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Evaluation of dentists' malpractice fears and defensive dentistry attitudes: a scale development

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Abstract

Objectives To develop and design the Defensive Dentistry Attitude Scale (DDAS) to evaluate the relationship between defensive dentistry and fear of malpractice among dentists in Türkiye.

Methods The Defensive Dentistry Assessment Scale (DDAS) questions were determined based on expert opinions and a literature review. Based on these results, a questionnaire including the 13-item DDAS and the malpractice fear scale was sent to 3513 dentists in Türkiye by email between 3.11.2023 and 10.1.2024. A total of 369 dentists returned. The questionnaire consisted of 26 questions with two VAS scales related to the frequency of complications and detailed anamnesis. During the development of DDAS, the Content Validity Index (CVI), Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) were utilized. The Mann–Whitney U and Kruskal–Wallis tests were employed for group comparisons. In examining the relationships between variables, path analysis within the structural equation modeling (SEM) framework was conducted.

Results The DDAS developed in the study was a valid and reliable measure with two dimensions and eight items. DDAS (Median = 29) and malpractice fear scores (Median = 21) were high in dentists. Malpractice fear scores of dentists aged 29–35 years (Median = 21) were found to be statistically significantly higher than those of dentists aged 36 years and older ($p < 0.05$). The levels of malpractice fears (Median = 22) and defensive dentistry attitudes (Median = 31) of dentists with 6–10 years of experience were statistically significantly higher than those of dentists with 11 years of experience and over (respectively (Median = 20), (Median = 28), $p < 0.05$). A statistically significant and high-level positive correlation was found between dentists' fear of malpractice and their tendency to adopt defensive dentistry practices ($\beta = 0.56$, $p < 0.001$).

Conclusions According to the results of this study, the DDAS was found to be a valid and reliable measure of negative and positive defensive dentistry. Specifically, a significant and strong positive correlation was identified between dentists' fear of malpractice and their engagement in defensive dentistry practices. This finding indicates that the tendency to adopt defensive dental behaviors increases as malpractice fear increases.

Keywords Anamnesis, Defensive dentistry, Complication, Malpractice, Health management

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Introduction

Defensive medicine has been defined in different ways since 1971. The first definition defined defensive medicine as practices used to reduce the possibility of malpractice [1]. In subsequent definitions, points such as the act of collecting evidence to gain an advantage in potential cases [2], the desire to avoid misdiagnosis [3], the fear of overlooking important findings [4], and the unwillingness to be criticized were also mentioned [5]. Based on the definitions defensive medicine is defined as avoiding the application of risky or difficult methods that may harm the patient or avoiding the treatment of complex cases. It can also be defined as physicians aiming to protect themselves from possible legal proceedings in the clinical decision-making process for their patients. Defensive medicine is divided into negative and positive defensive medicine practices. Positive defensive medicine practices can be explained as requesting consultation, additional examinations, and imaging without considering medical benefits to protect themselves from legal processes. Negative medical practices, on the other hand, are physicians'avoidance of patients with complex problems and not preferring treatment methods with high complication rates [6]. Negative defensive practices may result in difficult patients and cases not receiving the necessary health care and decreased quality of health care [7].

Interest in professional liability and malpractice issues is increasing in scientific communities worldwide [8]. Malpractice emerges as an important and increasing number of public problems addressed worldwide [9]. The World Medical Association defines malpractice as'damages caused by physicians not applying standard treatment, not being competent or not providing any treatment'[10]. The Turkish Medical Association, on the other hand, defined malpractice as'harming the patient due to lack of knowledge, inexperience or indifference'[11]. The concepts of medical error, patient safety, and malpractice brought to the agenda in the'To Err is Human: Building A Safer Health System'report published by the American Institute of Medicine in 2000 attracted the attention of health authorities. In this report, it was revealed that 44.000–98.000 people die in the United States of America (USA) annually due to malpractice [12]. In the intervening time, malpractice has risen to the third rank among the causes of death worldwide. It has been reported that approximately 400,000 people die each year in the USA due to malpractice [13]. Puhan He et al. reported that the most common cause of malpractice was lack of informed consent [14]. Detailed anamnesis and accurate evaluation of patient information is a prerequisite for an appropriate diagnosis and treatment [15, 16].

