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Study of mental foramen in patients coming to government dental hospital, Jamnagar

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Abstract---Introduction: The Mental foramen is one of two funnel-like openings located on the antero- lateral aspect of the body of the mandible. There are variations in it's anatomical position in different individuals of different populations. Such variations can cause difficulty in diagnosis of peri-apical lesions. It may result in failure of regional anaesthesia during clinical and surgical procedures required to be administered in the mandibular and mental region. Aims And Objectives: This study was performed to determine the position and bilateral positional symmetry of mental foramen on a digital orthopantomogram (OPG) of the population visiting Government Dental Hospital, Jamnagar. The objective was to document the frequency of location of mental foramen in relation with several teeth in close possible proximity to the mental foramen on digital panoramic radiographs. Materials And Methods: The study was conducted in the Department of Oral Medicine and Radiology, Government Dental College and Hospital, Jamnagar. Radiographic study of mental foramen of 1270 participants was carried out by analysing their digital orthopantomographs. Mental foramina were analysed with respect to their positions and bilateral symmetry. Results: From the conducted study, it was found that the most common position of mental foramen is located below the second premolar (63.11% of the total patients). It was followed by it's presence between the two premolars (24.13% of the total population). The mental foramen was found symmetrical in 1111 patients (87.48%) and asymmetrical in 159 patients (12.52%). Conclusion: The following study suggests that the most common position of the mental foramen was below the second premolar followed by between the two premolars in both the males and the females. It was found to be symmetrical in 87.48% of the population and asymmetrical in 12.52%.

Keywords---mental foramen, orthopantomogram, mandibular premolar, Jamnagar.

Introduction

The knowledge of accurate location of the mental foramen is most important for surgical as well as clinical procedures and diagnosis in the region around the mental foramina.^[1] Frequent failure during local anesthetic injections and different operative procedures may occur due to absence of knowledge about the accurate position of the mental foramen.^[2] The knowledge of the position of mental foramen is also important for endodontic procedures involving the premolars, treatments of fractures involving parasymphyseal region of the mandible, fabrication of complete dentures of mandible, and mandibular implant placement^{[3][4][5]}. Panoramic X-ray technology is commonly accessible and is used in daily clinical routine to assess mandibular vital structures bilaterally.^[6] Orthopantomography allows the visualization of right and left sides of craniofacial structures by producing an accurate, predictable image of all the teeth and related structures in the shortest possible time, with the least amount of radiation to the patient and to the operator.^[7] There are no absolute anatomical landmarks for reference and the foramen cannot be clinically visualized or palpated. Therefore, the reported anatomical position of the mental foramen has been variable, with the most common location being below the apex of the second premolar or between the apices of first and second premolars. The position of the mental foramen varies among different ethnic groups and races. Variations ranging from difference in the position and shape to the presence of accessory foramen to even complete absence in some patients have been reported.^[8]

Materials and Methods

A total of 1270 patients of both the genders, aged between 18-55 years were observed and their OPGs were analyzed in the present study. This study was conducted in the Department of Oral Medicine and Radiology, Government Dental College and Hospital, Jamnagar. All the subjects were briefed about the study and an informed consent was taken. The study was conducted over a period of 10 months.

Choice of OPGs to be considered for this study was according to the inclusion criteria. The position of the mental foramen in all the OPGs were recorded according to the criteria given by Wei Cheong Ngeow and Yusof Yuzawati. These criteria are:

- 1) Position 1: Mental foramen situated anterior to the first premolar
- 2) Position 2: Mental foramen in line with the first premolar
- 3) Position 3: Mental foramen between the first and second premolars
- 4) Position 4: Mental foramen in line with the second premolar
- 5) Position 5: Mental foramen between the second premolar and first molar
- 6) Position 6: Mental foramen in line with the first molar

Exclusion criteria which were considered for the study are as given:

- Mental foramen which cannot be visualized bilaterally on an OPG
- Absence of one or more teeth between and including the first mandibular molars on right and left side
- OPGs having possible periapical radiolucencies due to caries and teeth having been treated with root canal treatment OR any radiolucency in the region of the mental foramen
- Patients being treated orthodontically

Parameters which were followed while recording the OPGs are as given:

- 1) The Frankfort horizontal plane was parallel to the floor
- 2) The medial sagittal plane bisected the face into two equal halves
- 3) The canine plane passed through the long axis of the canine
- 4) All the OPGs were recorded and analyzed by the same radiologist, and the standardized protocols for patient positioning and exposure parameters settings were exercised throughout the study Radiological Assessment: OPG model CS 8100 Family Carestream digital panoramic system was utilized for the radiological assessment of the patients (Tube potential: 60-90 kv, Tube Current: 2-15 mA, Total Filtration: >2.5mm, time: 10.5s). The magnification factor for the region from the posterior border of ramus to canine (as reported by the manufacturer) is 1.25.

