



ORIGINAL RESEARCH ARTICLE

RADIOGRAPHIC STUDY OF MENTAL FORAMEN IN CHITWAN POPULATION

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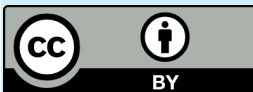
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ABSTRACT

Background: Knowledge about the type & position of mental foramen is very much important landmark for dentists to perform any surgical procedure in the vicinity of mental foramen. The purpose of this study was to determine the most frequently occurring type & position of the mental foramen in Chitwan population using digital Panoramic Radiograph.

Methods: This cross-sectional retrospective study was conducted on 500 (250 Male & 250 Female) digital panoramic radiograph which were collected from the department of Oral Medicine & Radiology. The type & position of Mental Foramen was analysed with Dicom viewer. The data obtained was statistically analyzed by with descriptive and inferential statistics using SPSS Version 20.

Result: The most common type of mental foramen was Type 3 (diffuse with a distinct border of the foramen) & the test showed significant difference by gender. The most common position of mental foramen was position 4 (in line with second premolar) followed by position 3 (Between the first & second premolar) with no significant difference with gender with p-value <0.05.

Conclusions: This study shows that the most frequent appearance of mental foramen lies in the line of second premolar. So this finding is used as a guide line in Chitwan population to perform various type of dental surgical procedure safely in mental foramen region but the accurate radiographic identification of mental foramen is paramount.

INTRODUCTION

The mental foramen is the terminus of the mental canal & situated inside the buccal cortical plate of the mandible. The size of the foramen is 4.6mm horizontal & 3.4mm vertically on the lateral surface of the mandible.¹ Mental Nerve emerges from the mental foramen & innervates the soft tissues of the chin, lower lip & gingiva on the each side of mandible.²

The location of the mental foramen is great importance for several procedures in the field of dentistry like administration of local anaesthesia for surgical, operative or diagnostic purposes, implant placement, extraction procedure & several other surgical procedures in the mental foramen region of mandible.³ Anatomically, mental foramen is present on each side of mandible & situated in the anterolateral aspect of the body part of the mandible.⁴ The position of mental foramen is very much important for the several clinical procedures such as giving local anaesthesia, fracture management in parasymphysis of mandible, orthognathic surgery, osteotomies for implant placement, complete denture for mandible.⁵ Radiographically mental foramen appear as a radiolucent area in lower premolar region & sometimes between the apex of a premolar.^{6,7}

The visualization of mental foramen in intraoral radiograph is difficult due to its position below the edge of the film. The proper placement of film inside the patient mouth during radiographic examination is difficult because of several factors such as limited mouth opening, mandibular tori, a shallow floor of mouth & malaligned teeth. Most of the time mental foramen cannot be captured in periapical radiograph due to its oblique direction in the mesiodistal & inferiosuperiorplanes.⁸

The accurate identification of the mental foramen is important for proper local anaesthesia & surgical procedure in the vicinity of mental foramen without any complications. Hence the main purpose of this study was to determine the type, position & symmetry of mental foramen & its correlation with age & sex in Chitwan population using digital panoramic radiographs.

METHODS

A retrospective study was conducted using 500 OPG (250 Male, 250 Female) of patients with age 15-50 years who were visited to the Oral medicine & radiology department, School of Dental Sciences, Chitwan Medical College during the period of February 2017 to February 2019 within age of 15-50 years. The research protocol was approved by the Institution Review

Committee (IRC) (Ref:CMC-IRC/F/075/076-118) at Chitwan Medical College, Bharatpur, Nepal.

All OPG were taken by Ortholix OPG (GENDEX, USA). All of the OPG were exposed at tube potential: 66Kv, tube current : 15mA ,time 17.6s with the magnification factors 1.2 & 1.25 respectively for the posterior border of ramus to canine as reported by the manufacture. The panoramic radiographs were analysed by the same observer to avoid intraobserver variability. All panoramic radiographs were analysed digitally with the help of Dicom Viewer for better localization & visibility of mental foramen. The type & position of mental foramen was evaluated on the basis of criteria given by Yosue & Brooks ,Wei Cheong & Yusof Yuzawati respectively. They were stated as below.

According to Yosue and Brooks⁹

Type I: Mental canal is continuous with the mandibular canal.

Type II: The foramen is distinctly separated from the mandibular canal.

Type III: Diffuse with a distinct border of the foramen.

Type IV: "Unidentified group."

The position of the image of the mental foramen was recorded as follows¹⁰

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.

