

Article

## Assessment of the Third Molar Using Panoramic Radiographs in a Sample of Syrian Patients

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**Abstract:** Purpose: To study the characteristics of the third molar by panoramic radiography in a sample of Syrian patients. Materials and methods: We analyzed 335 panoramic radiographs of Syrian patients with at least one third molar. The sample consisted of 169 males (50.5%) and 166 females (49.5%). Third molars were classified according to Pell and Gregory's classification and Winter's classification. Results: The incidence of impaction was higher among females than males. The most common pattern was of vertically mandibular third molars at level A and class II, followed by vertically maxillary third molars at level B. Conclusions: The early diagnosis of impacted third molars by panoramic radiographs is useful for determining the position and depth of these molars and for proper planning for extraction.

**Keywords:** third molar; impacted tooth; panoramic radiography

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### Introduction

A tooth is termed impacted when its eruption path is interrupted by a physical barrier that prevents it from reaching its normal position and occlusal level within a certain time range [1]. The most frequently impacted teeth are the mandibular third molar, followed by the maxillary third molar, the maxillary canine, and the mandibular premolars [1].

Impaction can result from a variety of factors, such as genetics, jaw size and growth, lack of available space, quality of surrounding tissues, physical or mechanical interference, failure to induce the underlying mesenchyme, presence of pathological lesions such as cysts and tumors, and diet or artificial feeding of infants and children [2–6].

The analysis of third molar eruption confirmed that third molars with large angulation have a weak chance of eruption compared with those with little angulation [7].

The third molar is placed laterally within the dental arch, which reduces the reach of the toothbrush to it, causing plaque accumulation and predisposing the occurrence of caries in this area [8].

Racial and ethnic groups can have different third-molar impactions [9–12]. To the best of our knowledge, this is the first study to assess the pattern of third molar impaction in Syria. Panoramic radiographs are typically used to assess impacted teeth for their angulation, depth, the amount of bone covering them, and relationship to anatomical structures. This study was conducted to assess the third molar pattern in a sample of Syrians using panoramic radiographs and dental support.

## Materials and Methods

A retrospective study of 335 panoramic radiographs for Syrian patients with at least one third molar was performed; there were 169 males (50.5%) and 166 females (49.5%). All of the panoramic radiographs were performed at the same panoramic radiology center, in order to preserve the same radiological parameters.

The pattern of third molars was evaluated by Pell and Gregory's classification and the Winter's classification, in addition to the site, caries of the second and/or third molar, and relationship with adjacent anatomical structures.

Data for categorical variables are expressed in frequencies and percentages and were statistically analyzed in Microsoft Excel 2019 and Jamovi 2.3.18 using the chi-square test at a significance level of 0.05. Demographic variables were calculated as simple descriptive statistics.

## Results

We evaluated 937 third molars: 431 (46%) were maxillary third molars and 506 (54%) were mandibular third molars; 466 (49.8%) were right third molars, and 471 (50.2%) were left third molars (Tables 1 and 2).

**Table 1.** Maxillary third molars' distribution ( $X^2 = 0.43$ ,  $p$ -value = 0.805).

	Bilateral	Unilateral		Total
		Right	Left	
Male	83	29	23	218
Female	84	24	21	213
Total	167	53	44	431

**Table 2.** Mandibular third molars' distribution ( $X^2 = 1.16$ ,  $p$ -value = 0.559).

	Bilateral	Unilateral		Total
		Right	Left	
Male	109	17	26	261
Female	98	22	27	245
Total	207	39	53	506

The number of third molars differed between males (479/937; 51.1%) and females (458/937; 48.9%). The impaction rate was 41.7% overall (391/937); 47.6% in females (218/458) and 36.12% in males (173/479) ( $X^2 = 12.6928$ ,  $p$ -value = 0.000367). Bilateral distribution was more frequent. Unilateral right maxillary third molars and left mandibular third molars were more common.

The impaction rates of the maxillary third molar were 32.9% overall (142/431), 50.7% on the right side (72/142), 49.3% on the left side (70/142), 37.3% in males (53/142), and 62.7% in females (89/142). The most common impaction pattern was the vertical position and level B (10.9%), followed by the distoangular position and level B (6.3%) (Tables 3–5).

