




Prevalence of Impacted Teeth and Related Pathologies: A Retrospective Radiographic Study

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Abstract

Objective: The aim of this study was to assess the prevalence of impacted teeth and the frequency of associated pathologies by panoramic radiography retrospectively.

Methods: This study was performed on digital panoramic x-ray images of a total of 688 subjects. The presence of impacted teeth was classified as third molar, canine, premolar, and supernumerary. Impacted teeth were evaluated in terms of cysts, abscesses, or caries. Patient files were reviewed to see if the impacted teeth were asymptomatic and required removal. Descriptive analyses were performed with GraphPad Prism 8.0.

Results: Impacted teeth were present in approximately 22% of the patient group. The third molars were the most prevalent impacted teeth, with approximately 92% of all impacted teeth, followed by canines and supernumerary teeth. A pathology was detected in 38 out of 335 of the impacted teeth. Among the patient group, only 12 patients had symptomatic teeth and required removal of the impacted teeth.

Conclusion: Impacted teeth are common and can cause a pathology. The most commonly impacted teeth are third molars with a predilection for the mandible. Even though most impacted teeth remained asymptomatic, a follow-up is required to monitor possible changes in the future.

Keywords: Impacted teeth, third molars, panoramic radiography

INTRODUCTION

Impacted teeth are defined as a condition when a tooth is not able to completely erupt in the oral cavity into its functioning position without any intervention. After radiographic and clinical evaluation, when a tooth is not expected to erupt due to obstructions in the eruption pathway or positional deviations, these teeth are deemed as impacted teeth.¹

Impaction of permanent teeth can be commonly seen in clinical practice, as the reported prevalence is between 2.9% and 13.7%, differing between populations and countries.² The most frequently seen impacted teeth are third molars, canines, premolars, and central incisors.³ In terms of gender, studies report similar prevalence rates for males and females in impacted teeth, but there is a predilection for females.^{4,5} In addition, impaction severity is found to be higher for females, and especially for the maxillary canines when third molars are excluded.²

The etiology of impaction can be multifactorial, including systemic, local, and genetic factors. Systemic factors may include malnutrition, anemia, deficiency of vitamin D, endocrine diseases, and specific bacterial infections.⁶ Local factors may also vary and include trauma, ankylosis, prolonged retention of deciduous teeth or their early loss, ectopic positioning of tooth germs, presence of supernumerary teeth, odontogenic tumors or cysts, and lack of space.^{7,8}

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Panoramic radiography is the primary imaging method to detect and evaluate impacted teeth, surrounding tissues, and any possible pathologies including cysts and tumors.⁹ Especially in the evaluation of third molars, it is an important initial tool, with a specificity ranging from 96% to 98%, to determine any possible injury to surrounding vital tissues such as inferior alveolar nerve injury.¹⁰

Most often impacted teeth remain asymptomatic; however, impaction of teeth may lead to complications with different severities. Enlargement of the dental follicle space, also known as hyperplastic follicle, is a possible problem that may eventually lead to odontogenic cysts such as dentigerous cyst or odontogenic keratocyst.¹¹ Other problems may include carious lesions, infections, and resorption of adjacent tissues such as roots and marginal bone. Clinicians need to be aware of the possible outcomes of impacted teeth and their complications.

The primary objective of this retrospective study was to evaluate the prevalence of impacted teeth in a group of patients, determine the most prevalent impacted teeth, their location, and any associated clinical pathologies. The secondary objective was to assess if present pathologies were symptomatic.

MATERIAL AND METHODS

This retrospective study was approved by the Ethics Committee (Approval no. ETK00-2023-0187) and was conducted in accordance with the Helsinki Declaration of 1975 as revised in 2008. Informed consent was taken from patients before any application. Only archived data were evaluated for the study. A total of 688 patient panoramic radiographs were reviewed. All panoramic radiographs were obtained with Kavo OP 3D Pro X-ray (Kavo, Germany) and assessed with the radiographic software Cliniview 11 (Instrumentarium Dental, Finland).

