

The Evaluation of Impacted Third Molars Using Panoramic Radiograph

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Abstract

Background: Impacted third molars are developmental pathologic medical deformities characteristic of a modern civilization. Surveys of the prevalence of impacted third molars in Anbar province and the population of different countries and races are relatively rare.

Objectives & Aims: To evaluate the cases of impacted third molars among dental students.

Materials & Methods: A total of 312 students were examined at Oral Diagnosis Department, mean age was 20 years, including (47%) males and (53%) females. Panoramic radiographs were taken in College of Dentistry, Anbar University using Cranex-Soredex panoramic x-ray machine (Helsinki, Finland). The panoramic Films were processed by Kodak RP X-OMAT automatic processor, the radiographs were studied & examined and the third molars were classified according to the state of eruption using simple classification adapted by the authors.

Results: The number of third molars found in 312 subjects was 1027; 468 teeth were in the maxilla and 569 teeth in the mandible. 9 (3%) subjects had third molar agenesis also 238 (76%) subjects had all four third molars, 53 (17%) subjects had three third molars, and 12 (4%) subjects had two third molars.

Conclusions: The present study concluded that one half of the mandibular third molars were in mesioangular position and 39% of the third molars were in vertical position.

Key words: Impacted teeth, third molars, panoramic radiograph, Iraq.
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Introduction

Surveys of the prevalence of impacted third molars in the population of different countries and races are relatively rare. Mead¹ reported that 18.8% of his office patients had at least one impacted tooth. Hellman² who examined 433 students at Columbia University found an incidence of 15.2%, with females twice as likely to have an impaction as males. Dachi and Howell³ examined 3874 patients and found that 29.9% of the maxillary third molar and 17.5% of the mandibular third molar were impacted but found no sex difference.

Kramer and Williams⁴ surveyed a black population and found the incidence of impaction was 18.2%. They also found that third molars were more often impacted in the maxilla than in the mandible, but there was no sex difference. Studies in Scandinavian communities revealed that the proportion of persons with impaction of third molar varies from 19 to 35%^{5,6,7,8}. Agensis of one or more third molars vary substantially in persons from different races, with prevalence of approximately 1% in African Negro and Australian aboriginal samples¹⁴, 10% to 25% in whites^{9,10,11,12,14,15}, 19% to 35% in Scandinavian^{8,16} and 30% in Japanese¹⁷ and Chinese¹⁸. Levesque *et al.*¹⁹ reported 9% bilateral agensis of mandibular third molar, without significant difference in sex distribution. Gorgani *et al.*¹² found that the rate of agensis of third molars for black and white population ranged from 7% to 10% with bilateral agensis occurring in 79% of the sample. Times of eruption of third molars are also variable starting at the age of 16 years; averages of 17.8¹⁰, 19.9¹⁹, 20.5²⁰, and 24²¹ years have been reported. Earlier eruption of third molars was reported among rural Nigerians, that is, by age of 13 years for females and 15 years for males²².

In most of these studies, however, the criteria used for eruption were the emergence of any portion of the crown through the oral mucosa. This may give misleading results because many of the third molar do not continue to erupt but remain impacted in a partially erupted position²³.

Material and Methods

A total of 312 dental students were seen in the department of Oral Diagnosis, College of Dentistry, Anbar University. Subjects receiving orthodontic treatment were excluded from the survey as well as those who had any of the posterior teeth, excluding third molars, extracted. The mean age was 20 years, including 148 (47%) males and 164 (53%) females. Panoramic radiographs were taken in college of Dentistry, Anbar University using Cranex-Soredex panoramic x-ray machine (Helsinki, Finland). The panoramic Films were processed by Kodak RP X-OMAT automatic processor, the radiographs were studied & examined and the third molars were classified according to the state of eruption using simple classification adapted by the authors that classified the third molars according to the state of eruption in two categories: (1) erupted (partly or completely erupted), the highest portion of the tooth was above the cervical line of adjacent second molar; (2) nonerupted (bony or soft tissue impaction) but with complete root formation. Impacted third molars were also grouped according to their position including vertical, mesioangular, distoangular, and horizontal. Nonerupted third molars with incomplete root formation were not included in the group of impacted teeth because eventual eruption is uncertain; also authors advocate a simple classification that group maxillary and mandibular third molars according to depth by their relationship to the cervical line of adjacent second molars.

