



## Three-Rooted Mandibular First Molars in a Saudi Arabian Population: A CBCT Study

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### Abstract

**Objective:** To know the prevalence three-rooted mandibular first molars in a Saudi Arabian population by using CBCT. **Material and Methods:** A total of 428 CBCT scans in the database of the College of Dentistry, Jouf University, Kingdom of Saudi Arabia were analyzed. All well-developed permanent mandibular first molars were analyzed for the presence of extra root in three dimensions and the reconstructed volumetric images by two qualified and experienced observers. The total incidence, distribution and comparison regarding gender, bilateral and unilateral appearance, and the side of occurrences of these permanent three-rooted mandibular first molars were analyzed by the Chi-square test. The level of significance was set at 5%. **Results:** The CBCT scans of 14 subjects had three rooted mandibular first molars with a prevalence of 3.27%. The prevalence in males and females was 2.96% respectively, with no significant differences between genders ( $p=0.865$ ). The frequency of bilateral three-rooted mandibular first molars was 1.16%, with unilateral frequencies of 1.40% and 0.70% on the right and left sides, respectively. No significant relationship between sides ( $p=0.981$ ) and the bilateral prevalence of three-rooted mandibular first molars ( $p=0.668$ ) was observed. **Conclusion:** Dental practitioners must be aware of the fact that though it is rare, an extra or third root can be present in mandibular first molars and CBCT can aid in accurate diagnosis of the presence of third root.

**Keywords:** Molar; Tooth Root; Cone-Beam Computed Tomography.

## Introduction

One of the main reasons for failure of root canal treatment is lack of understanding the anatomy of a tooth. The awareness and understanding of mandibular molar morphological variations is very essential for the dental practitioner to achieve the successful endodontic therapy [1].

Various anomalies affecting the hard tissue including the teeth are frequently in the encountered in routine dental practice [2]. The permanent mandibular first molar might exhibit variations in the number number, location of roots and root canals. Mandibular molars commonly have two roots, however, the existence of an extra or third root is a significant anatomic variant and this extra root in permanent mandibular molars can be present on the lingual side, which is called as radix entomolaris or on the facial aspect which is termed as radix paramolaris [3].

Previously, changes in the normal anatomy of roots in the mandibular molar may be recognized by careful radiographic interpretation. The precise diagnosis of the third root is necessary to overcome any complications or missing of canal during root canal therapy. Interpretation of specific characteristics like non distinct outline of the distal or mesial root contour or the root canal can hint the existence of a third root [4].

Conventional radiographic imaging methodologies are not considered as accurate in identifying the root morphology because of a resultant two-dimensional image and overlapping [5]. Cone-beam computed tomography (CBCT) is latest imaging modality, which is now widely employed for evaluating the number of roots and root canals in three dimensions and without superimposition [6-9].

The prevalence of three rooted mandibular first molars is reported to vary among different ethnic groups and in different races and population and so are significant in recognizing racial origins of the populations [3]. Limited studies has reported previously about the prevalence of three-rooted mandibular first molars in Saudi Arabian Population [10,11]. The present study is carried out to know the prevalence three-rooted mandibular first molars in a Saudi Arabian population by using CBCT.

## Material and Methods

### Study Design and Data Collection

This retrospective observational study analyzed 428 CBCT scans in the database of the College of Dentistry, Jouf University, Kingdom of Saudi Arabia. All the CBCT scans were taken for various needs of the patients. The CBCT unit used in this study was Scanora 3D (Soredex, Tuusula, Finland) with 6 mA and 89 kVp and the evaluation of the scans were carried out with the dedicated software (NewTom 3G: NNT, QR SRL; Scanora 3D: OnDemand®, Cypermed Inc., Irvine, CA).

The images were optimized for better interpretation by adjusting contrast and brightness with the aid of processing tool. All well-developed permanent mandibular first molars were analyzed for the presence of extra root in three dimensions and the reconstructed volumetric images by two qualified and experienced maxillofacial radiologist. All the scans on which the two observers did not reach an agreement were excluded.

## Data Analysis

The total incidence, distribution and comparison regarding gender, bilateral and unilateral appearance, and the side of occurrences of these permanent three-rooted mandibular first molars were analyzed by the Chi-square test with SPSS, version 20 (SPSS Inc., Chicago, IL, USA). The level of significance was set at 5%.

## Ethical Aspects

Ethical clearance was obtained from the Institutional Ethical Committee of College of Dentistry, Jouf University.

## Results

In the present study, CBCT scans of 428 subjects, 236 males and 192 females, with age range of 18-69 years and mean age of  $32.12 \pm 10.5$  years, were evaluated. The CBCT scans of 14 subjects had three rooted mandibular first molars with a prevalence of (3.27%). The prevalence in male subjects was 2.96% and in females was 3.64%, with no significant differences between genders ( $p=0.865$ ). The frequency of bilateral three-rooted mandibular first molars was 1.16%, with unilateral frequencies of 1.40% and 0.70% on the right and left sides, respectively. No significant relationship between sides ( $p=0.981$ ) and the bilateral prevalence of three-rooted mandibular first molars ( $p=0.668$ ) was observed (Table 1).

