Original Research

Prevalence of Impacted Teeth among Young Adults: A Retrospective Radiographic Study

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Abstract

Objectives: The prevalence of impacted teeth fluctuates across various ethnicities and geographical regions. The aim of the present study was to evaluate the prevalence and patterns of impacted teeth among patients living in the central part of Iran. **Methods**: This retrospective study was conducted on 3632 patients within the age group of 17-30 years. The frequency and pattern of the impaction were determined using orthopantomogram (OPG). **Results:** According to the results of the study, 56.3% of the patients were female (n=2046). Out of the 3632 OPGs, 1602 cases (44.1%) were detected with at least one impacted tooth. No significant difference was observed between the males (n=682; 42.6%) and females (n=920; 57.4%) in this regard (P=0.237). Furthermore, the third molars were the most common impacted teeth found in 1156 radiographs (31.8%) with no significant difference between the males (n=358; 30%) and females (n=798; 70%) (P=0.386). Mesioangular and distoangular impactions were detected to be the most frequent angulation of the impacted third molars in the mandible (49%) and maxilla (41%), respectively. Additionally, 357 (9.8%) and 78 (2.1%) cases showed at least one impacted maxillary canine and one impacted mandibular second premolar, respectively. Moreover, impacted ectopic teeth were observed in 11 (0.3%) individuals. **Conclusion:** Based on the findings of the present study, the third molar was the most common impacted tooth observed in the people living in the central region of Iran, followed by canine and second premolar impaction. The prevalence of the third molar impaction in the females was nearly twice as much as that in the males.

Keywords: Impacted teeth, Orthopantomogram, Young adults.

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Introduction

An impacted tooth is defined as an erupted, partially erupted, or unerupted tooth that does not have a normal arch relationship with other teeth in the mouth (1). There are several reasons causing the impacted tooth not to erupt normally into the dental arch. The etiology of these impactions could be the insufficient space in the dental arch for eruption and the blockage of tooth eruption path due to the presence of a cyst, supernumerary teeth, thick bone, soft tissue lesions, tumors, and teeth angulation (2). According to the American Association of Oral and Maxillofacial Surgeons, since the majority of the impacted teeth are at the risk of odontogenic infections, periodontal disease, cyst or tumor formation, and caries, they should be considered for removal as soon as possible (3).

Generally, orthopantomograms (OPG) and periapical radiographs are utilized to determine the presence of tooth impaction, angulation of impaction, anatomical obstacles preventing the normal tooth eruption, amount of surrounding bone, relation to adjacent teeth, and vital structures. Therefore, an accurate evaluation results in a correct planning and treatment in this regard (4). According to the literature, the mandibular wisdom teeth are the most frequently impacted teeth followed by maxillary third molars and maxillary canines, respectively. The third molars are the most frequently impacted since they are the last teeth in the sequence of eruption in the oral cavity (5).

The prevalence of the third molar or canine impaction in different populations has been fully studied and reported in the medical literature. However, there are limited numbers of comprehensive studies investigating all impacted teeth in one demographic research. With this background in mind, the current study aimed to evaluate the prevalence and pattern of tooth impaction using panoramic radiographs in a sample of patients living in the central regions of Iran.

Materials & Methods

This study was approved by the Ethics Committee of Shiraz Faculty of Dentistry. The OPGs and clinical notes of 3632 patients with the age range of 17-30 years were fully reviewed. The patients included in this study had attended the Oral and Maxillofacial Radiology Department of Shiraz Dental School for the screening of OPGs. The exclusion criteria included: 1) pathologic conditions, 2) trauma to the jaws, 3) impacted teeth with incomplete root formation, 4) missing, 5) history of tooth extraction, 6) orthodontic treatment or orthognathic surgery, 7) lack of complete records, 8) poor quality OPGs, and 9) congenital anomalies or craniofacial syndromes.

The OPGs were reviewed by a single professional examiner under standard circumstances to determine the presence, location, depth, and angulation of the impacted teeth. The teeth were referred as impacted in case they were not completely erupted to the normal functional level in the occlusal line. The angulation of the impacted third molars was recorded using the winter's classification with regard to the angle that is formed between the intersected longitudinal axis of the second and third molars (6). In addition, the uncommon position of the impacted teeth, such as impaction in the vertical ramus or the sub-nasal area was classified as 'ectopic'.

The data analysis was performed using the SPSS version 19.00 (IBM, Corp, Chicago, Illinois, USA). The patient's gender, number of impacted teeth, and classification of impaction were described as frequency and percentage. The Pearson's Chi-squared test was employed to test the correlation between different variables.