In level A, the highest part of the third molars was on the same level or above the occlusal plane of adjacent second molars. *In level B*, the highest part of the third molar was below the occlusal plane but above the cervical line of the second molar. *In level C*, the highest part of the third molar was beneath the cervical line of the second molar. All erupted and impacted third molars were registered except the unerupted third molars with incomplete root formation. The maxillary and mandibular nonerupted third molars were classified according to the stage of root formation, namely, completed or noncompleted.

The noncompleted were divided into one third or two third complete formations.

Results

The number of third molars per person is presented in Table I. The number of third molars found in 312 subjects was 1027; 468 teeth were in the maxilla and 569 teeth in the mandible. 9 (3%) subjects had third molar agenesis also 238 (76%) subjects had all four third molars, 53 (17%) subjects had three third molars, and 12 (4%) subjects had two third molars. The angular position of third molars presented in table II which showed that of the total 1027 teeth; 32% were vertical positioned, 57% were mesioangular, 7% distoangular and 4% were horizontally positioned.

Table I. Number of third molars per person

<i>Sex</i>	<i>Number of third molars</i>					<i>Total</i>
	<i>Four</i>	<i>Three</i>	<i>Two</i>	<i>One</i>	<i>None</i>	
Male	88	28	22	6	4	148 (47%)
Female	107	25	21	6	5	164 (53%)
Total	195	53	43	12	9	312 (100%)

The level of eruption of third molars is shown in Table III; of the 688 teeth, 399 (58%) were positioned with their occlusal surfaces on the same level or above the occlusal plane of the adjacent second molars (level A). Females demonstrate a higher frequency (9%) of level A eruption than males. The maxilla is predominant site (226 teeth) over the mandible (173 teeth). The difference was statistically significant ($p < 0.05$, $\chi^2 = 7.03$). Level B eruption was the least frequent in occurrence among the other levels of eruption (Table III).

Females had 4% more third molars at level B eruption than males. Level B eruption showed a higher frequency in the maxilla (61 teeth) than in the mandible (46 teeth). The difference was not statistically significant. One hundred eighty third molars (26.2%) were erupted to level C. The proportion of level C eruption in males was higher (13.1%) than in females. The difference was highly significant ($p < 0.001$, χ^2 test). Level C eruption occurred more frequently in the maxilla than in the mandible at a ratio of 1.3 ; However, the difference was not statistically significant.

The development of roots was assessed in unerupted maxillary and mandibular third molars. Of 232 subjects, 27 (11.6%) had incomplete root formation. This corresponds to 8.4% (68 of 814) of the total number of teeth examined. The ratio of two thirds to one third root formation was 4.3. One fourth of the unerupted third molars showed incomplete root formation. There was a tendency for more frequent incomplete root formation in males than in females.

Table II. Percent of angular position of mandibular third molars

<i>Angular position</i>				<i>Total</i>
<i>Vertical</i>	<i>Mesioangular</i>	<i>Distoangular</i>	<i>Horizontal</i>	
329 (32%)	585 (57%)	72 (7%)	41 (4%)	1027

Table III. Level of eruption of maxillary and mandibular third molars

<i>Sex</i>	<i>Level of eruption</i>			<i>Total</i>
	<i>A*</i>	<i>B**</i>	<i>C***</i>	
Male	165 (53%)	43 (14%)	104 (33%)	312
Female	234 (62%)	66 (18%)	76 (20%)	376
Total	399 (58%)	109 (16%)	180 (26%)	688

* **A**, the highest part of the third molars was on the same level or above the occlusal plane of adjacent second molars.

** **B**, the highest part of the third molar was below the occlusal plane but above the cervical line of the second molar.

*** **C**, the highest part of the third molar was beneath the cervical line of the second molar.

Discussion

Third molars are the teeth that are most often congenitally missing. If present, third molars may follow an abortive eruption path and become impacted as a result of the skeletal insufficiency in the area where they normally erupt. Impacted third molars are developmental pathologic medical deformities characteristic of a modern civilization. They account for 98% of all impacted teeth²⁴. The cause of agenesis of one or more teeth is essentially unknown, but several mechanisms have been suggested: physical disruption of the dental lamina, space limitation, and an inherent defect of the dental lamina or failure of induction of the underlying mesenchyme.