The inclusion criteria were as follows: good-quality panoramic x-rays without distortion or artifacts, patients aged 19 years and older or with complete root formation, and absence of syndromes or dentofacial anomalies. Impaction of teeth was determined as the crown of the teeth was either semi- or completely covered by bone. The classification of the impacted teeth was determined as third molars, canines, premolars, incisors, and supernumerary teeth.

The pathological status of the impacted teeth was assessed with the presence of abscess/cysts or caries involving

impacted teeth and any resorption in the root of the adjacent teeth or surrounding tissues, radiographically. Caries was determined with the radiolucency in the crown or cervical border. Cyst or abscess was determined by the presence of a peri coronal radiolucency of more than 3 mm in the area of the dental follicle.¹² Patient files were also reviewed to determine if the patient presented with symptoms associated with the impacted teeth and/or if the associated teeth were removed. The radiographs were examined by an oral surgery specialist. Reproducibility was determined by evaluating the same images 2 times in a 3-week interval. Descriptive analyses were performed using GraphPad Prism 8.0 (GraphPad Software, Inc., San Diego, Calif, USA). Statistical significance was determined with the Fisher's exact test.

RESULTS

A total of 688 patient files were evaluated. Out of 688 patients, 155 patients (approximately 22%) presented with an impacted tooth. The study group consisted of 81 females and 74 males. The age distribution of the study group is given in Table 1. The average age of the study group was calculated as 32, with more than half of the patients' ages ranging between 15 and 30.

The distribution of the impacted teeth according to tooth type is shown in Figure 1. The frequency of having an impacted third molar was highest at approximately 92%, which was followed by canines (3.58%), supernumerary teeth (3.28%), and premolars (1.19%) (Figure 2). Impacted incisors were not detected in the patient group. Out of the 11 supernumerary teeth detected, premolars were more common (n=6), followed by distomolars (n=4) and mesiodens (n=1).

The distribution of impacted teeth according to location is presented in Table 2. Impacted teeth were more frequently seen in the mandible (n=189) than in the maxilla (n=146). There was a significant difference between the location of the

Table 1. Distribution of Patients with Impacted Teeth According to Age and Gender

Age Group (n)	Age Group (n)				
	15-30	31-40	41-50	51-60	60 and Above
Males	45	8	10	7	4
Females	50	7	12	6	6
Total	95	15	22	13	10

Table 2. Distribution of Impacted Teeth According to Location

	Third Molars	Canines	Premolars	Supernumerary	Total
Mandible right	85	3	0	2	90
Mandible left	93	2	1	3	99
Maxilla right	69	2	0	1	72
Maxilla left	61	5	3	5	74