**Table 1. Distribution and comparison of patients with permanent three-rooted mandibular first molars.**

Gender	N	Unilateral				Bilateral		Total	
		Right		Left		N	%	N	%
		N	%	N	%				
Male	236	3	1.27	2	0.84	2	0.84	7	2.96
Female	192	3	1.56	1	0.52	3	1.56	7	3.64
Total	428	6	1.40	3	0.70	5	1.16	14	3.27
Male vs Female				p-value	0.865				
Unilateral vs Bilateral				p-value	0.981				
Right Side vs Left Side				p-value	0.668				

## Discussion

A mindfulness and comprehension of an additional root and the root canal morphology can add to the successful result of root canal therapy. Presence of an extra root in the mandibular molar may be recognized by reading radiographs thoroughly along with careful analysis of the cervical morphology of roots by periodontal probing, existence of an extra cusp or more noticeable distolingual lobe along with a cervical prominence [3].

The additional root in the mandibular first molar is known to be positioned in the same bucco-lingual plane as of the other two roots, and because of the superimposition the extra root cannot be identified in routine periapical radiographs. Generally, a second radiograph with different horizontal angulation (SLOB technique) to locate the extra root [3].

The CBCT is known to provide three-dimensional structure of the teeth and the related anatomical structures with more accuracy and specificity with no superimposition. Hence, CBCT is considered as a ideal advanced diagnostic imaging modality in the field of modern dental practice including the endodontics and the use of CBCT in this study to identify the mandibular third root is justified [12-14].

In this study the occurrence of permanent three-rooted mandibular first molars in a Saudi population was found to be 3.27%, this was almost similar to previously reported prevalence in Iranian population (3.1%) [15], but less than the frequency reported with the use of CBCT technique in Taiwanese population whose results were 33.3% [16] and 29% [17]. In contrast to this, our observation was higher than the frequency noted in Turkish - 2.06% [18] and 2.58% [19] and in Brazilian population (2.6%) [20] using CBCT. As compared to our study, a higher values was noted by the previous studies carried out in Saudi Arabian population by conventional methods [10,11], this discrepancy may be seen due to change in sample size and the different methodology employed in these studies.

A detailed comparison of the results obtained in the present studies carried out with different modalities is mentioned in Table 2.

**Table 2. Comparison of the results of different studies carried out with different modalities.**

Author (Year)	Origin	Technique	Incidence
Younes <i>et al.</i> (1990)[10]	Egyptian	Extracted teeth/radiographic	0.01%
	Saudi	records	2.92%
Al-Nazhan S. (1999)[11]	Saudi	Clinical	5.97% (Root canal treated mandibular first molars)
Gulabivala <i>et al.</i> (2001)[21]	Burmese	Canal Staining and Tooth Clearing Technique	10.1%
Gulabivala <i>et al.</i> (2002)[22]	Thai	Canal Staining and Tooth Clearing Technique	13.0%
Peiris <i>et al.</i> (2007)[23]	Sri Lankan	Clearing Technique	3.0%
Huang <i>et al.</i> (2007)[24]	Taiwanese	Periapical Radiographs	26.9%
Tu <i>et al.</i> (2007)[25]	Taiwanese	Periapical Radiographs	21.09%
Schafer <i>et al.</i> (2009)[26]	Germans	Periapical Radiographs	1.35%
Tu <i>et al.</i> (2010)[27]	Taiwanese	Vertical Bite-Wing Radiographs	5.0%
Liu <i>et al.</i> (2010)[28]	Chinese	Vertical Bite-Wing Radiographs	9.0%
Garg <i>et al.</i> (2010)[29]	Indian	Periapical Radiographs	5.97%
Song <i>et al.</i> (2010)[30]	Korean	Computed Tomography	24.5%
Yang <i>et al.</i> (2010)[31]	Chinese	Radiographs	32.3%
Huang <i>et al.</i> (2010)[32]	Taiwanese	Periapical Radiographs	22.0%
Colak <i>et al.</i> (2012)[33]	Turkish	Periapical Radiographs	1.41%.
Demirbuga <i>et al.</i> (2013)[18]	Turkish	CBCT	2.06%
Tu <i>et al.</i> (2009)[16]	Taiwanese	CBCT	33.3%
Zhang <i>et al.</i> (2011)[17]	Taiwanese	CBCT	29.0%
Garg <i>et al.</i> (2013)[34]	Indian	Spiral Computed Tomography	6.4%
Shemesh <i>et al.</i> (2015)[19]	Brazilian	CBCT	2.58%
Rodrigues <i>et al.</i> (2016)[20]	Israeli	CBCT	2.6%
Rahimi <i>et al.</i> (2017)[15]	Iranian	CBCT	3.0%
<b>Present study (2018)</b>	<b>Saudi</b>	<b>CBCT</b>	<b>3.27%</b>

The results of the present study did not reveal any significant differences in the prevalence of three-rooted mandibular first molars between males and females, which was consistent with the

result of the other studies using periapical radiographies [25], CBCT techniques [33], spiral computed tomograph [34] and extracted teeth [35].

No significant differences were observed in the prevalence of three-rooted mandibular first molars between the right and left sides. In contrast to our findings, some authors found more three rooted teeth on the right side [25,33]. Whereas some researchers found the prevalence rate of extra root in mandibular first molars was more on the left side [35].

The bilateral prevalence of three-rooted mandibular first molars in the present study was significantly lower when compared to previous studies [25,33,36,37] and was higher than that observed in the German population [26]. The discrepancies between the results of the present study and other studies might be attributed to racial, ethnic and method differences.

## Conclusion

Dental practitioners must be aware of the fact that though it is rare, an extra or third root can be present in mandibular first molars. Accurate diagnosis of the presence of third root with the help of CBCT can avoid and overcome procedural errors and aid in successful root canal therapy.

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