**Table 3.** Frequency of maxillary third molars' angulation ( $X^2 = 9.69$ ,  $p$ -value = 0.021).

	Vertical	Distoangular	Mesioangular	Horizontal
Male	189 (43.9%)	23 (5.3%)	6 (1.4%)	0 (0%)
Female	165 (38.3%)	30 (7%)	14 (3.2%)	4 (0.9%)

**Table 4.** Frequency of maxillary third molars' depth ( $X^2 = 18.6$ ,  $p$ -value = 0.00009).

	Level A	Level B	Level C
Male	172 (39.9%)	31 (7.2%)	15 (3.5%)
Female	128 (29.7%)	51 (11.8%)	34 (7.9%)

**Table 5.** Frequencies of maxillary third molars' patterns ( $X^2 = 22.79$ ,  $p$ -value = 0.011).

Angulation	Depth	Males	Females	Counts	% of Total
Vertical	A	165	124	289	67.1%
Vertical	B	19	28	47	10.9%
Distoangular	B	10	17	27	6.3%
Vertical	C	5	13	18	4.2%
Distoangular	C	7	9	16	3.7%
Mesioangular	C	3	9	12	2.8%
Distoangular	A	6	4	10	2.3%
Mesioangular	B	2	5	7	1.6%
Horizontal	C	0	3	3	0.7%
Mesioangular	A	1	0	1	0.2%
Horizontal	B	0	1	1	0.2%
Total		218	213	431	100%

The impaction rates of the mandibular third molar were 49.2% overall (249/506), 46.6% on the right side (116/249), 53.4% on the left side (133/249), 48.2% in males (120/249), and 51.8% in females (129/249). The most common impaction pattern was the vertical position, level A, and class II (17.8%), followed by the mesioangular position, level A, and class II (5.1%) (Tables 6–9).

**Table 6.** Frequency of mandibular third molars' angulation ( $X^2 = 5.35$ ,  $p$ -value = 0.253).

	Vertical	Mesioangular	Distoangular	Horizontal	Inverted
Male	198 (39.1%)	33 (6.5%)	16 (3.2%)	13 (2.6%)	1 (0.2%)
Female	182 (36%)	33 (6.5%)	24 (4.7%)	6 (1.2%)	0 (0%)

**Table 7.** Frequency of mandibular third molars' depth ( $X^2 = 4.44$ ,  $p$ -value = 0.109).

	Level A	Level B	Level C
Male	221 (43.7%)	35 (6.9%)	5 (1%)
Female	191 (37.7%)	50 (9.9%)	4 (0.8%)

**Table 8.** Frequency of mandibular third molars' class ( $X^2 = 1.01$ ,  $p$ -value = 0.603).

	Class I	Class II	Class III
Male	151 (29.8%)	107 (21.1%)	3 (0.6%)
Female	139 (27.5%)	105 (20.8%)	1 (0.2%)

**Table 9.** Frequencies of mandibular third molars' patterns ( $X^2 = 28.93$ ,  $p$ -value = 0.049).

Angulation	Depth	Class	Males	Females	Counts	% of Total
Vertical	A	I	141	116	257	50.8%
Vertical	A	II	50	40	90	17.8%
Mesioangular	A	II	13	13	26	5.1%
Mesioangular	B	II	12	13	25	4.9%
Vertical	B	II	6	17	23	4.5%
Distoangular	A	II	7	7	14	2.8%
Distoangular	B	II	7	7	14	2.8%
Distoangular	A	I	2	10	12	2.4%
Mesioangular	A	I	6	3	9	1.8%
Horizontal	B	II	6	3	9	1.8%
Vertical	B	I	1	6	7	1.4%
Mesioangular	B	I	1	3	4	0.8%
Vertical	C	II	0	3	3	0.6%
Horizontal	A	II	2	1	3	0.6%
Horizontal	B	III	2	1	3	0.6%
Horizontal	C	II	3	0	3	0.6%
Mesioangular	C	II	1	1	2	0.4%
Horizontal	A	I	0	1	1	0.2%
Inverted	C	III	1	0	1	0.2%
Total			261	245	506	100%

Caries were found in 52.2% of the maxillary third molars and in 62.1% of the mandibular third molars, with statistical significance between jaws ( $p = 0.006$ ), but with no statistical significance in each jaw alone (maxilla:  $p = 0.543$ , mandible:  $p = 0.087$ ) (Table 10).

**Table 10.** Frequency of caries by third molars' location ( $X^2 = 12.4$ ,  $p$ -value = 0.006).

Caries	18	28	Maxillary	38	48	Mandibular
+	118	107	225 (52.2%)	152	162	314 (62.1%)
-	102	104	206 (47.8%)	108	84	192 (37.9%)
Total			431 (100%)			506 (100%)

A percentage of 46.6% of the maxillary third molars were closed to the maxillary sinus, while 39.7% of the mandibular third molars were closed to the inferior alveolar canal (Tables 11 and 12).

**Table 11.** Relationship between maxillary third molar and maxillary sinus ( $X^2 = 6.97$ ,  $p$ -value = 0.008).

	Male	Female	Total
+	88	113	201 (46.6%)
-	130	100	230 (53.4%)

**Table 12.** Relationship between mandibular third molar and inferior alveolar canal ( $X^2 = 12.8$ ,  $p$ -value = 0.0003).