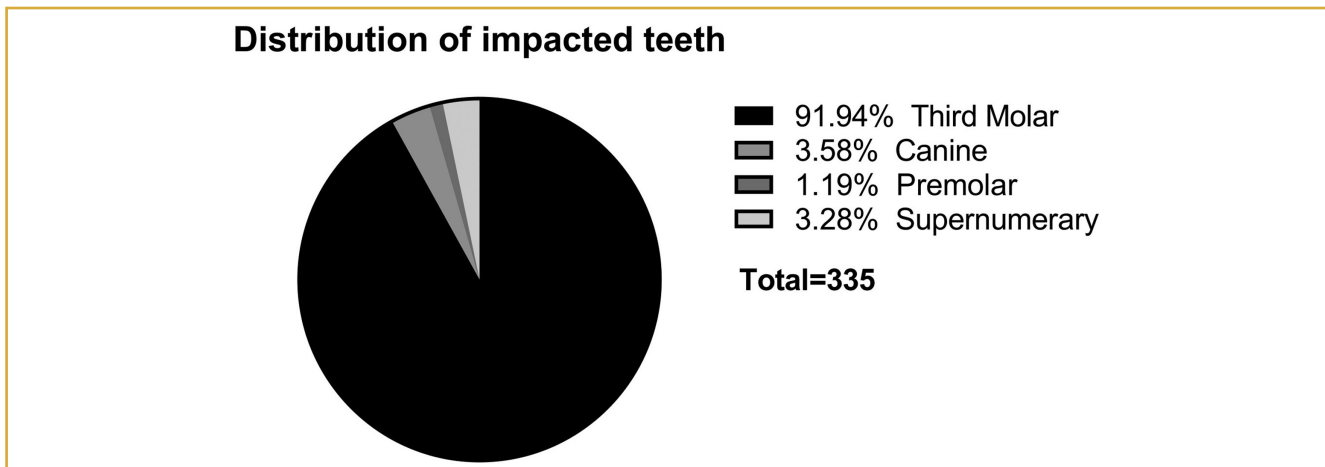


Figure 1. Distribution of impacted teeth according to tooth type.



Figure 2. An orthopantomogram of a patient with impacted supernumerary premolar and impacted third molars.

impacted teeth, with a predilection to localize in the mandible ($P=.0185$). The frequency of impacted teeth regarding the left or right side was similar between jaws.

Any pathologies involving impacted teeth were assessed in terms of cysts, abscesses, caries, or resorption. Thirty-eight impacted teeth indicated a type of pathology out of the 335 teeth, with only 12 of them giving a kind of symptom reported by the patient (Table 3). The type of pathologies was further evaluated, and the most common problem associated with impacted teeth in the study group was found to

Table 3. Presence of Pathologies in the Presence of Impacted Teeth According to Teeth Classification

	Pathologies	Symptoms
Third molars (n=308)	31	12
Canines (n=12)	4	0
Premolars (n=4)	2	0
Supernumerary (n=11)	1	0

be cysts, abscesses, and/or follicle enlargement (Table 4). Caries was the least seen problem in impacted teeth, with only 5 out of 335 teeth. Table 5 presents the distribution of pathologies according to the age groups, indicating a higher number of pathologies were present during the ages between 19 and 30.

DISCUSSION

Studies report different prevalence percentages in impacted teeth with a range between 3%–68.6% and 2.9%–13.7%.^{2,13} A recent study in a Brazilian population reported the prevalence of impaction as 38.7%,⁵ whereas a similar study on a Turkish population revealed 48.3%.¹⁴ The present study indicated a lower percentage in the study group, with only 22% having at least 1 impacted tooth. This wide range may be attributed to the heterogeneity of populations, methodology, and interpretation of data. Despite these differences between studies, dentists may encounter impacted teeth occasionally in clinical practice. Therefore, it is important to acknowledge

Table 4. Distribution of Pathologies According to Type

	Cyst/Abscesses/Follicle Enlargement	Caries	Resorption
Third molars (n= 308)	23	5	3
Canines (n= 12)	0	0	4
Premolars (n=4)	1	0	1
Supernumerary (n=11)	1	0	0
Total	25	5	8

the possibility of impacted teeth, and clinicians need to be aware of the importance of early detection and any related pathologies.

Impacted teeth were found to be more common in the mandible in the present study in accordance with previous studies.^{5,14-16} However, different studies also report a higher incidence of impacted teeth for the maxilla. Sarica et al¹⁷ reported the maxilla to be a more common site for impacted teeth. This finding may be related to the distribution of impacted teeth type; while the present study indicated 3.5% for canine impaction, the aforementioned study reported a higher percentage of impaction with 29.4% for canines in a similar number of study subjects. As canine impactions are more common in the maxilla,¹⁸ the overall impaction percentage may be influenced by the type of impacted teeth, which may explain the discrepancies between the studies.

The study group in the present study consisted of a similar number of subjects for females and males. Although there is no concrete evidence, studies are reporting a higher incidence of impacted teeth in females than in males.⁵ This may be attributed to the smaller dimension of the dental arch or jaws, which would prevent the eruption of teeth and lead to impaction to some extent.