It is important to understand the patient's medical problems and how this will affect his/her treatment [17]. In addition, physicians are legally obliged to obtain and maintain adequate patient records [18]. Today, the number of health law cases is increasing, especially in developed countries. In the literature, there are separate malpractice articles for each discipline of dentistry [19, 20]. This increase causes physicians to resort to defensive medicine practices more frequently. As a result, there is an inevitable increase in medical expenses [6, 7, 21–23]. Defensive dentistry practices have emerged due to increased malpractice lawsuits and medical negligence in dental treatment [24].

Due to the nature of healthcare services, it is not always easy to distinguish between complications and medical errors. For this reason, patients may perceive unwanted events as medical errors. Seeking legal rights against physicians may result in fear of malpractice. At the same time, it has also been reported that physicians'malpractice experiences during medical practice led to fear of malpractice [25]. This situation pushes physicians towards a defensive approach [26]. Complications are separated from treatment failure and sequelae and reported as adverse events. Adverse events that are not procedure-specific, inherent in the nature of the procedure, and therefore inevitably occurring are separated from complications [27].

In their study, Ünal et al. examined the scales related to defensive medicine and found that the validity and reliability of the scales were not performed or that the scales consisted of very limited questions. In the existing scale questions, it was observed that the scales focused more on defensive medicine [28]. Similarly, it was found that scales used to measure defensive dentistry were primarily based on medicine rather than dentistry [29], or their validity and reliability were not tested [21]. Eijkman et al. reported that the defensive behaviors of physicians are accepted as an important problem in today's health services and that defensive behaviors may also occur in dental practice. However, very little has been published in the dental literature [21]. Defensive dentistry has been evaluated as a subgroup of defensive medical practices [23]. This study was developed because defensive dentistry should be considered more comprehensively.

According to the reviewed literature, although measurement tools are designed to assess defensive medicine, no valid and reliable instrument was identified that evaluates defensive dentistry within the dental population from a holistic perspective [28, 30]. The primary aim of this study is to investigate the relationship between fear of malpractice and defensive dentistry attitudes among dentists. In line with this goal, the study also aims to develop a valid and reliable scale to measure defensive

dentistry. Additionally, it seeks to evaluate dentists'levels of defensive dentistry and fear of malpractice across different demographic and professional variables. In line with these objectives, the following research questions have been developed.

1. What is the relationship between fear of malpractice and defensive dentistry practices among dentists?
2. Is the newly developed Defensive Dentistry Attitude Scale (DDAS) valid and reliable?
3. Do levels of fear of malpractice and defensive dentistry practices differ based on dentists'demographic and professional characteristics?

Methods

This section provides methodological insights into the research process's design and implementation.

Universe and sample

This study was conducted among dentists residing in Ankara and registered with the Ankara Chamber of Dentists. Ankara was selected as the study setting because it is the capital city of Türkiye and provides access to a heterogeneous group of dentists working across various specialties. Following the approval of the ethics committee, data were collected between July 1 and July 30, 2023, from dentists who met the following inclusion criteria:

- Being registered with the Ankara Chamber of Dentists,
- Actively working as a dentist,
- I voluntarily agree to participate in the study.
- Dentists who did not wish to participate were excluded from the study.

The total number of registered dentists was 3,513, according to the information obtained from the Ankara Chamber of Dentists on June 15, 2023. This number was considered the study population. Based on the equal probability sampling calculation, the minimum required sample size was 346 dentists. In practice, 369 dentists were reached using a convenience sampling method.

Ethical consideration

Ethical approvals were obtained from Çankırı Karatekin University Health Sciences Ethics Committee on 20–06–2023 (Acceptance number: 8/2023). This study did not receive any financial support. A clinical trial registration number is not applicable. Written informed consent was obtained from all participants at the outset of the survey. Prior to accessing the survey questions, participants were presented with an information box outlining the following points:

- Participation in the study was entirely voluntary,
- The data collected would be used solely for scientific purposes,
- The survey would take approximately 10 min to complete,
- Participants could withdraw from the study at any time without any consequences.

