ADLİ TIP DERGİSİ
TURKISH JOURNAL OF FORENSIC MEDICINE

J For Med 2024;38(3):225–235
https://doi.org/10.61970/adlitip.2024.1565678
available online at: www.adlitipdergisi.com

ARAŞTIRMA MAKALESİ / ORIGINAL ARTICLE

FORENSIC DENTISTRY

The prevalence, type and severity of forensic dental cases in Türkiye

Türkiye'de meydana gelen adli diş hekimliği vakalarının prevalans, çeşit ve ciddiyet açısından değerlendirilmesi

İhsan Çağlar Çınar
0000-0002-9368-7109

ABSTRACT

Aim: The aim of this study was to assess prevalence, type and severity of forensic dental cases in Türkiye.

Materials and Methods: 620 of forensic dental cases which were referred to the Department of Dentistry of the 7th Specialization Board of the Council of Forensic Medicine, Türkiye,, between April 2019 and March 2024 evaluated retrospectively. Malpractice and complication occurance were determined, type and severity of cases analysed as well in six grades.

Results: 69.7% of the cases were female (n=432), and 30.3% were male (n=188), (p<0.05). 75% of the claims has decided as complication and 25% of them decided as malpractice by the board (p<0.05). 52.1% of the cases underwent surgery, patients received orthodontic, prosthetic, and endodontic treatment 13.5%, 21.5% and 12.9% respectively (p<0.05). The second level severity was the most common with 41.9%, while the sixth level was the least common with 1.5% (p<0.05).

Conclusion: Within the limits of this study, the most common failure following dental procedures were surgical treatments and second level of severity had the highest incidence. While many of the failures have been considered as complications by the board, it should not be overlooked that in recent years, there has been an increase in malpractice claims.

Keywords: *Forensic dental case, malpractice, complication*

ÖZET

Amaç: Bu çalışmanın amacı Türkiye'de meydana gelen adli diş hekimliği vakalarının prevalans, çeşit ve ciddiyet açısından değerlendirilmesidir.

Yöntem: 2019 Nisan-2024 Mart arasında Adli Tıp Kurumu 7. İhtisas Kurulu diş hekimliği bölümüne gönderilmiş 620 adli dental vaka geriye dönük olarak incelenmiştir. Komplikasyon ve malpraktis kararları ve vakaların çeşitlerinin yanısıra vakaların ciddiyeti de 6 seviyede değerlendirilmiştir.

Bulgular: Vakaların %69.7'si (n=432) kadın, %30.3'ü (n=188) ise erkektir (p<0.05). Konsey tarafından vakaların %75'i komplikasyon, %25'i ise malpraktis olarak sonuca bağlanmıştır (p<0.05). Vakalar içerisinde cerrahi işlemlerin oranı %52.1 iken, ortodontik protetik ve endodontik vakaların oranı ise sırasıyla %13.5, %21.5 ve %12.9'dur (p<0.05). Vakaların ciddiyeti açısından 2. seviye %41.9 ile en sık görülürken en az görülen %1.5 ile 6. seviyedir (p<0.05).

Sonuç: Bu çalışmanın sınırları dahilinde adli diş hekimliği vakalarında cerrahi işlemler ve ciddiyet açısından 2. seviye başarısızlıklar en sık görülen prosedürlerdir. Vakaların büyük bir kısmı konsey tarafından komplikasyon olarak sonuca bağlanmış olsa da son yıllarda malpraktis davalarındaki büyük artış akıldan çıkartılmamalıdır.

Anahtar Kelimeler: *Adli diş hekimliği, malpraktis, komplikasyon*

Cite as: Çınar İÇ. The prevalence, type and severity of forensic dental cases in Türkiye. J For Med 2024;38(3):225–235

Received: 11.10.2024 • **Accepted:** 02.12.2024

Corresponding Author: İhsan Çağlar Çınar, Department of Oral Implantology, Faculty of Dentistry, Istanbul University, Fatih, Istanbul, Türkiye
E-mail: cinarcaglar@gmail.com

Department of Oral Implantology, Faculty of Dentistry, Istanbul University, Fatih, Istanbul, Türkiye

INTRODUCTION

Dentistry is a complex branch of medicine encompassing various fields such as surgery, prosthodontics, orthodontics, and endodontics, each with its unique techniques and challenges. Any situation that arises beyond the expected recovery after the procedure, any unexpected outcome is classified as a complication or malpractice (1, 2). Appropriate indications, proper techniques, and the management of adverse events are essential criteria for distinguishing between complication and malpractice. In recent years, there has been a growing number of lawsuits filed between healthcare professionals and patients due to these adverse events (3).