The most significant outcome of the present study indicated a dramatic difference between the frequency of impaction according to tooth type; third molars composed approximately 92% of all impacted teeth, followed by canines (3.58%), supernumerary (3.28%), and premolars (1.19%). The impaction frequency of third molars and canines was found to be in accordance with previous studies.^{16,19} As the third molars are the last teeth to erupt into the permanent dentition, a lack of space may prevent proper eruption, resulting in partial or total impaction, which may explain the high frequency of third molar impaction. Mandibular third molar impaction is also attributed to the lack of space between the anterior border of the ramus and the distal of the second

molar in the mandible.²⁰ As canines are one of the last teeth to erupt in dentition, there may be complications during its eruption, leading to impaction. Interestingly, the frequency of premolar impaction did not follow canines as would be expected according to the literature.^{3,21} Supernumerary teeth impaction was more common than premolars, with supplemental premolars comprising the majority of supernumerary teeth in the present study. Impaction of supernumerary teeth is not uncommon, but mesiodens is the most seen type with varying percentages (36% to 80%) according to different studies.²²⁻²⁴

The presence of any type of impacted tooth may lead to different problems such as cysts, tumors, abscesses, and resorption of bone and adjacent roots. In the present study, the most frequently encountered pathology was follicle enlargement, cyst, and/or abscesses, with third molars being affected the most. According to a study conducted on impacted third molars, the prevalence of cystic development was found to have a range of 1-2.31%.²⁵ Caries was the least encountered pathology in the present study, possibly due to the impaction of the teeth as they are less exposed to the oral cavity. However, other studies report caries, widening of periodontal ligament space, and loss of lamina dura as the most frequently seen types of pathologies, whereas cysts were rarely encountered in impacted teeth.^{26,27} On the other hand, Adaki et al²⁸ conducted a histological study on specimens obtained from impacted third molars with a follicular space of less than 2.5 mm radiographically and reported cystic changes in 23.3% of the specimens. Although the development of cysts related to impacted teeth is reported to be rare, follow-up of impacted teeth regarding changes in the follicular space may prevent further progress of a possible cystic change.

The percentage of patients reporting symptoms due to impacted teeth was lower than that of impacted teeth with radiologically detected pathologies. This is in accordance with the literature, as most impacted teeth present no symptoms but are frequently diagnosed by a clinician in routine radiographs or when a delay occurs during tooth eruption.²⁹

The most commonly used radiographic methods in the diagnosis of impacted teeth are panoramic or periapical radiographs.³ A panoramic radiograph is advantageous as the whole dentition can be assessed in a single radiograph with a faster capture and less radiation. The presence and level of tooth impaction can be easily evaluated along with its relationship

Table 5. Distribution of Pathologies According to Age

Age Group n (%)	19-30	31-40	41-50	51-60	60 and Above
Abscess/cysts	16	3	3	3	—
Caries	5	—	—	—	—
Resorption	3	2	1	—	2

to neighboring vital anatomical landmarks. However, periapical radiographs are superior in terms of detecting caries which may be overlooked in panoramic radiographs when the progression of caries is not more advanced. However, it is reported that in approximately 25–36% of cases, adjacent vital structures cannot be properly imaged by intraoral radiography.³⁰ The superimposition of different structures in panoramic radiographs is another disadvantage that may prevent the detection of pathologies. Therefore, one of the limitations of the present study is related to the drawbacks of panoramic radiography. Another limitation would be related to the number of patients included in the study. A patient group with a higher number would help to profile the prevalence of impacted teeth and related possible pathologies more extensively.

CONCLUSION

In conclusion, impacted teeth are encountered frequently in dental practice, with almost one-fifth of the population according to the results of the present study. There are variances regarding the reported prevalence percentages between studies, which may be attributed to ethnic origin or the scale of the study group. Although asymptomatic, impacted teeth may lead to complications in some circumstances, such as caries, cysts, and resorption in the neighboring tissues. Therefore, monitoring impacted teeth is advised to prevent complications.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Eastern Mediterranean University. (Approval no: ETK00-2023-187, Date: 13/10/2023).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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