Participants could proceed to the survey only after providing their consent by checking the designated confirmation box. Data collection commenced following the receipt of this consent. The study was conducted per the ethical principles of the Declaration of Helsinki.

Data collection tool

A questionnaire consisting of four sections and 26 items instrument was used as a data collection tool. The first section of the survey includes five items assessing the demographic characteristics of the participants (Table 1). The five questions were about age, gender, dental experience, specialty, and institution where the participants practiced.

The second section comprises the Malpractice Fear Scale, originally developed by Katz, Williams [31] and adapted into Turkish by Uğrak and Işık [32]. The scale consists of six items measured on a 5-point Likert scale. There are no reverse-scored items in the scale. A cumulative score is calculated, with higher scores indicating greater fear of malpractice [31, 32]. A minimum score of 6 and a maximum score of 30 can be obtained from this scale.

The third section of the survey includes the DDAS, developed within this study's scope through psychometric analyses to evaluate defensive dentistry attitudes among dentists. The scale development process initially included 13 items. The DDAS items were developed through literature review and expert consultancy [21, 29, 33, 34]. DDAS questionnaire underwent validation and pilot testing. As a result of the development and validation process, the final version of the DDAS consists of eight items grouped under two dimensions: Negative Defensive Dentistry and Positive Defensive Dentistry. The negative defensive dentistry subscale includes five items and assesses dentists'tendencies to avoid high-risk procedures or patient groups. The positive defensive dentistry subscale comprises three items and measures attitudes to minimize legal risks while maintaining patient care. All items are rated on a 5-point Likert scale. There are no reverse-coded items in the scale. Reversed items are statements written in the opposite direction of the construct being measured. Reversed items were intentionally excluded to keep the items clear, easy to understand, and reduce the risk of

Table 1 Descriptive findings on scales scores and characteristics of participants

Characteristics of Participants		n	%
Gender			
Male		121	32,79
Female		248	67,21
Age			
23-28		67	18,16
29-35		139	37,67
36 years and over		163	44,17
Experience			
0-5 years		96	26,02
6-10 years		77	20,87
11 years and over		196	53,12
Institution			
Private Clinic		117	31,71
Public		242	65,58
Private and Public		10	2,71
Professional Status			
General Dentist		74	20,05
Specialist		295	79,95
Specialization			
Orthodontics		195	52,85
General Dentist		74	20,05
Periodontology		31	8,40
Oral and Maxillofacial Surgery		16	4,34
Pedodontics		14	3,79
Prosthodontics		12	3,25
Restorative Dental Treatment		11	2,98
Endodontics		10	2,71
Oral and Maxillofacial Surgery		4	1,08
Public Health		2	0,54
Total		369	100,00
Scales (n=369)	**Median (Min-Max)**	**Mean**	**(±SD)**
Positive Defensive Dentistry	12(6-15)	12.32	1.88
Negative Defensive Dentistry	17(7-25)	16.91	4.43
Total Defensive Dentistry	29(19-40)	29.24	4.86
Fear Of Malpractice	21(6-30)	20.33	4.68
Complication Frequency	2(1-10)	2.22	1.82
Detailed Anamnesis Frequency	8(1-10)	7.51	2.58

misinterpretation. Since the survey was self-administered, using only straightforward items helped prevent confusion and ensured more consistent responses. The scale yields both subscale-specific and total cumulative scores. A minimum score of eight and a maximum score of 40 can be obtained from this scale. Higher scores indicate a greater level of defensive dental practice (Table 2).

The final section includes two Visual Analogue Scale (VAS) items that assess the frequency of clinical complications and the frequency of taking a detailed patient history.