Results

Out of a total of 3632 patients included in the study, 2046 (56.3%) cases were female. The mean age of the participants was 23.25±4.17 years. As the results indicated, 1602 (44.1%) patients had at least one impacted tooth. Furthermore, no significant correlation was observed between the presence of the impacted teeth and gender (P=0.237) (Table 1). The third molar impaction was detected in 1156 (31.8%) OPGs. The distribution of the impacted third molars between the upper and lower jaws is illustrated in Table 2.

Table1. Distribution of OPGs in terms of impacted teeth and gender

Gender	With impacted tooth N (%)	Without impacted tooth N (%)	Totals N (%)
Male	682(42.6)	904(44.5)	1586(43.7)
Female	920(57.4)	1126(55.5)	2046(56.3)
Totals	1602(100)	2030(100)	3632(100)
	P=0.237		

OPGs=Orthopantomographs

Table2. Distribution of impacted third molars in terms of arch and gender

Gender	Impacted third molars N (%)		Totals N (%)
	Mandible	Maxilla	
Male	188(29.8)	170(32.3)	358(30.9)
Female	441(70.2)	357(67.7)	798(69.1)
Totals	629(100)	527(100)	1156(100)
	P=0.386		

The prevalence of the impacted mandibular third molars (n=629; 54.4%) was not significantly higher than that of the impacted maxillary third molars (n=527; 45.6%) (P=0.386). In addition, the females were 2.2 times more likely to have impacted mandibular third molar than the males. Mesioangular impaction (49%) was the most common angulation of the mandibular third molar, followed by the vertical impaction (29%). On the other hand, distoangular (41%) and vertical (37.6%) impactions were the most common angulations in the maxilla, respectively. Additionally, there was a significant correlation between the distribution of the third molar impaction and the angulation of impaction in both jaws. The prevalence of mesioangular and horizontal angulation of third molar impaction in the lower jaw was significantly higher than the upper jaw (p=0.002 and p<0.001respectively), while the prevalence of distoangular and vertical angulation of third molar impaction in the upper jaw was significantly higher than the lower jaw (P<0.001). There was no significant difference between the prevalence of other angulation in both jaws (p=0.489). (Table 3)

Table3. Distribution of the angulation of impacted third molars

Angulation	Impacted third molars N (%)		Totals N (%)
	Mandible	Maxilla	
Mesioangular	308(49)	56(10.6)	364(31.4)
Vertical	182(29)	198(37.6)	380(32.8)
Distoangular	26(4.1)	216(41)	242(20.9)
Horizontal	84(13.3)	28(5.31)	112(9.6)
Others	29(4.6)	29(5.5)	58(5)
Totals	629(100)	527(100)	1156(100)
	P<0.001		

Table 4 presents the prevalence of the impacted canines. Based on the collected data, a total of 357 (9.8%) impacted canines were observed out of which 298 (83.5%) and 59 (16.5%) cases were in the maxilla and mandible, respectively. However, the distribution of the impacted maxillary and mandibular canines was not statistically different between the males and females (P=0.401). Moreover, the prevalence of the impacted mandibular second premolar was evaluated (Table 5). A total of 78 (2.1%) impacted mandibular second premolar was detected, 45 (57.7%) cases of which were observed in the females. No statistical difference was observed between the males and females in terms of the impacted mandibular second premolar distribution (P=0.494). Finally, out of the 1602 impacted teeth, a total number of 11 (0.3%) ectopic teeth were observed in the vertical ramus and sub-nasal area. Seven ectopic teeth (0.2 %) were found in women and 4 (0.1%) in men.

Table4. Distribution of impacted canine in terms of gender and jaw

Gender	Impacted canine N (%)		Totals N (%)
	Mandible	Maxilla	
Male	25(42.3)	109(36.6)	134(37.5)
Female	34(57.7)	189(63.4)	223(62.5)
Totals	59(100)	298(100)	357(100)
	P=0.401		

Table5. Distribution of the impacted second premolar in terms of gender and jaw

Gender	Impacted second premolar N (%)		Totals N (%)
	Maxilla	Mandible	
Male	4(33.4)	29(43.9)	33(42.3)
Female	8(66.6)	37(56.1)	45(57.7)
Totals	12(100)	66(100)	78(100)
	P=0.494		

Discussion

This study is the first attempt targeting towards investigating the incidence of the impacted teeth in a sample of population living in the central part of Iran. To the extent of the researchers' knowledge, there are neither conducted nor published studies conducted by other institutions in our country, dealing with the prevalence of all impacted teeth in one study. As expected, the patient selection method in this study is similar to that employed in other studies. However, the sample size chosen in this study is considerably greater than that of most of other studies mentioned in the medical literature (7, 8).

