21,22). It is possible to locate MF more precisely in both vertical and horizontal directions when the complete mandible can be seen. However, due to magnification, it appears a little bit bigger on radiographic images than on the periapical radiographs(20,23) However, the manufacturer's recommended magnification factor can be used to adjust the measurement to 100%. The inferior alveolar nerve branch and the mental nerve, as well as its related arteries and veins, emerge through the mental foramen (MF), a bilateral opening in the jaw. The nerve splits out from the MF and innervates the front teeth and nearby tissues. The lower jaw's soft tissues are nourished by blood vessels In anesthesia techniques like the incisive/mental nerve block, the position of the mental foramen is used as a reference point. In dentistry, the positioning of dental implants and other surgical procedures in this area, such as endodontic surgery, are primarily related to the significance of this structure(24,25). By using limited Panoramic images the current radiographic study sought to assess the course and visibility of the Mandibular canal and MF and mental foramen.

MATERIALS AND METHOD

About 100 Panoramic images were collected and the course, visibility and position of mandibular canal and mental foramen was analyzed. The panoramic images were collected from the database of our esteemed institution with ethical approval. The collected panoramic images were visually analyzed and grouped according to their types as discussed below (figure 1,2).

FIGURE 1 : COURSE AND VISIBILITY OF



MANDIBULAR CANAL

The course of the mandibular canal, as seen in the panoramic radiographs, was classified into Linear, elliptic, spoon shaped and turning curve. In figure 1 the following is seen as depicted 1- Linear curve, 2- Spoon Shaped curve, 3- Elliptic curve, 4 - Turning Curve.

By visually judging whether the mandibular canal was definitely visible, perhaps visible, or undetectable on panoramic radiographs, the visibility of the mandibular canal was assessed. It was evaluated in the first molar, second molar, and third molar regions of the mandible.

FIGURE 2 : POSITION OF MENTAL FORAMEN.