After dental procedures, patient satisfaction, dentists' professional liabilities, and resulting legal processes have recently become major concerns worldwide. The increase in malpractice cases not only leads to changes in physicians' treatment approaches but also disrupts patients' access to the necessary treatment. Most allegations in lawsuits against dentists are related to deficiencies in practice and/or the occurrence of postoperative complications. Delays or mistakes in diagnosis and the recurrence or persistence of the disease are other bases for allegations (4, 5).

During the legal process, distinctions between complications and malpractice are determined based on expert opinions and reports provided by the Forensic Medicine Institution (FMI). In Türkiye, if a patient complains about a dentist, he/she can go to court and sue. Afterward, the patient is generally referred to the dentistry faculty for a thorough and precise examination and the results are then sent to the court. In some cases, judges are not satisfied with these reports and may refer file to the FMI for a more accurate decision. In the FMI, the documents are reviewed by specialized medical commissioners, and the final decision is then sent to the court.

The prevalence, type, and severity of postoperative failures are influenced by various factors, such as the patient's age, gender, anatomical considerations, the knowledge and experience of the performing dentist, the patient's systemic condition, and other factors like smoking (6). Conditions that increase the risk of morbidity, such as bleeding disorders, cardiac problems, and diabetes, should be thoroughly examined before the procedure, and consultation with the patient's physician should be sought when necessary (7, 8). Numerous studies in the literature emphasize the correlation between the success of dental procedures and the patient's existing systemic condition (9-12). Before the procedure, necessary clinical and radiological investigations should be conducted, comprehensive information about potential risk factors should be obtained, and the patient should be adequately informed. The patient's treatment expectations and treatment's ability can meet these expectations, and potential adverse events that may occur during the process should be documented and stored with the informed consent form (13).

There are limited number of studies in the literature regarding the evaluation of postoperative failures in dental procedures as complication or malpractice, and the ratio of postoperative adverse events associated with different procedures. Furthermore, healthcare professionals can benefit from conducting a preoperative assessment of potential risk factors to reduce postoperative failures. Therefore, this study aims to assess and classify forensic cases resulting from dental procedures that have been referred to and adjudicated by the FMI.

MATERIALS AND METHODS

The retrospective study was conducted on a total of 620 dentistry cases referred to the Department of Dentistry of the between April 2019 and March 2024. The study was approved by the Committee of Education and Scientific Research, Council of Forensic Medicine, under the reference number 21589509/2022/1057. Forensic cases due to failures following surgical, prosthetic, orthodontic, and endodontic procedures in dentistry were examined in this study. After reviewing expert reports and the available data, these cases were referred to court as complication or malpractice based on the decision of the FMI's 7th Specialization Board. The study did not include pediatric dentistry cases involving individuals under the age of 13.

Categorization of Data

Failures were evaluated in four primary categories: surgical, prosthetic, orthodontic, and endodontic. Surgical failures included tooth extraction, bone graft procedures, implant treatment, orthognathic surgery, and periodontal surgery. Prosthetic failures include aesthetic deficiencies related to restorations, problems such as cracking, occlusal relationship disorders, and issues arising from poorly fitted prosthetics. Endodontic failures included incorrect or incomplete root canal therapy, file fracture in the root canal, and accidental injection of sodium hypochlorite (NaOCL) for anesthesia during treatment. Orthodontic failures were classified as dissatisfaction with the aesthetic outcome of the treatment, occlusal discrepancies, and resorptions occurring in the roots of the teeth.

Classification of postoperative failures

Based on the impact of routine daily activities and the severity the recorded postoperative failures were classified into one of six groups.

Grade I failures

Localized failures were those that do not significantly impact the success of the applied dental procedure. Instances in this category included minor bleeding, increased sensitivity, prolonged swelling, and delayed wound healing.

Grade II failures

Localized failures were those that affect the success of the performed dental procedure. Complications such as exposure of the membrane used in bone augmentation procedures, necrosis of the bone graft, implant failure, fracture of the file during endodontic therapy, cracking of prosthetic restoration, poorly obturated root canals, inappropriate occlusion or root resorption after orthodontic treatment, the opening of the wound area, migration of tooth/implant to neighbouring anatomical structures, and gingival recession have been classified as level 2 complications.

Grade III failures

These localized and/or systemic failures represent conditions those were observed either locally or systemically, adversely affecting the patient's daily life but not requiring hospitalization. Examples of such conditions included jaw fracture, poorly fitted dental restorations, fever, sinusitis, trismus, excessive bleeding, and similar situations.

Grade IV failures

These were conditions observed either locally or systemically, which not only negatively impact the patient's daily life but also require hospitalization. Conditions such as sepsis and anaphylaxis fell into this category.

Grade V failures

These were situations where one or more anatomical structures incur irreversible damage. Examples within this category include nerve injuries, NaOCL injection, and squamous cell carcinoma due to poorly fitted prosthetics.

