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Prevalence of Third Molar Impacted Teeth: A Cross-Sectional Study Evaluating Radiographs of Adolescents

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ABSTRACT

Objective: The aim of this cross-sectional randomized study was to investigate the prevalence and angulation of third molar impaction in patients between 19–26 years old who were living in the Middle Black Sea region of Turkey.
Methods: Total 1006 patients between 19 and 26 years of age who were referred to the Ordu University Faculty of Dentistry Department of Oral Maxillofacial Surgery between 2010 and 2015 were included in the study. Of these 1,006 patients, 410 were male and 596 were female. The prevalence and positions of the impacted third molar teeth from the 4th quadrant on the panoramic radiographs were documented according to the classifications of Pell and Gregory as well as that of Winter. In the Pell and Gregory classification, the teeth in class C were evaluated as impacted teeth.
Results: There was a total of 1,518 impacted molars. Of the included patients, 48.3% had impacted third molars. The most common angulation of impacted third molars was the vertical position in both mandible (28.4%) and maxilla (28.8%). The prevalence of impacted mandibular third molars (57.3%) was significantly higher than that of the impacted maxillary third molars (42.7%) ($P<0.05$). The prevalence and angulation of impacted third molars between genders was not significant ($P>0.05$).
Conclusion: The pattern of third molar impaction in the Middle Black Sea region was characterized by a high prevalence of level C impaction with a vertical position that was greater in the mandibles and had no sex predilection.
Key words: Impacted teeth, Pell and Gregory, prevalence, Turkish population, Winter

INTRODUCTION

The impaction of permanent teeth is a pathological situation in which a tooth cannot erupt into its normal functioning position without treatment [1]. Third molars are the most frequently impacted teeth [1-3]. The causes of third molar impaction include insufficient skeletal growth, macrodontia, late maturation of the third molars, and systemic and local factors, such as cleidocranial dysplasia and Down's syndrome [4, 5]. Impaction can cause pericoronitis, dental caries, and the development of cystic lesions [6, 7]. Therefore, the extraction of third molars is one of the most common surgical procedures for Oral and Maxillofacial surgeons [8].

The angle of impaction refers to the angle formed between the intersected longitudinal axes of the second and third molars, and can be measured using Winter's classification system [7]. Whether embedded or not, maxillary and mandibular third molars can also be classified using the Pell and Gregory classification system [5].

The etiology of tooth loss is unclear, although it has been suggested that local genetic and systemic factors may play a role [9]. In addition, the prevalence of third molar impaction may vary regionally. The aim of this retrospective radiographic study was to investigate the prevalence of third molar impaction and angulations among dental patients living in the Middle Black Sea region of Turkey.

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PATIENTS AND METHODS

For this study, we screened the retrospective data of 1,480 adult patients between the ages of 19 and 26 who were referred to Ordu University Faculty of Dentistry Department of Oral Maxillofacial Surgery for third molar eruption between 2010 and 2015. Of the 1,480 patients screened, 474 were excluded from the study, and all included data were randomly selected from the records (specifically, orthopantomograms (OPG)) of the remaining 1,006 patients.

This study included randomly chosen males and females who were born in the region of the middle black sea. Patients less than 19 years of age were excluded from the study because human growth continues beyond this age. Other exclusion criteria included having third molars with incomplete root formation, having had orthodontic treatment, dentoalveolar trauma, pathological diseases, craniofacial anomalies, syndromes (such as Down's syndrome), incomplete records, or poor quality OPG. In addition, uncommon angulations, such as buccolingual, mesioinverted, distoinverted, and distohorizontal angulations were not included. The data were collected cross-sectionally from panoramic radiographs. No consent forms were needed because we analyzed radiographs that were previously taken for routine diagnosis. The study design was approved by the Ordu University Ethics Committee.

In present study, the impaction of the maxillary and mandibular third molars was determined using the Pell and Gregory classification system.[10] The third molar was considered impacted when the occlusal plane of the impacted tooth was apical to the cervical line of the adjacent tooth (Pell and Gregory classification Class: C). The angulation of the impacted third tooth was recorded using Winter's classification,[11] and the angulation of each tooth was measured using tools available in the Off Screen Angle Meter software. Winter's classification was used as follows: mesioangular impaction at 11° to 79°; vertical impaction at 10° to -10°; distoangular impaction at -11° to -79°; and horizontal impaction at 80° to 100° [11] **(Figure 1).**