Data collection

In order to evaluate the clarity and feasibility of the data collection instrument, a pilot test was conducted face-to-face with 20 dentists between October 23 and October 30, 2023."Three thousand five hundred thirteen (3,513) dentists were emailed through the Ankara Chamber of Dentists between November 3, 2023- January 10, 2024, and reminder emails were sent two weeks after the initial invitation. The email included an informed consent statement and a link to the online survey created via Google Forms (Google LLC, Mountain View, USA). All data were collected electronically through this platform. The data

Table 2 Explanatory factor analysis results of the defensive dentistry scale

Defensive Dentistry	Factor 1	Factor 2
11. I avoid treatment protocols with a high probability of complications	0,917	
10. I avoid cases with complex procedures	0,899	
9. I avoid patients who are likely to have legal problems	0,802	
12. I prefer non-invasive treatment protocols.	0,696	
13. I feel uneasy in my medical practice as issues related to malpractice are frequently mentioned.	0,688	
7. I use imaging techniques with every patient.		0,815
8. I always ask for consultation regarding complications that may develop in my patients.		0,806
6. I explain treatment practices in detail to each patient		0,726
Core values	3,275	1,853
Explained variance (%)	40,937	23,160
Total variance explained (%)	40,937	60,097

collection process was terminated once the targeted sample size was achieved ($n = 369$). Approximately 11% of the target population was reached.

Statistical analyses

DDAS scale development

The development process of the DDAS was carried out in four main stages. In the first stage, a comprehensive literature review was conducted, followed by two focus group interviews with expert dentists to identify potential items for the scale. These sessions informed the initial item pool based on current knowledge and clinical experience.

In the second stage, content validity was evaluated for the proposed items. Expert opinions were obtained from eight professionals in the field. The Content Validity Index (CVI) was calculated to assess the relevance and clarity of the items [29–31].

In the third stage, the draft version of the DDAS, developed based on content validation results, was subjected to construct validity analysis. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed to examine the underlying factor structure of the scale [32, 33]. EFA was conducted using the principal component extraction method with Varimax rotation without imposing any restrictions on the number of factors. CFA was performed using the Maximum Likelihood (ML) estimation method.

In the fourth stage, once construct validity was confirmed, reliability analyses were conducted using Cronbach's Alpha (CA) and Composite Reliability (CR) coefficients to ensure internal consistency and measurement stability [34].

Validity and reliability of malpractice fear scale

As the Turkish adaptation of the Malpractice Fear Scale had previously been conducted byUğrak and Işık [32], its construct validity in the present study was assessed solely through CFA. CFA was performed using the maximum likelihood estimation method [35, 36]. Reliability analyses were performed using Cronbach's Alpha (CA) and Composite Reliability (CR) coefficients [37].

Inferential statistical analyses

The normality of the data was examined using the Kolmogorov–Smirnov test. Since the normality assumption was not met, non-parametric tests were applied (Kolmogorov–Smirnov test sig $p < 0{,}05$). The Mann–Whitney U test was used to compare two independent groups. The Kruskal–Wallis H test was used to compare three or more groups. Post hoc analyses were conducted using the Mann–Whitney U test with Bonferroni correction at a 95% confidence level.

Path analysis was conducted using structural equation modeling (SEM) to explore the relationships among variables. Path analysis was conducted using the ML estimation method within SEM. A p-value of less than 0.05 was considered statistically significant. Data was analyzed using IBM SPSS Statistics version 26 and IBM AMOS version 24 (IBM Corp., Armonk, NY, USA).

Results

This section presents the results under three main headings: descriptive statistics, validity and reliability analysis results, and inferential statistical results.

Descriptive results

Table 1 presents the demographic and professional characteristics of the participants. Of the 369 dentists included in the study, 67.21% ($n = 248$) were female. In terms of age, 44.17% ($n = 163$) were 36 years or older, while 37.67% ($n = 139$) were between 29–35 years, and 18.16% ($n = 67$) were between 23–28 years.

Regarding professional experience, 53.12% ($n = 196$) had been practicing for 11 years or more. Most participants were employed in the public sector (65.58%, $n = 242$), followed by those working in private clinics (31.71%, $n = 117$). Only 2.71% ($n = 10$) reported working in both sectors.