Regarding the fact that the normal body growth is essentially completed by the age of seven, the determination of an unerupted or partially erupted tooth as impacted would be more reliable beyond this age (9). In this study, the maximum age of the study population was set at 30 years since most of the impacted teeth may have been removed for surgical or orthodontic reasons after this age (10).

Similar to the studies reporting gender predilection in terms of the third molar impactions, (5, 10, 11) the results of the present study are in line with the findings obtained in the literature. Nevertheless, the difference in the distribution of the impacted third molar between the males and females was not statistically significant (P=0.386).

Different growth pattern between the genders seems to explain the higher prevalence of third molar impaction in the females. Besides, the growth of the jaws in the females usually ceases at the time when the third molars just begin to erupt. However, in the males, the growth of the jaws sustains during the time of the third molar eruption, which provides adequate space for the eruption of the third molar (12). The frequency of the patients with at least one impacted third molar in the current study was 32%, which is consistent with the findings of such studies conducted by Hassan et al., (7) Rajasuo et al., (13) Hattab, (14) and Eliasson (15) reporting frequencies of 40%, 38%, 33%, and 30%, respectively. Conversely, Quek et al. reported a higher prevalence of tooth impaction (68%) in a sample of 1,000 OPGs obtained from the Chinese people. This disagreement between the findings of the aforementioned study and those of our research can be due to the higher discrepancy between the tooth size and jaw length in the Chinese population (16).

Olasoji et al. reported that the third molar impaction was seven times more common in the urban Nigerians, compared to that in the rural ones (17). Moreover, they suggested that the teeth impaction is considered as an urban phenomenon owing to an unnoticed transition process of disuse atrophy in the dental arch length. Regarding the angulation of the impacted teeth, the majority of the studies reported the mesioangular impaction as the most common angulation pattern of the impacted third molar (7, 16, 18-20). On the other hand, few studies reported the vertical position as the most frequent pattern (21). In the present study, the most frequent angulation of the impacted third molars was the mesioangular (49%) and distoangular impactions (41%) in the mandible and maxilla,

respectively. Different results obtained in various studies can emphasize the significance of racial and cultural factors in changing the pattern of third molar impactions.

In the present study, the prevalence of canine impaction was found to be 9.8%, which is much higher than the range of 0.2-2.5% reported in other studies (22). Generally, canine has a complex pattern of eruption and is one of the last teeth erupting in the dental arch. Consequently, this tooth may have an unusual eruption process (23). Moreover, the prevalence of canine impaction in our study (9.8%) is similar to the result of two studies by Fardi et al. (8.8%) and Santosh et al. (9.7%) conducted in Greece and India, respectively (24,25). The discrepancy between the findings of different studies can be ascribed to the racial differences and the use of various methodologies in these studies.

The permanent upper canines are assumed as the second most frequently impacted teeth with the overall prevalence of 1-2% (26). They have 2:1 female predilection, clear familial trend, five times more chance to occur in the Caucasians than in the Asians, (23) and is believed to be 10-20 times more common than their mandibular counterparts (27). In our study, the canine impaction in the maxilla was five times more frequent than that in the mandible. The studies revealing the frequency of mandibular impacted canines are limited. Shah et al. (28) demonstrated mandibular canine impaction in the 0.10% of 7,886 subjects. In addition, in another study, 11 (0.22%) impacted mandibular canines were found in 5,000 individuals (29).

Our findings revealed 59 impacted mandibular canines in 3632 individuals resulting in an incidence of 1.6% impaction. The male to female prevalence ratio was 1:1.6 that is in line with the other studies (1:1.3-1:3.2), signifying the higher prevalence of impacted canines among the females (30). There was no statistically significant difference between the gender and distribution of the impacted canines in our study.

A few reports have considered the impacted premolars in the literature. It has been concluded from the results of these studies that the premolar impaction is uncommon with the prevalence rates of 2.1-2.7% (31-33). This study presented a prevalence of 2.1% for the impacted premolars, which is consistent with the results of other studies. Additionally, the findings in this study revealed that the mandibular premolars were more commonly impacted than their maxillary counterparts; however, Sağlam et al. reported the contrary in their study (34). The impacted ectopic teeth were reported to be a very scarce abnormality, the frequency (0.3%) of which was low in the present study.

Conclusion

The actual prevalence of tooth impaction requires a comprehensive and randomized sample of the overall population. Regarding this, a radiographic examination performed on a particular population seems to be the most convenient approach to avoid the risk of bias in the data collection. It is recommended that the future studies evaluate the etiology of teeth impaction and investigate the solutions to reduce its associated adverse effects.

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