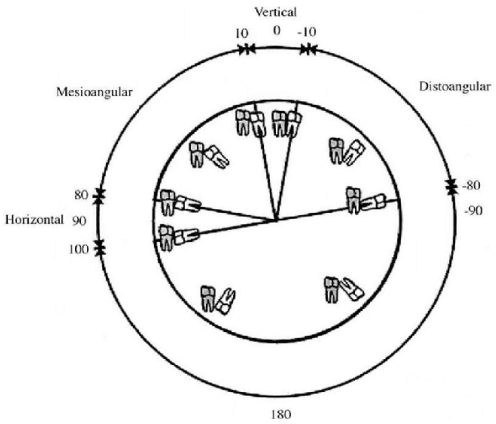

Figure 1. Winter's classification

MCTTA: Most common type of tooth angulation, TPITM: The percentage of impacted third molars, F/M: female/male impacted third molars

The panoramic radiographs were obtained using a Kodak 8000C Digital Panoramic and Cephalometric Extraoral Imaging System (Kodak Dental Systems, Rochester, NY, USA), and the images were stored in a digital database. A single examiner measured the angulation of impaction, and assessed each tooth according to Winter's classification. Two examiners performed the Pell and Gregory assessments (impaction), and the data were recorded only when both examiners agreed. All of the acquired data were recorded and classified for statistical analysis.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), Version 20.00 (IBM, Corp, Chicago, Illinois, USA). Patient age, gender, and number of impacted third molars were displayed by frequency and percentage. The Pearson's Chi-squared test was used to determine the associations between different variables.

RESULTS

A total of 1,006 patients (410 male and 596 female) were included in this study. A total of 1,518 impacted third molars were found (627 male and 891 female) in the 4th quadrant.

Table 1 presents the distribution of subjects according to the total number of impacted third molars. Of the included subjects, 48.3% had impacted third molars. There was no significant difference in gender with regards to the number of impacted third molars (627 male and 891female, P=0.071). The distribution of impacted third molars between the maxilla and mandible was also evaluated (Table 1). Of the 1,518 impacted third molar teeth, 649 were in the maxilla and 869 were in the mandible. The proportion of impacted mandibular third molars (57.3%) was significantly greater than that of impacted maxillary third molars (42.7%, P <0.00). Impacted third molars were 1.33 times more likely to occur in the mandible than in the maxilla.

Table 1. The distribution of subjects according to the total number of impacted third molars between the maxilla and the mandible.

Impacted	Male	Female	Total
Maxilla	270	379	649
Mandible	357	512	869
Total	627	891	1518

Table 2. The angulation of impacted third molars between the maxilla and the mandible.

	Mezioangular	Distoangular	Vertical	Horizontal	Other	Total
Maxilla	41	142	438	16	12	649
Mandible	242	11	432	168	16	869
Total	283	153	870	184	28	1518

A Chi-square test revealed that the prevalence of vertical angulation (57.3%) was significantly higher than all other angulations (Table 2, P <0.001). Impacted third molars had a higher frequency

of being in the vertical position (28.8%), followed by mesioangular (9.3%), distoangular (2.7%), horizontal (1%), and other (0.7%) in the maxilla, and vertical position (28.4%), mesioangular (15.9%), horizontal (11%), other (1%), and distoangular (0.7%) in the mandible (Table 2).

Based on Winter's classification, the most prevalent angulation in males was vertical (24.4%), mesioangular (7.1%), distoangular (3%), horizontal (5.5%), and other (0.8%), while in females, the distribution was mesioangular (11.5%), distoangular (6.7%), vertical (26.3%), horizontal (6.5%), and other (0.9%). The difference in the angulation of impacted third molars between male and female patients was not significant (*P*=0.106) (Table 3).

Table 3. The distribution of impacted third molar angulation between male and female patients.

	Mezioangular	Distoangular	Vertical	Horizontal	Other	Total
Male	108	51	371	84	13	627
Female	175	102	499	100	15	891
Total	283	153	870	184	28	1518

DISCUSSION

Impacted teeth should be evaluated both clinically and radiographically. The clinical evaluation should include anamnesis of pain, infection, swelling, and the appearance of soft tissue overlying the impacted teeth [12]. The radiographic evaluation should include the determination of the spatial relationship of the tooth to the ramus of the mandible and the second molar, as well as the relative depth of the third molar in the bone according to the classification of Pell and Gregory [10, 12]. It has been shown that the prevalence of impacted teeth varies between regions. The present study determined the prevalence of impacted teeth in the middleblack sea region, and herein we hypothesize the possible etiological factors of this condition. This study should help to determine whether teeth impaction is an emerging problem, or if it is due to simply to influences of the population's ethnic background.