All the radiographs were assessed digitally using CS IMAGING SCANNER software tool without any alteration in order to facilitate the visibility. Blinding during the assessment was confirmed. Position of the mental foramen were recorded such that it is present in line with the longitudinal axis of the tooth. A line was drawn parallel to the long axis of the teeth, where the mental foramen was either too large or was present between those two teeth, using the same software, to determine its position.

Results

In this study, mental foramina of 1270 patients were observed and studied from their OPGs. Out of 1270 patients, 692 were males and 578 were females. Hence, a total of 2540 mental foramina were observed for their positions and bilateral symmetry. The most common position of mental foramen found in both males as well as females was in line with the second premolar i.e. Position 4 for left side (63.46%) followed by the right side (62.76%) (Graph 1, Table 1). This was followed by the Position 3 i.e. between first and second premolars on the left side (24.49%) and right side (23.78%). In both males as well as females, the most common position of mental foramina were found in line with the second premolar i.e. Position 4 followed by position 3 (Graph 2, Table 1). A total of 1603 out of 2540 mental foramina were found in Position 4 and 613 out of 2540 mental foramina were found in position 3. Only 19 mental foramina were found in Position 1 and 26 in Position 6.

Positional bilateral symmetry of mental foramina was observed in 1111 (87.48%) patients and it was found to be asymmetrical in 159 (12.52%) patients (Table 2,

Pie Chart 1). The most common position for symmetrically placed mental foramina was found to be in position 4(61.42%). It was followed by position 3(17.40%). For all the asymmetrically placed mental foramina, the most common position was found for position 3(6.73%) followed by the position 5(2.28%) (Table 3, Pie Chart 2)

Discussion

The mental foramen has been reported to vary considerably in different ethnic groups.[9] Mental foramen has been reported to be usually located between the premolars in some studies.[10,11] Although, there are several studies where mental foramen was reported to be lying in close proximity of the apex of and/or in line with the second premolar.[12] The study conducted here showed that the most common position of mental foramen is in line with second premolar (position 4) for the left side (n=806, 63.46%) and right side (n=797, 62.76%). This was followed by the position between first and second premolar on the left side (n=311, 24.49%).

On the right side, the second most common position was between the first and second premolar in position 3 (n=302, 23.78%) followed by position 5 [Right side(n=105, 8.27%), Left side(n=93, 7.32%)]. This was followed by position 2[Right side(n=44, 3.46%%), Left side(n=37, 2.91%%)], position 6[Right side(n=13, 1.02%%), Left side(n=13, 1.02%%)] and position 1[Right side(n=09, 0.71%%), Left side(n=10, 0.79%)]. Similar results were observed in the studies conducted in Malay population by Ngeow et al.,[2] Tanzanian adult black males[13], Sankar et al.,[12] Ukoha et al.,[14] and Gangotri et al.[15] This study was carried out in 1270 patients, however, larger sample size should be considered in further to evaluate the accurate position of mental foramen.