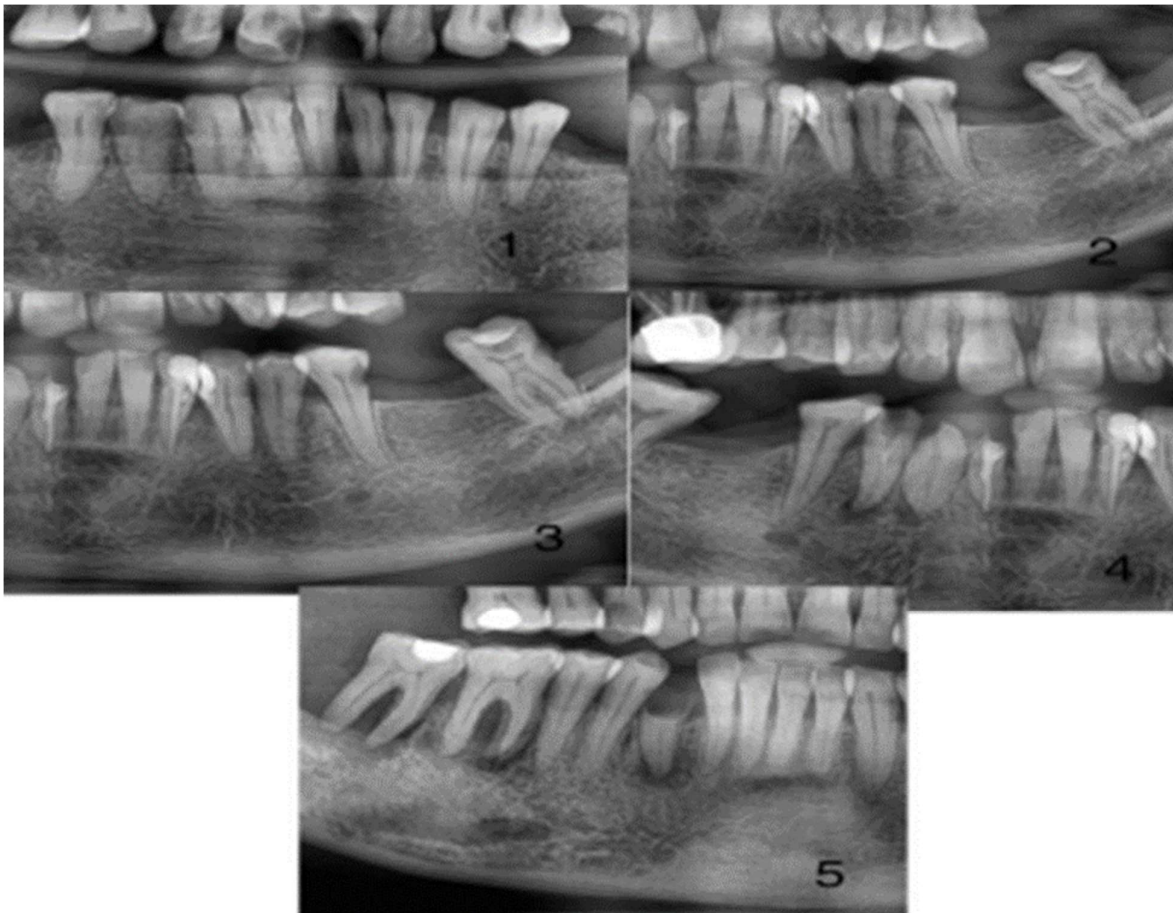


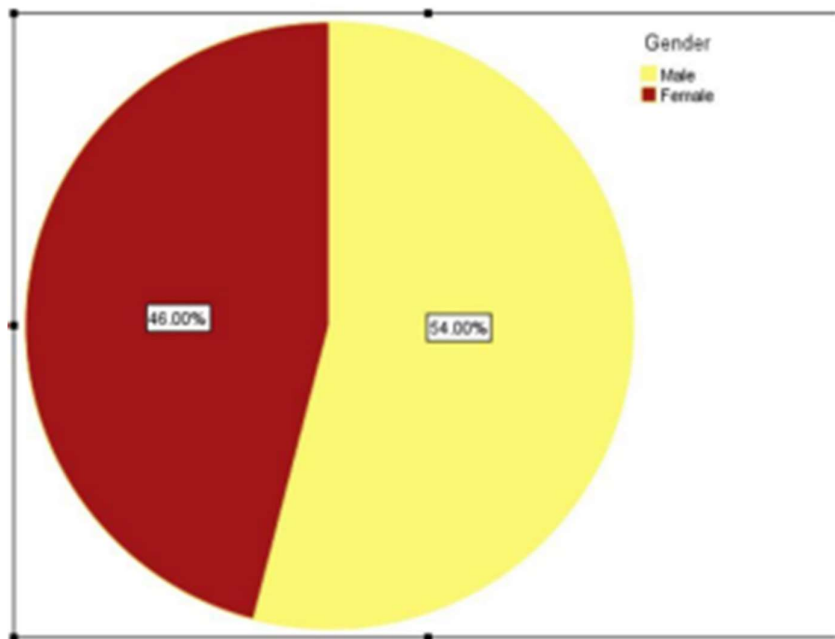
Figure 2, Shows position of mental foramen. There are about 5 types and they are Type 1- anterior to the inferior first premolar, Type 2- below the inferior first premolar, Type 3- Between inferior premolar roots, Type 4 - Immediately below the inferior second premolar apex. Type 5 : Posterior to the inferior second premolar.

Statistical Analysis :

Utilizing descriptive statistics (mean and SD), the data were analyzed. The Pearson correlation test was used to correlate all values, and Pearson's rating scale was used to categorize the outcomes. For qualitative factors, the Chi-squared test was applied. In order to conduct the statistical analysis, SPSS/PC + software, version 23.0, was used. The significance cutoff was established at =5%.