Grade VI failures

Failures resulting in the patient's death were classified as Level 6.

Statistical analyses

The data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) 26.0 Statistics package program. The normal distribution of severity levels in cases was evaluated using skewness and kurtosis values. It was observed that all of these values followed the rules of a normal distribution, with the reference value falling within ±1.5.

Independent Sample T Test and One Way ANOVA tests were used to compare severity levels based on gender, age, smoking status, applied treatment, and complication/malpractice occurrences for all cases and different procedure groups (surgical, orthodontic, prosthetic, and endodontic). Post Hoc Tests were employed to analyze differences between groups. The Chi-square test was used to explore associations between gender, age, smoking status, applied treatment, procedure type, severity levels, and occurrences of complication/malpractice occurrences for all cases and cases within different procedure groups. Throughout the study, the significance levels were set at 0.05 and 0.01.

RESULTS

The study included 620 cases, 69.7% of the cases were female (432), and 30.3% were male (188). 32.1% of the cases were in the 18-35 age range, 35.8% were in the 36-50 age range, and 32.1% were 51 or older. A quarter of the cases did not smoke, while 18.9% smoked fewer than 10 cigarettes per day, and 56.6% smoked 10 or more cigarettes per day. The mean age of dentists was 36.5 years with a range of 28–58 years old. All the cases involved Turkish dentists. Out of 620 dentists, 405 (65.3%) were men and 215 (34.7%) were women. The majority of complaints (88.3%) were related to the private sector, with 61.9% of the cases, against private solo-practice clinics, 10.9% against polyclinics, and 15.5% against medical centers. The remaining complaints (11.7%) pertained to the governmental sector.

52.1% of the cases underwent surgery, 13.5% received orthodontic, 21.5% received prosthetic, and 12.9% received endodontic treatment. When analyzing the severity grades of forensic cases, the second level was the most common with 41.9%, while the sixth level was the least common with 1.5%. Table 1 provides the overall descriptive features of forensic dental cases.

Table 1. Descriptive Analysis of Forensic Dental Cases

Descriptive Features		Number	%
Gender	Female	432	69,7
	Male	188	30,3
Age	18-35 years old	199	32,1
	36-50 years old	222	35,8
	51 years and above	199	32,1
Smoking Habits	Non	152	24,5
	<10	117	18,9
	10>	351	56,6
Procedure Type	Surgery	323	52,1
	Orthodontic	84	13,5
	Prosthetic	133	21,5
	Endodontic	80	12,9
Severity Grade	I	102	16,5
	II	260	41,9
	III	83	13,4
	IV	79	12,7
	V	87	14,0
	VI	9	1,5
Complication/ Malpractice Status	Complication	465	75,0
	Malpractice	155	25,0
	Total	620	100

The comparison of severity levels of forensic cases based on gender, age, smoking habits, procedure type, and the occurrence of complications/ malpractice was shown in Table 2.

Table 2. Comparison of Severity Grades of Forensic Dental Cases Based on Descriptive Features

Descriptive Features		Mean	Standard Deviation	P-Value
Gender	Female	2,71	1,34	0,886
	male	2,69	1,37	
Age	18-35 years old	2,55	1,28	0,156
	36-50 years old	2,79	1,41	
	51 years and above	2,76	1,33	
Smoking Habits	Non	2,61	1,40	0,303
	<10	2,86	1,37	
	10>	2,69	1,31	
Procedure Type	Surgery[a]	2,90	1,44	**0,000****
	Orthodontic[b]	2,27	1,05	**Difference: a, d > b, c**
	Prosthetic[c]	2,27	0,99	
	Endodontic[d]	3,06	1,48	
Complication/ Malpractice Status	Complication	2,54	1,29	**0,000****
	Malpractice	3,19	1,39	

*p<0.05, **p<0.01, t: Independent Sample T Test (Gender and Comp./Malp.), F: One Way ANOVA, Difference: Post Hoc Tests[a]

The severity levels among forensic cases were found not to have a significant difference based on gender, age, and smoking status (p>0.05). Although there was no statistical difference, it can be noted, especially for cases in the 18-35 age group, that the severity grades were lower compared to other age groups. The severity-level of surgical (2.90) and endodontic (3.06) groups were higher than the orthodontic (2.27) and prosthetic (2.27) groups (p<0.05). The severity level for cases with complications was on average 2.54, while the average severity grade for cases involving malpractice was 3.19 (p<0.05).

The comparison of complications/malpractice occurrences among cases based on gender, age, smoking habits, and applied treatment was presented in Table 3.

There was no significant difference in complications/ malpractice occurrences among cases based on gender, age, smoking habits, and applied treatment (p>0.05).