The radiographs were chosen according to the following inclusion & exclusion criteria Inclusion Criteria. The inclusion criteria are all mandibular teeth between right first molar & left first molar present ,mental foramen was clearly visible on both side & all permanent set of teeth are fully erupted. The exclusion criteria are patient age below 15 years,missing first molars,any pathology, fracture, supernumerary teeth or impacted teeth& images with poor resolution or artifact.

RESULTS

A total 500 Digital Panoramic Radiographs were evaluated for the determination of the type ,position & symmetry of mental foramen among which 250 were males (50%) & 250 were females (50%).All the data were recorded & studied by performing Chi –Square test.

The most common type of mental foramen was diffuse with a distinct border of the foramen (Type 3) for left side (n=152,32.2%) and on the right side (n=147,29.4%as a

whole ,followed by unidentified group (Type 4) for left side (n=145,29%) and mental canal continuous with mandibular canal (Type 1) for the right side (n=130,26%) (Table1and 2).In male the most common type of mental foramen was Type 3(n=156,31.2%) followed by Type2,Type 4 & Type 1. In female the most common type of mental foramen was Type 3(n=152,30.4%) followed by Type 4,Type 1 &Type 2 (Table 1 and 2).

Table 1: Distribution of Mental Foramen Type in Male

Type	Right	Left	Total	p-value
Type 1	60(24%)	34 (13.6%)	94(18.8%)	0.012019
Type 2	64(25.6%)	65 (26%)	129(25.8%)	
Type 3	76(30.4%)	80(32%)	156(31.2%)	
Type 4	50(20%)	71(28.4%)	121(24.2%)	
Total	250(100%)	250(100%)	500(100%)	

Table 2: Distribution of Mental Foramen Type in Female

Type	Right	Left	Total	p-value
Type 1	70(28%)	43(17.2%)	113(22.6%)	0.016045
Type 2	55(22%)	52(20.8%)	107(21.4%)	
Type 3	71(28.4%)	81(32.4%)	152(30.4%)	
Type 4	54(21.6%)	74(29.6%)	128(25.6%)	
Total	250(100%)	250(100%)	500(100%)	

The Type of mental foramen was symmetrical in 225 (90%) male & 218 (87.20%) females.. The result was not significant at $p < 0.05$ (Table 3 and Figure 1).

Table 3: Gender wise Distribution of symmetry of Mental Foramen Position

Sex	Symmetrical	Asymmetrical	Total	p-value
Male	225(90%)	25(10%)	250	0.3248
Female	218(87.20%)	32(12.80%)	250	
Total	443	57	500	

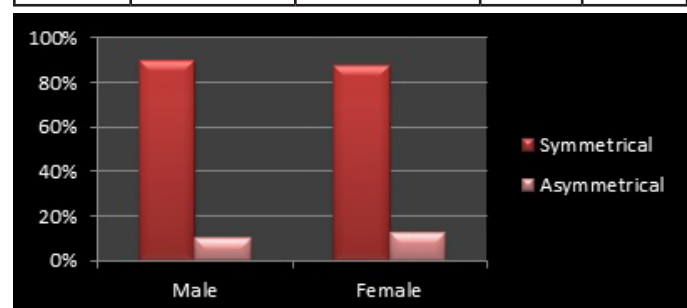


Figure 1: Gender wise distribution of symmetry of Type of Mental Foramen

The most frequent location of mental foramen was in the line with second premolar, position 4 for both right side (n=254,50.8%) & left side (n=221,44.2%).The second most common location was between first and second premolar,position 3 in left

side (n=154,30.8%) & situated anterior to the first premolar ,Position 1 in right side (n=84,16.8%) (Table 4 and 5). No case was noted in position 6 in both side of the mandible in total. In male the most common position of mental foramen was position 4 (n=241,48.2%) followed by position 3,1,5 and position 2 respectively. But in female the most common position of mental foramen was position 4 (n=234,46.8%) followed by position 3,1, 5 & position 2 same sequence as male (Table 4 and 5).

Table 4: Distribution of Mental Foramen position in Male

Position	Right	Left	Totals	p-value
P1	40(16%)	21(8.4%)	61(12.2%)	< 0.00001
P2	27(10.8%)	9(3.6%)	36(7.2%)	
P3	29(11.6%)	82(32.8%)	111(22.2%)	
P4	131(52.4%)	110(44%)	241(48.2%)	
P5	23(9.2%)	28(11.2%)	51(10.2%)	
Total	250(100%)	250(100%)	500(100%)	

Table 5: Distribution of Mental Foramen position in Female

Position	Right	Left	Totals	p-value
P1	44(17.6%)	23(9.2%)	67(13.4%)	< 0.00001
P2	27(10.8%)	11(4.4%)	38(7.6%)	
P3	35(14%)	72(28.8%)	107(21.4%)	
P4	123(49.2%)	111(44.4%)	234(46.8%)	
P5	21(8.4%)	33(13.2%)	54(10.8%)	
Total	250(100%)	250(100%)	500(100%)	

The mental foramen location was symmetrical in 206(82.4%) male and 195(78%) female. The result was not significant at p < 0.05 (Table 6 and Figure 2).