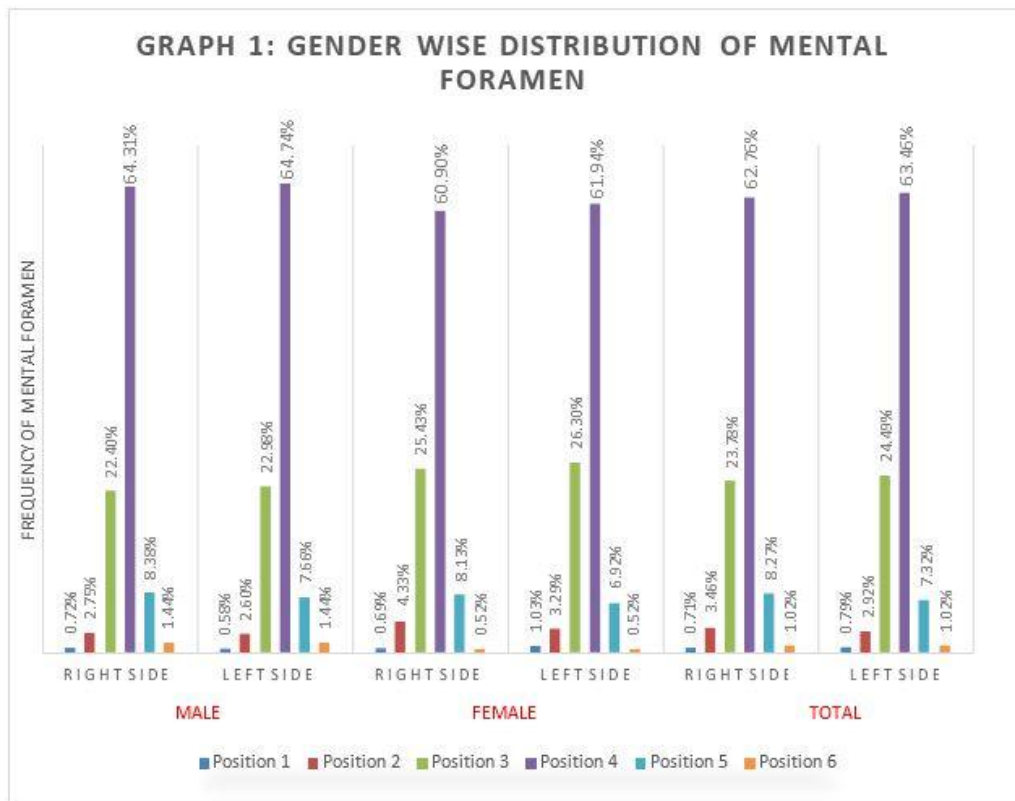


Table 1: Gender Wise Distribution Of Mental Foramen

POSITION	MALE		FEMALE		TOTAL	
	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT
1	05	04	04	06	09	10
2	19	18	25	19	44	37
3	155	159	147	152	302	311
4	445	448	352	358	797	806
5	58	53	47	40	105	93
6	10	10	03	03	13	13
Total	692	692	578	578	1270	1270

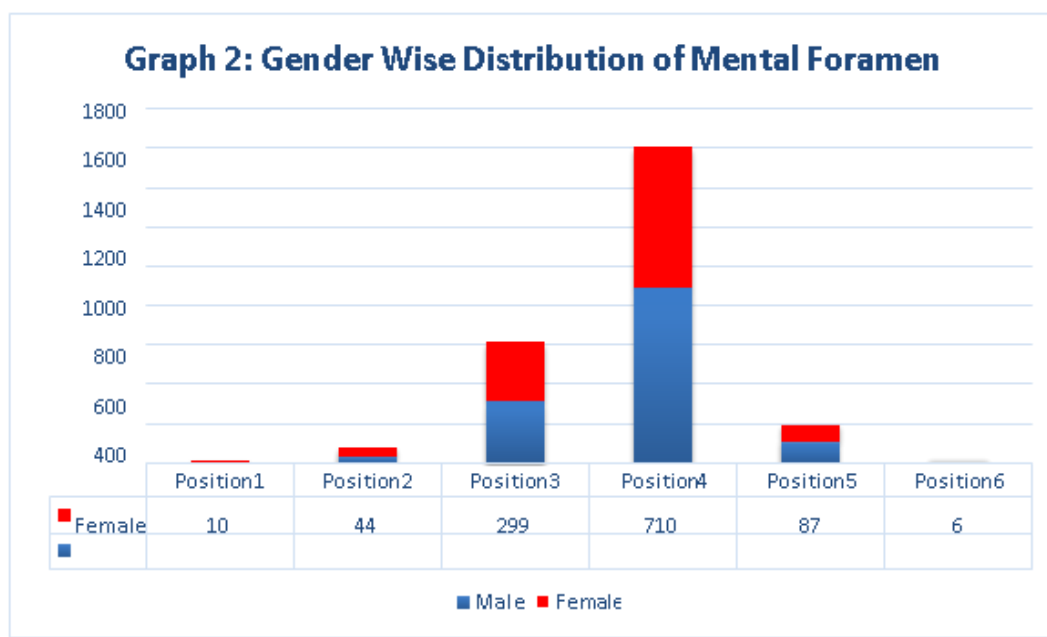


Table 2: Frequency And Percentage Of Symmetrical MentalForamen

LOCATION	FREQUENCY	PERCENTAGE
1	007	0.55%
2	024	1.89%
3	221	17.40%
4	780	61.42%
5	070	5.51%
6	009	0.71%
Total	1111	87.48%