Table 3. Comparison of Complications/Malpractice Occurrences of Forensic Dental Cases Based on Descriptive Features

Descriptive Features		Complication (n:465)		Malpractice (n:155)		
		N	%	n	%	p
Gender	Female	331	76,6	101	23,4	0,190
	Male	134	71,3	54	28,7	
Age	18-35 years old	153	76,9	46	23,1	0,451
	36-50 years old	160	72,1	62	27,9	
	51 years and above	152	76,4	47	23,6	
Smoking habits	Non	116	76,3	36	23,7	0,830
	<10	89	76,1	28	23,9	
	10>	260	74,1	91	25,9	
Procedure Type	Surgery	249	77,1	74	22,9	0,096
	Orthodontic	67	79,8	17	20,2	
	Prosthetic	97	72,9	36	27,1	
	Endodontic	52	65,0	28	35,0	

*p<0.05, **p<0.01, $\chi 2$: Chi-square test (Categorical data)

Table 4. Comparison of Severity Grades of Surgical Forensic Cases

Descriptive Features		Mean	Standard Deviation	p-Value
Gender	Female	2,89	1,46	0,556
	Male	3,00	1,50	
Age	18-35 years old	2,74	1,41	0,463
	36-50 years old	2,95	1,48	
	51 years and above	3,01	1,49	
Procedure Type	Tooth Extraction	2,98	1,50	0,937
	Implant	2,92	1,50	
	Bone Graft	2,73	1,40	
	Orthognathic	2,86	1,37	
	Periodontal Surgery	3,00	1,60	
Complication/Malpractice Status	Complication	2,74	1,43	0,000**
	Malpractice	3,58	1,40	

*p<0.05, **p<0.01, t: Independent Sample T Test (Gender and Comp./Malp.), F: One Way ANOVA (Age and Failure Type).

The comparison of severity grades among cases treated with surgical procedures based on gender, age, procedure type, and complications/malpractice occurrences was presented in Table 4.

There were no significant differences in the severity grades among cases based on gender, age, and procedure type (p>0.05). However, a significant difference was observed in the severity levels among cases based on the occurrence of complications/malpractice (p<0.05). The average severity grade for cases with complications was 2.74, while the average severity grade for cases with malpractice was 3.58.

The comparison of complications/malpractice occurrences in cases undergoing surgical procedures based on gender, age, and procedure type was presented in Table 5.

There were no significant differences among cases in terms of complications/malpractice occurrences based on gender, age, and procedure type (p>0.05). Despite the lack of a statistical difference, it can be noted that particularly cases undergoing implant treatment had a higher incidence of malpractice occurrences compared to other types of procedures.

The comparison of complications/malpractice occurrences in cases undergoing orthodontic treatment based on gender, age, and procedure type was presented in Table 6.

Table 5. Comparison of Complications/Malpractice Incidence in Surgical Forensic Cases

		Complication (n:252)		Malpractice (n:71)		
Descriptive Features		**N**	**%**	**n**	**%**	**p**
Gender	Female	180	76,6	55	23,4	0,313
	Male	72	81,8	16	18,2	
Age	18-35 years old	60	76,9	18	23,1	0,778
	36-50 years old	104	80,0	26	20,0	
	51 years and above	88	76,5	27	23,5	
Type of failure	Tooth Extraction	90	76,3	28	23,7	0,129
	Implant	73	73,0	27	27,0	
	Bone Graft	25	96,2	1	3,8	
	Orthognathic	45	80,4	11	19,6	
	Periodontal Surgery	19	82,6	4	17,4	

*p<0.05, **p<0.01, $\chi 2$: Chi-square test (Categorical data)

Table 6. Comparison of Complications/Malpractice Incidence in Orthodontic Forensic Cases

		Complication (n:71)		Malpractice (n:13)		
Descriptive Features		**n**	**%**	**n**	**%**	**p**
Gender	Female	54	90,0	6	10,0	0,028*
	Male	17	70,8	7	29,2	
Age	18-35 years old	57	83,8	11	16,2	0,527
	36-50 years old	8	80,0	2	20,0	
	51 years and above	6	100,0	0	0,0	
Type of Failure	Aesthetic	38	84,4	7	15,6	0,002**
	Occlusion	28	96,6	1	3,4	
	Resorption	5	50,0	5	50,0	

*p<0.05, **p<0.01, $\chi 2$: Chi-square test (Categorical data)

Table 7. Comparison of Complications/Malpractice Incidence in Prosthetic Forensic Cases

		Complication (n:99)		Malpractice (n:34)		
Descriptive Features		**N**	**%**	**n**	**%**	**p**
Gender	Female	76	80,9	18	19,1	0,044*
	Male	23	59,0	16	41,0	
Age	18-35 years old	14	70,0	6	30,0	0,884
	36-50 years old	37	75,5	12	24,5	
	51 years and above	48	75,0	16	25,0	
Procedure Type	Aesthetic	36	73,5	13	26,5	0,002**
	Fracture	24	75,0	8	25,0	
	Occlusion	25	78,1	7	21,9	
	Poorly-Fitted	14	70,0	6	30,0	

*p<0.05, **p<0.01, $\chi 2$: Chi-square test (Categorical data).

