

## Prevalence of Three Rooted Permanent Mandibular First Molars in Haryana (North Indian) Population

### Abstract

**Background:** Mandibular first molars typically have two roots but sometimes a supernumerary root presents distolingually called as radix entomolaris (RE). **Aim:** The present study evaluated the prevalence of permanent mandibular first molars featuring a distolingual root in Haryana (North India). **Materials and Methods:** Five hundred patients possessing bilateral mandibular first molars were selected for this study. The intraoral periapical radiographs were taken. The radiographs of these patients were evaluated under optimal conditions. A total of 1000 mandibular first molars were screened, and the incidence of three-rooted mandibular first molars, RE and the correlation between left and right side occurrence and between either gender were recorded. **Statistical Analysis:** The binary logistic regression test and Pearson's Chi-square test were used for statistical analysis. **Results:** The prevalence of three-rooted permanent mandibular first molars was 13% of the patients examined and 8.3% of the teeth examined. There was no statistically significant difference between gender and side of occurrence ( $P \geq 0.05$ ). The bilateral incidence of a symmetric distribution was 27.6 (18/65) among the RE teeth examined. **Conclusion:** RE is considered as an Asiatic trait. The occurrence of this macrostructure in the Haryana (North India) population was found to be 13%. The clinician must thoroughly examine the radiographs before the initiation of endodontic therapy.

**Keywords:** Cone beam computed tomography, radix entomolaris, supernumerary roots

### Introduction

The success of root canal treatment depends on the appropriate diagnosis, knowledge, and recognition of correct morphology of the tooth along with proper biomechanical preparation and obturation.<sup>[1]</sup> The awareness of roots and their anatomy is of utmost importance for correct diagnosis and to prevent errors. Unrecognition of these variations may alter the success of endodontic treatment. Thus, it becomes necessary to identify them beforehand. Many anatomical variations have been suggested for mandibular molars with regard to its roots and root canals.<sup>[2]</sup>

A major anatomical variant of the two-rooted mandibular first molar is the presence of an extra root found distolingually first mentioned in the literature by Carabelli (1844) known as radix entomolaris (RE).<sup>[3]</sup>

The etiology regarding the formation of RE is still unclear. The formation of an extra root could be related to extrinsic factors

during tooth formation or due to inclusion of atavistic gene in genetic makeup of an individual.<sup>[2,3]</sup> RE demonstrates relatively higher levels of genetic predominance.<sup>[2,3]</sup>

The maximum frequency of 3.4%–4.2% has been reported in the European population for RE.<sup>[4,5]</sup> In the African population, a maximum of 3%,<sup>[6]</sup> <5% among Eurasian and Indian population,<sup>[7,8]</sup> and 5%–30% in the Chinese, Eskimo, and American Indians have been reported.<sup>[9,10]</sup> The high rate of occurrence of RE in the Mongoloid population indicates the heritable basis of this supernumerary radicular structure.<sup>[11]</sup> RE can be seen in all mandibular molars, with fewer occurrences in second molars.<sup>[2,3]</sup> Frequency of RE on the right side is more commonly reported as compared to the left side with no gender variations. Bilateral occurrence of the RE ranges from 50% to 67%.<sup>[2,9]</sup>

Tratman surveyed the incidence (0.2%) of RE in Indians in 1938,<sup>[10]</sup> but no study so far has been conducted in Haryana, a North Indian state particularly. Hence, the objective of this study was to evaluate the

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prevalence of RE in permanent mandibular first molars in Haryana (North India). The study also aimed at assessing any gender predilections along with the side (right or left) predominance.