To our knowledge, this is the first study to evaluate the prevalence of third molar impaction in the Middle Black Sea region of Turkey. The sample size used herein was equivalent to those used in many other international studies [1, 7, 13, 14]. Another study was performed in Turkey in the region of Anatolia, and that study also reported a high prevalence of third molar impaction in the vertical position [13]. Many studies have similar findings in international studies [13, 15-19]. In some studies, the most common angulation pattern was mesioangular in the mandible [7, 18, 20] (Table 4). The results of our current study may differ from those in the literature due to differences in methods of classifying angulation.[7] Studies using Winter's classification method often report higher rates of the Vertical position. In addition, studies in different racial and ethnic groups have produced different results. In Bhopal, India [19], Saudi Arabia [1] the Anatolian Turkish Population,[13] and the present study, the vertical position is seen at the highest rates, while the mesioangular position is seen at higher rates in the Northeast Of Iran [18], Oman [7], India,[20] and Saudi Arabia[1]. In Saudi Arabia[1], the vertical position is higher at the maxilla, and the mesioangular position is higher at the mandible (Table 4).

Table 4. Data from published previous studies

	n	Age (years)	MCTTA		TPITM		P value TPITM	F/M	*P* Value
			Maxilla	Mandible	Maxilla	Mandible			
Northeast of Iran[18]	1433	<19	Mesioangular		48.7 %			2.35	<0.05
Oman[7]	1000	19–26	Mesioangular		19.0%	48.7%	<0.05	1.73x	<0.05
Bhopal, India[19]	1100	20-35	Vertical	Vertical	56.5%		<0.05		
India[20]	1200	20-40	Mesioangular		64.1%			0.94	>0.05
Saudi Arabia[1]	1039	19-46	Vertical	Mesioangular	40.5%*			0.9	>0.05
Anatolian Turkish Population[13]	705	19–73	Vertical	Vertical	75.6%		>0.05	1.1*	>0.05
Present study	1006	19-26	Vertical	Vertical	48.3%		<0.05	1.4	>0.05

The mean age of the participants in our study was 22.7 years (range: 19 to 26 years). We excluded patients that were less than 19 years of age because human growth continues beyond this age [21]. Schersten et al.[22] suggested that the most suitable ages for studying the frequency of mandibular third molars and their impaction are between 20 and 25 years. Previous studies have included patients between 19 and 73 years (Table 4) [1, 13].

In our current study, we found no significant gender distribution in the prevalence of mandibular and maxillar third molar impaction (P=0.071). In agreement with the current study, Padhye et al.[20], Hassan et al.[1], and Yilmaz et al.[13] also reported no difference between genders. However, Hashemipour et al[14], Quek et al[23], Hugoson and Kugelberg [17], Kim et al.[24] Anquidi et al. [7], and Eshghpour et al [18] reported that third molar impaction

was significantly higher in females. According to Eshghpour et al. [18], the higher prevalence in females may be due to their smaller jaw size, which may limit third molar eruption.[18] In the Anatolian Turkish Population,[13] 75.6% of third molars were impacted. The difference in the number of patients with third molar impactions in the Anatolian (75.6%) and Black Sea regions (48.3%) of Turkey may be due to different age ranges.

Evaluating the distribution of impactions between the maxilla and mandible showed that the number of impactions in the maxilla (42.7%) was significantly less than in the mandible (57.3%). In the present study, impacted third molars were 1.33 times more likely to occur in the mandible. Hashemipour et al. [14] reported a 1.9 times higher incidence of impaction in the mandible than in the maxilla. Of note, there are opposite findings in the studies of Kramer et al. [25] (USA), Schersten et al. [22] (Sweden), and Hattab et al. [6](Jordan). The limitation of the present study is that it is cross-sectional and covered only the East Black Sea region of Turkey. The percentage of impacted third molars was 48.3%, and they were 1.33 times more likely to occur in the mandible than in the maxilla ($p<0.05$). The most common angulation was the vertical angulation in both the maxilla and the mandible. A similar result was found in previous studies, and there was no difference in the region of the middle black sea compared to other regions.

In conclusion, there are many studies conducted in different regions, and they can be compared with regards to incidence, position, depth, and other measurements of impacted teeth. Comparing the current study with other regional studies revealed that there is no universal consensus on the incidence or patterns of impactions. We also wanted to combine and globalize the previously published studies from around the world with graphics.

Declaration of Conflicting Interests: The authors declare that they have no conflict of interest. **Financial Disclosure:** No financial support was received.

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