There was no significant difference between complication/malpractice occurrences and the age of cases (p>0.05). However malpractice occurrences in female cases were higher compared to males, and malpractice occurrences in cases with the type of resorption were higher compared to aesthetic and occlusion cases (p<0.05).

The comparison of complications/malpractice occurrences in cases undergoing prosthetic procedures based on gender, age, and procedure type was presented in Table 7.

There was no significant difference in the complications/malpractice occurrences in cases

Table 8. Comparison of Complications/Malpractice Incidence in Endodontic Forensic Cases

		Complication (n:43)		Malpractice (n:37)		
Descriptive Features		**n**	**%**	**n**	**%**	**p**
Gender	Female	25	58,1	18	41,9	0,396
	Male	18	48,6	19	51,4	
Age	18-35 years old	16	48,5	17	51,5	0,731
	36-50 years old	19	57,6	14	42,4	
	51 years and above	8	57,1	6	42,9	
Procedure Type	File Fracture	26	83,9	5	16,1	0,000**
	Poorly Obturated Root Canal	15	44,1	19	55,9	
	NaOCl Injection	2	13,3	13	86,7	

**p<0.05, **p<0.01, χ2: Chi-square test (Categorical data).*

based on age (p>0.05). Malpractice occurrence was higher in female and poorly fitting prostheses group (p<0.05).

The comparison of complications/malpractice occurrences in cases undergoing endodontic procedures, based on gender, age, and procedure type was presented in Table 8.

There was no significant difference in complications/malpractice occurrences in cases based on gender and age (p>0.05). The occurrence of malpractice in cases with NaOCL injection was higher compared to file fractures and poorly obturated root canals (p<0.05).

DISCUSSION

In this study, dental procedures that were referred to the FMI 7th Specialization Board were retrospectively evaluated. The study examined the demographic characteristics of forensic cases, the practitioners involved, complications/malpractice decisions by the board, and the content and severity of cases were examined. There are limited studies on the prevalence, type, and severity of dental claims in Türkiye. Analyzing the content of forensic cases and the decisions made can provide practitioners with the necessary knowledge, enabling them to feel more secure in their procedures and ensuring patients receive better treatment by considering potential risk factors.

Rehabilitating oral health, especially in advanced and complex cases, requires meticulous planning, appropriate clinical skills, and high technical standards. While an acceptable outcome is the target for any dental treatment, failure, injuries, and dissatisfaction may happen (14, 15). When any of these situations happen they could be considered malpractice, leading to medico-legal and ethical implications. Dentists, like other healthcare professionals, strive to restore their patients' health; however, despite their best efforts, various failures can occur after procedures. Recently, similar to other medical fields, dentistry has experienced a rise in the number of legal processes due to patients' expectations and adverse treatment outcomes. Numerous international data about the complaints against doctors in various countries around the world reflect the fact that regardless of significant progress in new technologies and science concerning therapeutic procedures and diagnostics, complaints are increasing, making it a significant concern in the field of medicine, not only in Türkiye but also worldwide (16-18). This problem is influenced by several factors including the overgrowth of medical graduates, the economic status of doctors encouraging them to try high-risk operations, and the involvement of insurance companies and lawyers. Additionally, the growing population and increased patient awareness about their rights might be other reasons for the rise in patient claims. The raising of complaints is a global issue, with changing levels of severity in different countries. For instance, in the US, 3-4% of all doctors received complaints in 1970, 20% and 25% in 1980 and 1990 respectively (19).

More than half of the 620 cases examined in the study were associated with surgical procedures. Failures

related to tooth extraction, implant applications, orthognathic surgery, bone graft applications, and periodontal surgical procedures are documented. Oral surgical procedures are inherently prone to complications, as many treatments are applied close to important anatomical structures. In the study, the most commonly encountered failures in the oral surgery group were related to tooth extractions, particularly complications such as jaw fractures, temporary/permanent paraesthesia in the tongue and/or lips, and displacement of the tooth into adjacent anatomical structures during the extraction.

Wafa Al Ammar et al. (20) found 32 claims against dentists in 1997. The majority of complaints were related to surgical procedures. In Washington, the occurrence of paraesthesia following surgical extraction of mandibular wisdom teeth was 25% of the claims in 1984. In another study, it was found that oral surgery claims were 18.8% in 1988 and increased to 31.8% in 1991 (21).