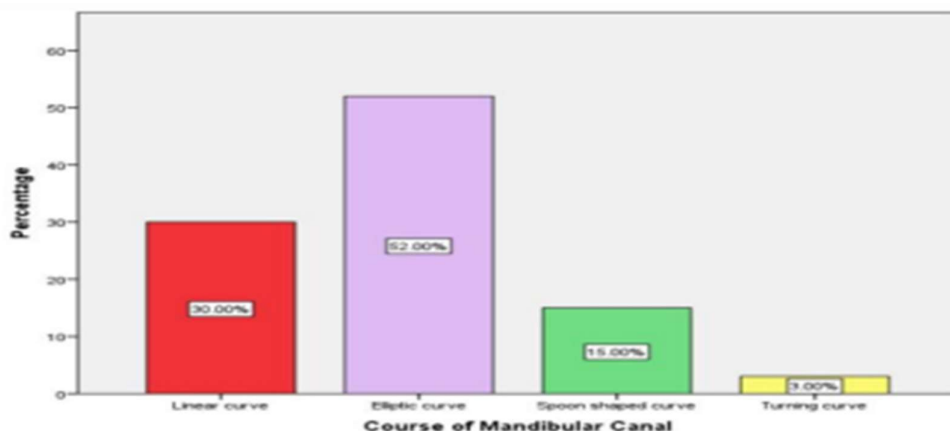
RESULTS:

Graph 1 : GENDER POPULATION



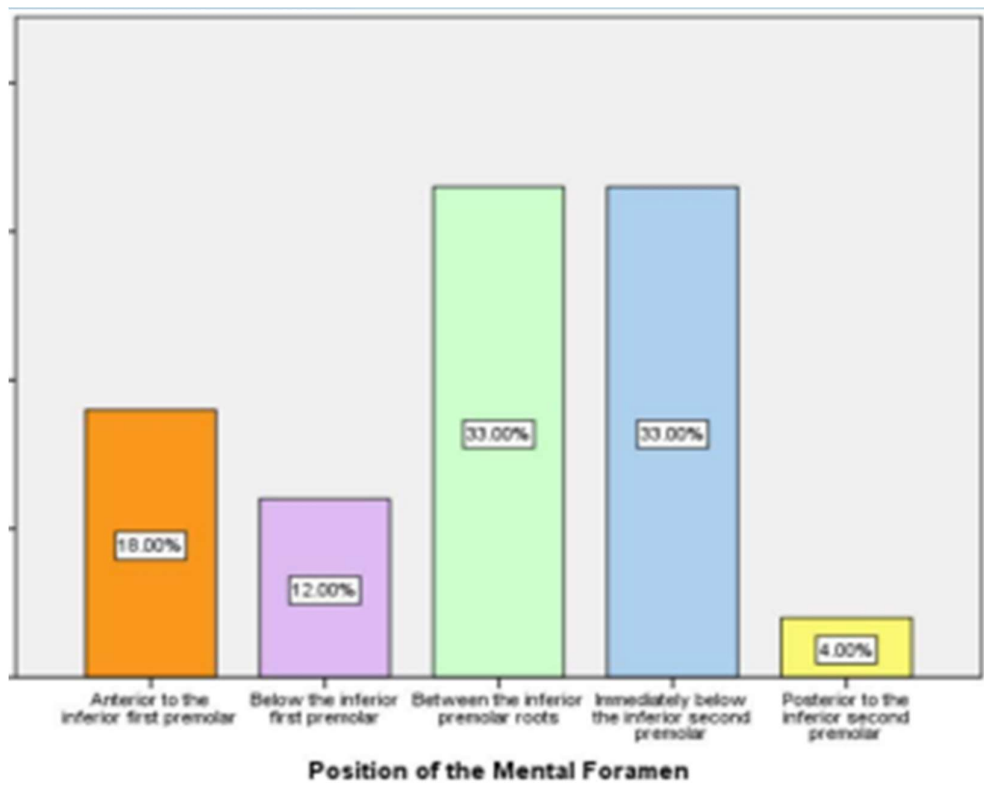
From graph 1, we can see that Among total population about 46% of them were females and 54% of them were males. Here red colour indicates female population and yellow colour depicts male population.