In terms of professional status, 79.95% ($n = 295$) were specialists, while 20.05% ($n = 74$) were general dentists. Among specialists, orthodontics was the most common field (52.85%, $n = 195$), followed by periodontology (8.40%, $n = 31$).

Of dentists in this study, Positive Defensive Dentistry scores ranged from 6 to 15, with a mean of 12.32 (± 1.88). Negative Defensive Dentistry scores ranged from 7 to 25, with a mean of 16.91 (± 4.43). Total Defensive Dentistry scores ranged from 19 to 40, with a mean of 29.24 (± 4.86). Fear of Malpractice scores ranged from 6 to 30, with a mean of 20.33 (± 4.68). The mean score for complication frequency of dentists in this study was 2.22 (± 1.82). The mean score for detailed anamnesis frequency was 7.51 (± 2.58).

Validity and reliability analysis results of the DDAS

The validity and reliability analysis results of the DDAS are presented under three subheadings: content validity, construct validity (EFA and CFA), and reliability analyses (CA and CR).

Content validity

CVI values were calculated for the content validity of the DDAS questions (13 items). Each item was evaluated by eight experts using a 4-point relevance scale (*1 = Not relevant, 2 = Needs major revision, 3 = Needs minor revision, 4 = Highly relevant*). The minimum acceptable item-level content validity index (I-CVI) threshold was determined as 0.875 based on the number of experts. It was determined that I-CVI values of the questions *"D2-I obtain consent form before each patient"* and *"D3-I obtain consent form from patients whom I foresee complications"* were 0.750 (< 0.875.) It was determined that the I-CVI value for all other questions was 1.00 (> 0.875) [29–31]. Accordingly, the scale content validity index S-CVI value was 1.00 [29–31].

Construct validity (EFA and CFA)

In the first stage, EFA was conducted to assess the construct validity of the DDAS, which consisted of 11 items. The analysis used the Principal Component extraction method with Varimax rotation. As a result of the analysis, *"D1- I take detailed anamnesis from each patient to avoid legal problems.""D4- I always keep the patient's records in detail."* and *"D5- I always allocate more time to my patients in the first examination"* were excluded from the scale because they loaded on multiple dimensions.

EFA was repeated with the remaining items (eight items). As a result of the analysis, the data were suitable for factor analysis according to the Kaiser Meyer Olkin (KMO) (0.791) value and Bartlett's test of sphericity ($\chi 2(45) = 1208{,}093$; $p < 0.001$) (Table 2). When the anti-image correlation values were analyzed, the lowest value was 0.601 (> 0.500; item-8) [38], and when the common variance values were analyzed, the lowest value was 0.246 (> 0.200; item-11) [39].

The EFA findings of the DDAS are presented in Table 2. The scale, consisting of eight items and two dimensions, explained a total variance of 60.10%. Specifically, the Positive Defensive Dentistry dimension accounted for 40.94% of the variance, while the Negative Defensive Dentistry dimension accounted for 23.16%. Based on the content of the items, the first factor was conceptually labeled as Positive Defensive Dentistry, and the second as Negative Defensive Dentistry.