In recent years, the use of dental implant applications has significantly increased worldwide. The number of patients expecting implants has risen, leading not only specialist implantologists but also general practitioners to frequently initiate implant procedures. This trend has also brought about numerous failures after implant applications. Mellor et al. (22) declared that implants and oral surgeries are associated with more claims compared to other treatments.

Pogrel and Tamby and his colleagues (23) reported in their study of 163 patients that inferior alveolar or lingual nerve injuries were significantly more common in women than in men. The surgical procedures most frequently causing nerve damage were, in order, third molar extraction, implant surgery, and orthognathic surgery. Tay et al. (24) in their study of 59 patients, found that the most common etiology of trigeminal nerve injuries was lower third molar surgery (52.1%).

In the study, 252 cases of oral surgical complications were identified, with 71 cases evaluated as malpractice. Tooth extraction and implant cases were the most common issues in malpractice decisions. The board evaluates the appropriate management of failures that occur alongside accurate indications and techniques, influencing malpractice decisions, and basing its judgment on these three parameters. Cases involving inadequate management of paraesthesia after tooth extraction and implant surgeries, measurement errors in implant treatment planning, and overlooking jaw fractures following the extraction of mandibular wisdom teeth were the most frequent malpractice decisions. While there was no significant difference in the severity levels of cases and treatments among the group undergoing oral surgery, the severity level in cases receiving malpractice decisions was significantly higher compared to cases receiving complication decisions. We believed that malpractice decisions were not solely based on severity but were influenced by an increase in severity, especially in cases where anatomical damage or failure was not appropriately managed due to faulty planning.

In our study, the rate of malpractice observed in the group undergoing orthodontic treatment was found to be significantly higher in women and in cases where resorption failure occurred in tooth roots, compared to groups where aesthetic and occlusal failures were observed. Resorption occurring in tooth roots as a result of incorrect orthodontic force application can lead to tooth loss, and this plays a role in categorizing failures as malpractice. The rate of malpractice observed in the group undergoing prosthetic rehabilitation was significantly higher in women and in the group where poorly-fitted prostheses were applied, compared to groups with aesthetic, fracture, and occlusal failures. Kiani et al (25) reported that the majority of patients' complaints were related to fixed prosthodontics (27.8%). Rene and Owall (26) showed that prosthodontics is involved in patient claims more frequently than other disciplines. Lopez-Nicolas et al. (27) stated that the highest incidence of patients' clinical complaint cases involved prosthetic cases (42.85%).

Prosthetic procedures are complex practices where doctors collaborate with technicians, usually involving high treatment costs and patient expectations. Poorly fitted prostheses can lead to life-threatening issues such as pre-cancerous or squamous cell carcinoma in soft tissue. Additionally, failure to address patient expectations and complaints related to poorly fitted

prostheses may give rise to the perception that the resulting failure has not been managed well enough, leading to more frequent malpractice decisions.

In the study, women sued more than men (69.7%), which is similar to the results of a study by René and Owall (26) and many other studies in the literature (27-30). This could be explained by the fact that women use dental services more than men; therefore, they face a greater risk of treatment failure.

In the group where endodontic treatment was applied, the highest malpractice rate was observed in the group where NaOCL injection was performed. NaOCL is an agent with high toxicity used in the irrigation of infected root canals. Its inadvertent application as a local anesthetic can have serious adverse effects on the patient, leading to necrosis in soft and/or bone tissue. The physician should always be very careful about this issue.

To categorize the impact of certain failures on treatment outcomes and patient well-being, according to level of severity, we proposed a six-grade classification. The highest incidence of the reported failures pertained to Grade II. In this group, there were various failures such as; implant failure, exposure of membrane, inappropriate occlusion or root resorption following orthodontic therapy, gingival recession, cracking of prosthetic restoration, migration of tooth/implant to neighbouring anatomical structures, opening wound area, fracture of file and poorly obturated root canals. Failures in implant applications, dissatisfaction resulting from prosthetic restorations, undesired tooth movements occurring during orthodontic treatment, the generally high costs of these treatments, and patients' high expectations could explain why this group has the highest incidence.

In the study, cases where death occurred were categorized as Grade VI, and there were 9 cases out of 620 (1.5%). 5 patients died due to a heart attack during the procedure; multiple organ failure was developed in 2 patients after the operation; 1 patient died from mucormycosis; and 1 patient died from brain hemorrhage. None of these cases resulted in a malpractice decision, and they were all considered complications. To minimize the risk of such adverse events, patients need to consult with their doctors. Their systemic conditions, medications, and possible interactions of these medications should be carefully examined, and necessary consultations should be made. This is not only important for preventing potential complications but also a legal responsibility of the physicians. Ozdemir et al. (31) showed that complaints included treatment malpractices, malpractice in diagnosis, lack of consultation, not obtaining informed consent, and lack of follow-up.