	Male	Female	Total
+	84	117	201 (39.7%)
-	177	128	305 (60.3%)

## Discussion

According to earlier studies, the reported prevalence of impacted third molars differs among various racial and ethnic groups [9–12].

Impacted third molars were at a prevalence of 41.7% (32.9% of maxillary third molars and 49.2% of mandibular third molars) in this report. However, lower prevalence rates have been reported in research carried out on Chinese (27.8% [13]), Indian (27% [14]), Saudi (24.3% [15], 12.31% [9]), and Emirati (23.05% [16]) populations, and higher prevalence rates have been reported in Indians (76% [17]), Malaysians (73.5% [18], 67.6% [19]), Saudis (70% [20]), Singaporeans (68.6% [21]), and Omanis (54.3% [22]).

A percentage of 55.75% of impacted third molars were in females and 44.25% in males. The majority of studies stated that the frequency of impacted third molars was noticeably higher in females [2,15,16,23–29], whereas other studies reported more frequent impaction in males than females [8,10]. However, some studies have claimed that there was no difference between gender and the prevalence of impacted third molars [5,9,20,30–32].

A fascinating finding of the current study is that female impaction is deeper than male impaction (60.5% of level B impactions and 65.5% of level C impactions). Previous studies with comparable findings have been reported [5,15,18]. This is due to the difference in the growth rate, as the size of the jaws is smaller in females and their third molars often erupt after the growth of the jaws has been completed, whereas they erupt in males with the continued growth of the jaws [33].

Another significant finding of the current study was the higher distoangular impaction rates in females (58.1% of distoangular impactions). Females were found to impact distoangularly more frequently than males in earlier studies [15,16,18]. Given that females experience distoangular and deeper impaction, it is likely that impacted third molars in females will be harder to surgically remove than those in males.

In the current study, level B was the most frequent depth for impacted maxillary third molars (57.7%) and level A was the most frequent depth for impacted mandibular third molars (62.2%). According to the results of several earlier studies [2,4,6,9,10,25,28,34,35], level A was the most frequent impaction level. Earlier studies [1,5,15,16,20,26,27,36,37] found a higher level of impaction, even though level B was the most prevalent. Level C came at a lower frequency in the current study, while it was found to be the most frequent in Malaysian [18] and Turkish [38] samples.

The prevalence of bilateral impaction was higher in the present study. Similar results have been noted in earlier studies [9,20,21]. The prevalence of unilateral and bilateral impactions was nearly equal in previous studies [16,36]. Another study reported a lower rate of bilateral impaction [13].

Unilateral right maxillary and left mandibular impactions were more common. These results agreed with previous studies [8,25,27,28] in terms of the frequency of mandibular impaction on the left side, but differed

from the results of Kalaiselvan, where the impaction is repeated equally between the two sides, and from Hekmatian, where the impaction was more frequent on the right side [10,29].

Many studies, including the one we conducted, found that the mandible and maxilla both exhibit the highest rates of vertical angulation [1,4,8,10,23,25–29,34,38–41], while numerous studies found that mesioangular impaction was the most typical pattern of angulation [2,5,6,9,13,15,16,18,20,31,36,42–44].

In the current report, the class II relationship with the ramus predominated (85.1% of impacted mandibular third molar), followed by class I and class III. Class II was more common in other studies, too [2,4,5,10,20,26,28,36].

In this study, caries were detected in 57.5% of impactions (52.2% of maxillary third molars and 62.1% of mandibular third molars). Other previous studies have shown different percentages of 12.2% [36], 14.86% [16], 18.75% [4], and 24.63% [42]. In addition, we found that vertical third molars were associated with more caries, followed by mesioangular impaction. Previous studies found that caries were more prevalent in mesioangular impaction followed by horizontal impaction [4,16,44], and in distoangular impaction [13,42]. Moreover, we found that caries were more prevalent in level A and in class I. Earlier studies support this finding [16,44].

## Conclusions

Based on these results, the prevalence of impacted third molars in Syrian patients was 41.7%. This may be of considerable value because the possible related complications are costly and problematic. Moreover, the prevalence of impacted third molars was higher in the mandible than maxilla, and higher in females than in males. The most common impaction pattern of the maxillary third molar was a vertical position at level B, and the most common impaction pattern of the mandibular third molar was a vertical position at level A and Class II.

Regular monitoring of the third molar's status should become an integral part of appropriate oral health care due to considerable differences. We recommend the use of panoramic radiographs for their usefulness in diagnosing the angulation and depth of the third molar, as well as in planning a proper surgical removal if needed.

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