Table 6: Gender wise Distribution of symmetry of Mental Foramen Position

Sex	Symmetrical	Asymmetrical	Total	p-value
Male	206(82.4%)	44(17.6%)	250	0.217
Female	195(78%)	55(22%)	250	
Total	401	99	500	

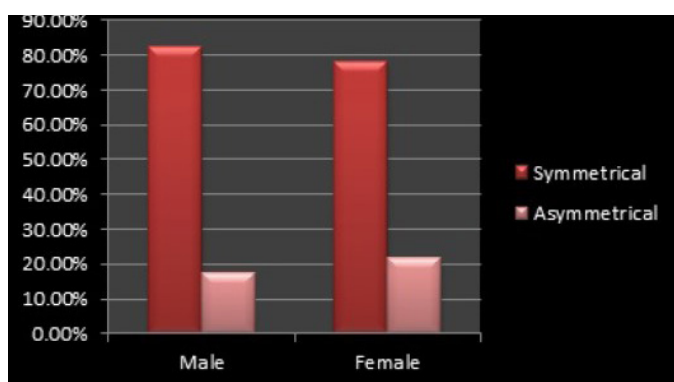


Figure 2: Gender wise distribution of symmetry of Position of Mental Foramen

DISCUSSION

Radiography is one of the non-invasive methods which are widely used in the field of dentistry for diagnosis & treatment planning of various types of surgical procedure in mandible. An OPG (Orthopantomogram) is most common imaging tool used for presurgical screening, diagnosis and selecting the best possible surgical approach.¹¹

In this study OPG were evaluated from the patients who had completed their growth as studies have showed that the location of mental foramen could change during the development of the jaws bone.^{12,13}

Orthopantomogram has gained popularity in the last three decades over intraoral radiograph to view mental foramen because the entire mandible can be viewed .It gives the more accurate location of the mental foramen in horizontal & vertical dimensions.⁸The OPG mode is most commonly used diagnostic means in implant dentistry.¹⁴

In this study we used Orthopantomogram instead of intraoral radiograph because of two reasons first opg reveals whole mandibular continuity in a single image, second it also overcomes the drawbacks of intraoral radiograph as stated by Fisher et al.^{7,15}

Youse et al conducted a study on 297 patients & concluded the most frequent appearance Type 2- The foramen is distinctly separated from the mandibular canal (24%), followed by Type 3 –Diffuse with a distinct border of the foramen(24%), Type 1 – mental canal continuous with the mandibular canal(21%), Type 4-unidentified(12%) where as in this study Type 3 was most common type followed by Type 2, Type 4, & Type 1 respectively in male & in female also the commonest appearance was Type 3.¹ Our results showed that the most common position of mental foramen is position 4 that is mental foramen in line with second premolar which is similar to the the previous study conducted by Ngeow et al.,¹⁰ Sankar et al.,¹⁵ Ukoha et al.,¹⁶ and Gangotri et al.¹⁷ But the several previous studies showed the the most common position of mental foramen belongs to the position 3(mental foramen lies between the first & second premolar) which is similar to our study.

The studies which were performed in various ethnic & racial groups like Chinese, Nigerians & Asian Indians; their results are similar to our study.^{16,18,19} Our results are also similar to the previous studies which were conducted on dry human skull by Kandel.M et al & Badhiraja V et al.^{19,20}

In conclusion the type & position on mental foramen varies in different population, but our study showed that the type & position of mental foramen is not gender dependent .In majority of population shows bilaterally symmetry type & Position which is in agreement with previous studies.

The first limitation of the study was the study population, which was included is smaller in size & conducted in the only Chitwan district of Nepal so it fails short of representing the whole

sample of different regions of Nepal. The second limitation of the study is the inherent magnification and distortion in Orthopantomogram could not be controlled.

CONCLUSION

Determining the variations of type & position of mental foramen is important for isolation of mental nerves & vessels when administering local anesthesia & performing various types of dental surgical procedure. So it is very important to know normal range of possible type & position of Mental foramen. The most frequent appearance of mental foramen type was type 3 which showed variations from previous studies. But the position of mental foramen results of our study supports the several previous studies which clearly indicates that it has positional variations in different population groups. But the accurate radiographic identification of mental foramen

is paramount to perform any dental surgical procedure in the vicinity of mental foramen.

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CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

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