GRAPH 2 : COURSE AND VISIBILITY OF MANDIBULAR CANAL.



Graph 2, depicts that the panoramic images were mostly 52% with Elliptic curved type of mandibular canal and least 3% were with Turning curve type of mandibular canal. Whereas, spoon shaped curves were 15% and Linear curves were 30% of the total population. Here red colour denotes Linear curve, purple colour denotes Elliptic curve, green colour denotes spoon shaped curve and yellow colour denotes Turning curve.

GRAPH 3 : POSITION OF MENTAL FORAMEN



Graph 3 represents the position of the mental foramen. Here both type 3 and 4 are at the same rate. About 33% of the total populations had mental foramen between the inferior premolar roots and another 33% with immediately below the inferior second premolar. The least was about 4% with mental foramen located posterior to the inferior second premolar.

Here orange colour denotes mental foramen located anterior to the inferior first premolar, purple colour denotes mental foramen below the inferior first premolar, green colour indicates mental foramen situated immediately below the inferior second premolar and yellow colour shows mental foramen at posterior to the inferior second premolar.

All the values were taken into mean value and found that it was with a significant p value of about <0.05 using Chi square test in SPSS software.

DISCUSSION

A fairly common anatomical feature with significant clinical value is the MF. To prevent difficulties during clinical and surgical operations in this region, understanding its anatomy is crucial.(26) According to a study of the literature by Ceballos et al, MF was found in 95.2% of the PANs examined and was

more frequently seen on the left side than the right. Furthermore, according to these authors, the MF is situated distal to the inferior second premolar root in 10.98% of PANs, coincident with the inferior second premolar roots in 33.98% of instances, and is situated between inferior premolar apices in 42.22% of cases (27). In a study with Chileans, Fuentes et al. discovered that MF was situated on the right side of the second premolar's longitudinal axis.

In other groups, including those from Iraq, Asia, Korea and India (28,29), the same posture was discovered to be the most prevalent. The most frequent site in our analysis was just below the inferior second premolar apex, which also occurs in Moroccan, Spanish, and Indian populations. The MF position did not differ by gender, supporting other research (30,31). Less often occurring were the other three positions; in the current study, Type 1 frequency ranged from 5.7% to 0%, Type 2 frequency ranged from 11.4 to 0%, and Type 5 frequency ranged from 17.1% to 3.7%.

Similar findings were reported by Amorim et al, (32), with values typically falling under 10%, with Type 5 in F2 reaching a value of 13.16%. Almeida et al. (33) who discovered that Types 1 and 2 represented only 5% and 1% of cases, respectively, while no case of Type 5 was found, reported significantly lower percentages.

Depending on the subject and the location of the mandible, the mandibular canal's visibility may vary. 36.1% of panoramic radiographs of specimen cadavers, according to Klinge et al(15), did not show the mandibular canal. On panoramic pictures, the canal was completely undetectable in 32% of the sites in the molar region that Naitoh et al, (30,34) evaluated. In our investigation, panoramic radiographs of the first molar region showed that the mandibular canal was not undetectable in 22.7% of the studied sites. Additionally, according to Lindh et

al.(35) 25% of panoramic radiographs of specimen cadavers showed the mandibular canal to be plainly visible. In this study, 13.0% of the first molar sites that were evaluated had the mandibular canal clearly apparent on panoramic radiographs.(1) (2)

The bone density in the alveolar region was connected to how the mandibular canal wall appeared on panoramic pictures. Reduced integrity of the mandibular canal wall and decreased bone trabeculation may be indicated by reduced visibility of the mandibular canal wall on a panoramic radiograph. Our team has extensive knowledge and research experience that has translate into high quality publications(3–12)

CONCLUSION :

Within the limitations of the study we can conclude that the visibility and course of mandibular canals was highest with Elliptical curve and least with Turning curve. Whereas with Position of mental foramen it is mostly 33% found inferior to the premolar roots and another 33% immediately below the inferior second premolar. Hence Further, studies can be conducted with more sample size and modified radiographs like CBCT for better analysis.

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