56.6% of the cases examined consisted of patients who smoked 10 or more cigarettes a day. Smoking not only leads to atherosclerosis in the vascular structure, disrupting blood flow and nutrition, but also, as a result of the direct contact effect of cigarette smoke, particularly after oral procedures, it may lead to prolonged healing, infection of the wound or graft material, membrane exposure, and many other adverse effects, especially after surgical procedures. Moreover, smoking has been extensively associated with an effect on host response by reducing neutrophil and phagocytosis (32).

Zambon et al. (33) declared that the risk of subgingival infection in heavy smokers (≥10 per day) is 2.3 times more than in non-smokers. Smoking was also associated with early membrane exposure (5.4%), excessive pain (11.1%), flap dehiscence (8.0%) in GBR, and prolonged wound healing in guided tissue regeneration (7.6%).

The majority of the files examined in the study belong to physicians working in the private sector. Many claims were against private dental offices; the level of the higher socioeconomic level of patients and costs could be the reason for this; patients expect high-quality treatments from these offices and dentists.

Despite the inclusion of 620 claims, the present paper has some limitations. Since the patients' medical history data were not available in the case files, their systemic conditions could not be evaluated. In some cases, the treatment administered to the patients, which was the subject of the complaint, had been corrected or renewed by another physician. Therefore, the final condition could not be observed during the follow-up examination,

and decisions had to be made based on X-rays and photographs submitted to the board. Additionally, while measuring the degree of sensitivity and pain, no objective scale was used. Parameters such as an emergency visit to the office due to pain were used to assess different grades of pain.

CONCLUSION

When considering the limitations of this study, it is noted that the most common failures following dental procedures are surgical and prosthetic procedures. While many of the failures have been considered as complications, it should not be overlooked that in recent years, there has been an increase in malpractice cases due to the rising treatment expectations of patients and increased involvement of lawyers and insurance companies in the matter. Proper medical history taking, informed consent, conducting necessary consultations, having adequate technical knowledge related to the treatment to be applied, documenting medical records, and showing necessary care in following up on the resulting failures will reduce the likelihood of physicians facing legal proceedings.

I would like to thank Dr. Hizir Asliyuksek and Dr. Caner Beskoc for their assistance in the collection and analysis of data in this study.

Ethics approval and consent to participate: *The study was approved by the Education and Scientific Research, Council of Forensic Medicine Ethics Committee (date and number 05.12.2022/21589509/2022/1057*

Competing interests: *No competing interests are declared by the authors.*

Funding: *No funding was received from any source for the completion of this work*

REFERENCES

1. Yamalik N, Perea-Pérez B. Patient safety and dentistry: what do we need to know? Fundamentals of patient safety, the safety culture and implementation of patient safety measures in dental practice. Int Dent J. 2012;62:189–196. https://doi.org/10.1111/j.1875-595X.2012.00119.x
2. Tiwana KK, Morton T, Tiwana PS. Aspiration and ingestion in dental practice: a 10-year institutional review. J Am Dent Assoc. 2004;135:1287–1291. https://doi.org/10.14219/jada.archive.2004.0404
3. Thusu S, Panesar S, Bedi R. Patient safety in dentistry –state of play as revealed by a national database of errors. Br Dent J. 2012;213:E3. https://doi.org/10.1038/sj.bdj.2012.669
4. Swanson AE. Removing the mandibular third molar: neurosensory deficits and consequent litigation. J Can Dent Assoc. 1989;55(5):383–386.
5. Sjostron O. No-fault-compensation, patient guarantee, peer review committees: the Swedish experience. Int Dent J. 1990;40:103–108.
6. Freire MO, Van Dyke TE. Natural resolution of inflammation. Periodontol 2000. 2013;63:149–164. https://doi.org/10.1111/prd.12034
7. Mei CC, Lee FY, Yeh HC. Assessment of pain perception following periodontal and implant surgeries. J Clin Periodontol. 2016;43:1151–1159. https://doi.org/10.1111/jcpe.12618
8. Lodi G, Figini L, Sardella A, Carrassi A, Del Fabbro M, Furness S. Antibiotics to prevent complications following tooth extractions. Cochrane Database Syst Rev. 2012;11:CD003811. https://doi.org/10.1002/14651858.CD003811.pub2
9. Scully C. Medical problems in dentistry, 6th ed. London: Churchill Livingstone; 2010.
10. National Institute for Health and Care Excellence. Antimicrobial prophylaxis against infective endocarditis. London: NICE; 2008.
11. North West Medicines Information Centre. Surgical management of the primary care dental patient on antiplatelet medication. Liverpool: North West Medicines Information Centre; 2009.
12. Griffiths M, Scully C. New anticoagulants. Br Dent J. 2012;213:96. https://doi.org/10.1038/sj.bdj.2012.674
13. Kalantari F, Saeidimehr S, Rahim F. Medical specialties at high risk of litigation in Iran, 1991e2011: a systematic review of 24 studies. J Med Sci. 2012;12:248e55. https://doi.org/10.3923/jms.2012.248.255
14. Conrad DA, Whitney C, Milgrom P, O_Hara D, Ammons R, Fiset W, Vesneski W. Malpractice premiums in 1992: results of a national survey of dentists. J Am Dental Assoc. 1995;126:1045–1056. https://doi.org/10.14219/jada.archive.1995.0283
15. Keeling SD, Martin CS. The malpractice morass and practice activities of orthodontists. Am J Orthodont Dentofacial Orthopedic. 1990;97:229–239. https://doi.org/10.1016/S0889-5406(05)80056-3
16. Hapcook CP Sr. Dental malpractice claims: percentages and procedures. J Am Dent Assoc. 2006;137:1444–1445. https://doi.org/10.14219/jada.archive.2006.0059
17. Clark N, Paquin N, Nevin J. Dental malpractice baseline data from insurance claims closed in 1970, with analyses. Public Health Rep. 1984;99:87–93.
18. Griangrego E, Johnson B, Dwyer B. Emphasis: the liability issue protecting the profession. J Am Dent Assoc. 1986;112:607. https://doi.org/10.14219/jada.archive.1986.0085
19. Medical malpractice, from world of health; 2007. http://www.bookrags.com/ research/medical-malpractice-woh/ [Accessed: 09.07.07]
20. Al Ammar W, Guile E. A one-year survey of dental malpractice claims in Riyadh. Saudi Dental J. 2000;12:95–99.
21. The statistics on dental malpractice claims. Am Dent Assoc; 2007. http://www.ada.org/prof/resources/topics/riskmanagement_survey.pdf [Accessed: 09.07.07]