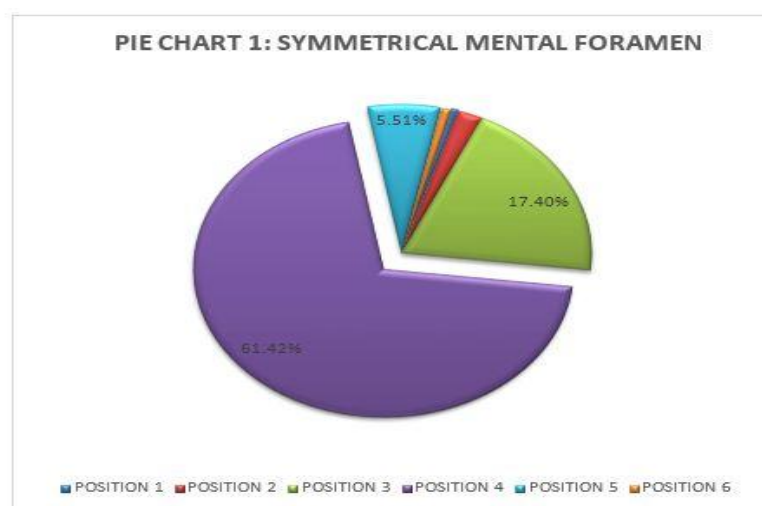
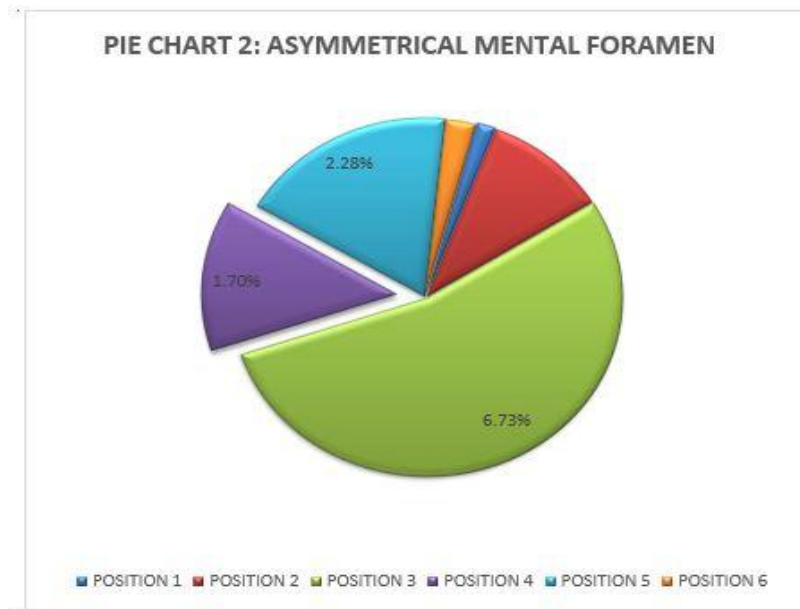


Table 3: Frequency And Percentage Of Asymmetrical MentalForamen

LOCATION	FREQUENCY		TOTAL	PERCENTAGE
	RIGHT	LEFT		
1	02	03	05	0.20%
2	20	13	33	1.30%
3	81	90	171	6.73%
4	17	26	43	1.70%
5	35	23	58	2.28%
6	04	04	08	0.31%
Total	159	159	318	12.52%



Conclusion

This study was conducted to analyze the position of the mental foramen radiographically, for clinical, diagnostic as well as surgical procedures, so as to prevent any damage to the potential nerves exiting through it. In this study, the most common position of the mental foramen in the given population was found to be below the second premolar (position 4). It was followed by the position between the premolars (position 3) in both males as well as females. This study suggests that the mental foramen should be carefully identified by the clinicians to minimize the complications in the same region during regional nerve anesthesia, dental implant surgeries, orthognathic surgeries and treatment of maxillofacial injuries.

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