## Materials and Methods

The study was conducted in the Department of Conservative Dentistry and Endodontics, Postgraduate Institute of Dental Sciences, Rohtak, Haryana. Approval for the study was obtained from the Institutional Ethical Committee. Five hundred (280 males and 220 females) patients visiting the Department of Conservative Dentistry and Endodontics for routine treatment were enrolled for the study. Patients were informed about the study, and written consent to participate in the study was acquired from each patient. The inclusion criteria were (1) patients of Haryana origin (North India); (2) patients with bilateral permanent mandibular first molars; (3) molars with complete root apex which were evaluated on radiographs; (4) patients aged 15–60 years. Patients from other states and patients having permanent mandibular first molar on one side were excluded from the study. Personal details, including age, sex, and ethnicity of patients, were recorded. One thousand mandibular first molars in these patients were evaluated using the intraoral periapical radiographs (IOPA) (Kodak Dental Intraoral E-speed Film). Periapical radiographs, with bisecting angle technique, were taken from 20° to 30° (average 25°) mesial horizontal with –5° vertical angulation to evaluate the presence of an additional root [Figure 1]. Each radiograph was mounted on a view box; the radiographs were evaluated carefully by 2 observers (Gupta and Duhan) under favorable settings with a magnifying lens. Discrepancy if any in the interpretation of radiographs was considered among the observers to reach a conclusion. The criteria for RE presence included an extra root on radiograph justified by the crossing of the translucent lines defining the pulp space and periodontal ligament originating in the upper half of distal root in the



Figure 1: Intraoral periapical radiographs at 25° horizontal angulation distinctly showing a distolingual root

mandibular first molars. Further in two suspicious cases (Case 1 and 2) [Figures 2a, b and 3a, b] the presence of extra root was confirmed by cone beam computed tomography (CBCT) [Figures 2c and 3c]. The prevalence, side specificity, and the ratio of the occurrence in gender of such teeth were assessed statistically using (IBM SPSS statistics software, Chicago, United States) with significance set at  $P \leq 0.05$ . To find out the statistical difference in occurrence of RE on the gender basis, the binary logistic regression test was used. The side specificity difference between right and left side was analyzed by Pearson's chi-square test.

## Results

Five hundred patients (280 males and 220 females), aged between 15 and 60 years, were enrolled for the study. A total of 1000 permanent mandibular first molars were evaluated. Overall, the prevalence of patients who presented with such teeth was 13% (65/500 patients), and the prevalence of teeth with RE from the total teeth examined was 8.3% (83/1000 teeth). Table 1 shows tabulated results individually for both males and females, as well as collectively. Although more number of females (38, 7.7%) as compared to 27 males (5.4%) exhibited RE among these 500 patients, statistical analysis with binary logistic regression test ( $P \geq 0.05$ ) showed no significant difference between both genders. The occurrence of RE on the right side was 4% as compared to the left side (5.4%) out of 500 patients. The presence of RE on the right side was 2% and on the left 2.7% out of 1000 mandibular first molars. Statistically no significant difference ( $P \geq 0.05$ ) was found as related to sides using Chi-square test. Gender-based bilateral occurrence of RE revealed no statistically significant difference. Bilateral occurrence of RE was 27.6% (18/65).

## Discussion

Understanding the existence of RE is essential for the success of endodontic treatment. Abella *et al.* from the available literature stated that the frequency of mandibular first molar exhibiting RE was 14.4%. Ethnicity has been suggested as a predisposing factor for its presence.<sup>[11]</sup> Garg *et al.*<sup>[12]</sup> and Chandra *et al.*<sup>[13]</sup> studied the prevalence of RE in the Indian population and found its occurrence of 4.5% and 13.3%, respectively. However, in our study, the occurrence of RE was found to be 13% (65/500) of all patients evaluated and 8.3% (83/1000) of all teeth examined. Thus, an affirmative relationship exists between the prevalence of RE and geographical place of certain population.