22. Mellor AC, Milgrom P. Prevalence of complaints by patients against general dental practitioners in greater Manchester. Br Dent J. 1995;178:249–253. https://doi.org/10.1038/sj.bdj.4808726

23. Pogrel MA, Thamby S. The aetiology of altered sensation in the inferior alveolar, lingual, and mental nerves as a result of dental treatment. J Calif Dent Assoc 1999:27:531-538. https://doi.org/10.1080/19424396.2016.12221149

24. B. G. Tay, J. R. Zuniga: Clinical characteristics of trigeminal nerve injury referrals to a university centre. Int. J. Oral Maxillofac. Surg. 2007;36:922–927. https://doi.org/10.1016/j.ijom.2007.03.012

25. Kiani, M.;Sheikhazadi, A. A five-year survey for dental malpractice claims in Tehran, Iran. J. Forensic Leg. Med. 2009, 16, 76-82. https://doi.org/10.1016/j.jflm.2008.08.016

26. Rene N, Owall B. Malpractice reports in prosthodontics in Sweden. Swed Dent J. 1991;15:205e17.

27. Lopez-Nicolas M, Falcón M, Perez-Carceles MD, Osuna E, Luna A. The role of a professional dental organization in the resolution of malpractice claims the Professional dentist college in the region of Murcia (Spain) . Med Law. 2011;30:55e63.

28. Poloson GJ, Gee NJ. The essentials of forensic medicine, 5th ed. Oxford: Pergamon Press; 1985. p. 105e15.

29. Robert D, Dripps Leroy D, Vandam James E, Eckenhoff F. Introduction to anesthesia, the principles of safe practice. 6th ed. Philadelphia and London: W. B. Saunders, Elsevier; 1982. p. 124e8 Chapter 6.

30. Abasi M. Collection of medical law. Tehran, Iran: Juridical Press; 1996.

31. Ozdemir MH, Saracoglu A, Ozdemir AU, Ergonen AT. Dental malpractice cases in Turkey during 1991e2000. J Clin Forensic Med. 2005;12:137e42. https://doi.org/10.1016/j.jcfm.2005.01.003

32. MacFarlane GD, Herzberg MC, Wolff LF, Hardie NA. Refractory periodontitis associated with abnormal polymorphonuclear leukocyte phagocytosis and cigarette smoking. J Periodontol. 1992;63:908–913. https://doi.org/10.1902/jop.1992.63.11.908

33. Zambon JJ, Grossi SG, Machtei EE, Ho AW, Dunford R, Genco RJ. Cigarette smoking increases the risk for subgingival infection with periodontal pathogens. J Periodontol. 1996;67(Suppl. 10S):1050–1054. https://doi.org/10.1902/jop.1996.67.10s.1050