Space limitation and crowding is particularly involved in the agenesis of third molars, where competition for minimum nutritional requirement in a spatially constricted area can cause tooth germ regression and agenesis¹⁴. In general, these changes are under the influence of genetic and environmental factors. There is no known association of agenesis of only the third molars with syndromes. On the other hand, impaction of third molars occurs as a result of retardation of facial growth, shortage of space in the third molars region, vertical direction of the condylar growth associated with low resorption of the anterior border of the ramus, the distal direction of the eruption of the other teeth, low mandibular growth rate resulting in a reduction in the length of the jaws, early physical maturity, and late third molars mineralization^{5,25,26,27}.

The growth of the maxilla and mandible is essentially completed by 16 to 17 years of age. The mean age of participants in the present study (20.4 years) is very close to the average age of 20.3 years reported for the eruption of third molars^{2,11,19,21}.

Schersten *et al.*⁸ suggested that 20 to 25 years is the most suitable age for studying the frequency of third molars and its impaction. The reason for this is to avoid overestimation of third molars agenesis as a result of unnoticed early extraction in older group. Further, many impacted third molars can change their position and erupt after the age of 18 to 20 years^{23,28,29,30}. This indicates that the eruption period for third molars is longer than supposed previously. Results of the present study showed that about three quarters of the subjects had all four third molars. This proportion is higher than Hellman² found with American students and Schersten *et al.*⁸ with Scandinavians who also noted that one half of the persons had all four third molars. Our observation that 9.1% of third molars are congenitally missing is in agreement with the data reported by Levesque *et al.*¹⁹ for French-Canadians, Gorgani *et al.*¹² for American whites, and Haider and Shalhoub³¹ for the Saudi population but one half the prevalence reported by Porgel³² for orthodontic patients. In the present study, 1.7% had agenesis of all third molars. This observation is considerably less than that for the Scandanavian population (10% to 13%)^{5,8,16} and the Americans (7% to 10%)¹². According to Banks⁹, it is most common for two third molars to be missing, followed by one, four, and three. On the contrary, we found the order of frequency for missing teeth is one, two, three, and four, which is in agreement with frequency noted by Nanda³³. The proportion of third molars agenesis for females was less than males, but the difference, unlike the sample of Thompson *et al.*¹⁵ was not significant. In this context, our findings are in agreement with those reported by Levesque *et al.*¹⁹ and Gorgani *et al.*¹² but differ from those of Hellman² and Shah *et al.*³⁴ who found that females had a higher incidence of third molars agenesis.

Results of the present study agree with earlier reports^{1,3,4,16} that maxillary third molars were more commonly missing than mandibular third molars. Equal distribution between the left and right side as noted by Hellman², Grahen⁶, and Shah *et al.*³⁴ is confirmed in our study. In the present study, one third of the persons had one more impacted third molars. This figure is considerably higher than that reported by Shah *et al.*³⁴ (6.9%) for Canadian population and about 13% higher than the average of 20% presented by some studies in the United States^{1,2,3,4}, but in agreement with Scandinavian data (29% to 35%)^{5,7,9}. Our results showed no sex differences in the prevalence of third molars impaction. This differs from the observation made by Hellman^[2] and Schersten *et al.*⁸ but is in agreement with the observation made by Dachi and Howell³ and Kramer and Williams⁴. The lack of definite sex predominance in the third molars impaction raised the question against Hellman's statement that the jaws of females stop growing when third molars just begin to erupt, whereas, in males, the growth of the jaws continues beyond the time of eruption of the third molars. Our observation that the maxilla showed a greater tendency for occurrence of third molars impaction than the mandible (52.6% versus 47.4%) is in the general line, but less in magnitude, than those reported by others²⁻⁴. The angulation of the third molars may influence their subsequent eruption and therefore impart clinical significance on the state of third molars^{35,37,38}. Altonen *et al.*²⁷ found that the angulation of the lower third molars in relation to second molars decreased with age especially after 14 to 15 years of age. Richardson²⁵ reported that third molars with a small degree of angulation erupted earlier than those with steeper angulation. Longitudinal studies on the positional changes and eruption of third molars

demonstrate that many unerupted, partially erupted, or impacted third molars are likely to change their position and erupt after the age of 20 years and that their final state remains unpredictable^{23,28,29,30}. It has been speculated that the third molars have a constant path of eruption until contact is made with adjacent teeth. The present study showed that one half of the mandibular third molars were in mesioangular position (Table II). This number is considerably higher (18%) than that reported by Sewerin and von Wowern²⁸, but similar in proportion to that noted by Richardson³⁰ for persons aged 21 years. Our observation that 39% of the third molars were in vertical position is less than that reported by others^{29,30}.

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