Steelman<sup>[4]</sup> and Song *et al.*<sup>[7]</sup> in their study identified male tendency for RE in mandibular first molars. However, Garg *et al.*<sup>[12]</sup> and Schäfer *et al.*<sup>[14]</sup> found no significant differences in RE on the gender basis. In our study, more number of females (38, 7.7%) as compared to 27 males (5.4%) exhibited RE among these 500 patients, but statistically



Figure 2: (a) Intraoral periapical radiographs of case 1 showing double outlining of both mesial and distal roots at 0° horizontal angulation, (b) intraoral periapical radiographs of case 1 at a 25° mesial angulation, (c) cone beam computed tomography of case 1



Figure 3: (a) Intraoral periapical radiographs of case 2 at 0° angulation showing double outlining of both mesial and distal roots, (b) intraoral periapical radiographs of case 2 at 25° mesial angulation, (c) cone beam computed tomography of case 2

**Table 1: Results showing number and percentage of three-rooted permanent mandibular first molar**

	Number of patients	Left, <i>n</i> (%)	Right, <i>n</i> (%)	Bilateral, <i>n</i> (%)	Total, <i>n</i> (%)
Male	280	10 (3.50)	8 (2.80)	9 (3.20)	27 (9.60)
Female	220	17 (7.70)	12 (5.40)	9 (4)	38 (17)
Total	500	27 (5.40)	20 (4)	18 (3.60)	65 (13)
Total number of teeth examined	1000	27 (2.70)	20 (2)	36 (3.60)	83 (8.30)

no significant difference was found between both genders. This was in accordance with the recent studies of Tu *et al.*<sup>[15]</sup> and Wang *et al.*<sup>[16]</sup>

The result of the present study showed no significant difference statistically among the left- and right-sided molars. This finding is similar to the studies of Schäfer *et al.*<sup>[14]</sup> and Peiris *et al.*<sup>[17]</sup> However, some studies reported more predilections on the right side and few others on the left side.<sup>[7,15]</sup> These contradictory results may be due to the variations in case selection, methods used for detection, and sample size.

Literature demonstrated the bilateral presence of RE in the range of 56.6%–68.57% in the Asian population.<sup>[4,13]</sup> Contrary to this, Schäfer *et al.*<sup>[14]</sup> in their study on the German population found only unilateral occurrence. We found an incidence of 27.6% for bilateral occurrence of RE in our study, which is much lower than percentages found in other Indian studies.

According to *in vitro* studies, clearing technique is the main method for the identification of RE. However, current techniques involve micro-computed tomography or CBCT. We utilized noninvasive and inexpensive periapical radiographs for our study similar to other studies.<sup>[8]</sup> The radiographs were taken from 25° mesial angulation. Wang *et al.*<sup>[16]</sup> found that horizontal radiographs taken at

a 25° provide additional detail of the confirmation of extra distolingual root.

Periapical radiographs have known limitations which include anatomical noise, two-dimensional images, and geometric distortion. CBCT overcomes these drawbacks by reducing superimposition and permitting better view of three-dimensional structures.<sup>[18]</sup> In two suspicious cases, radiographic image of case 1 simulated Wang's Type II, i.e., moderately overlapped at 0° horizontal angulation exposure [Figure 2a]. A mesial angulation of 25° depicted a distant periodontal ligament lining beside the roots giving an indication of extra root [Figure 2b]. Similarly in case 2, Wang's Type III, i.e., severely overlapped images of tooth root were seen [Figure 3a]. At 25° (mesial) angulation, a distinct periodontal lining along both roots was separately seen [Figure 3b]. However, in these two cases, the separate roots and their root canals could not be identified on radiographs. Thus, in these two cases, CBCT was opted and the absence of extra roots was confirmed [Figures 2c and 3c]. The dual root outlining primarily viewed seen on the radiographs could be due to the dumbbell-shaped root anatomy. Thus, CBCT might be an alternate choice to IOPA if any suspicion arises regarding the morphology of the mandibular tooth. However, the expense and limited access to CBCT may hinder its use.

## Conclusion

The prevalence of RE in this study was 13% for the North Indian population. The prevalence of RE and ethnicity shows a direct relation to the populations inhabiting a certain geographical area. Knowledge about their location and morphology allows a better clinical approach toward a successful root canal treatment with minimal procedural errors.

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## Conflicts of interest

There are no conflicts of interest.

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