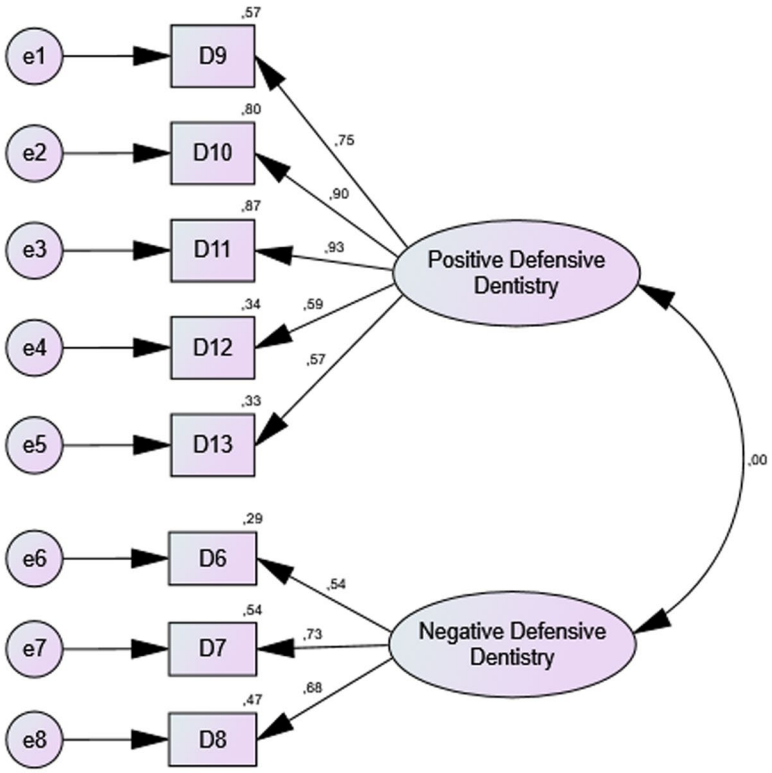
CFA was conducted in the second stage for the construct validity of the DDAS (Fig. 1). The model for the analysis using Maximum Likelihood-ML as the estimation method is given in Fig. 1. In CFA, the model demonstrated an acceptable fit with the following indices: (*CMIN = 49.054, DF = 19, CMIN/DF = 2.58, RMSEA = 0.066, CFI = 0.975, GFI = 0.975, NFI = 0.960, AGFI = 0.938, and SRMR = 0.051*). The standardized factor loadings of the DDAS were 0.538–0.933 and statistically significant ($p < 0.05$). According to the findings, the DDAS had construct validity.

Reliability analysis

The Positive Defensive Dentistry subscale demonstrated high reliability (CA = 0.864; CR = 0.870). Although the Negative Defensive Dentistry subscale had relatively lower values (CA = 0.685; CR = 0.691), they were still within acceptable limits. The Total Defensive Dentistry score showed acceptable internal consistency (CA = 0.755; CR = 0.895).

Validity and reliability analysis results of malpractice fear scale

As the Turkish adaptation of the Malpractice Fear Scale had previously been conducted by Uğrak and Işık [26], its construct validity was assessed with CFA in this study.



CMIN=49,054, DF=19, CMIN/DF=2,582, RMSEA=0,066, CFI=0,975, GFI=0,967, NFI=0,960, AGFI=0,938, SRMR=0,051

Fig. 1 Defensive dentistry attitude scale CFA model

Construct validity

The construct validity of the malpractice fear scale was analyzed by in accordance with the conceptual framework of Uğrak and Işık [25] using the ML estimation method. In CFA, the model demonstrated an acceptable fit with the following indices: (*CMIN=37,084, DF=9, CMIN/DF=4,120, RMSEA=0.072, CFI=0.964, GFI=0.968, NFI=0.953, AGFI=0.925, and SRMR=0.037*). The standardized factor loadings of the Malpractice Fear Scale ranged between 0.579 and 0.878, and all loadings were statistically significant ($p < 0.05$). As a result of CFA, the Malpractice Fear Scale had construct validity.

Reliability analysis

The Fear of Malpractice subscale showed good internal consistency with a (CA = 0.839; CR = 0.840).

Inferential statistical results

This section presents the findings regarding the evaluation of dentists'malpractice fear and defensive dentistry levels in terms of their characteristics (Table 3) and the relationships among complication frequency, malpractice fear, and defensive dentistry scores (Fig. 2).

A statistically significant difference in dentists'malpractice fear levels was found in terms of age (H = 6.544, $p = 0.038$). Dentists aged 29–35 years (Median = 21) reported significantly higher levels of malpractice fear than those aged 36 years and above (Median = 20) ($p > 0,05$).

Another statistically significant difference in dentists'malpractice fear levels was observed concerning professional experience (H = 7.360, $p = 0.025$). Dentists with 6–10 years of experience (Median = 22) had significantly higher malpractice fear levels than those with 11 years or more of experience (Median = 20) ($p <$ 0,05).

A statistically significant difference in dentists'levels of malpractice fear also emerged based on professional status (U = 12,814, $p = 0.020$). General dentists (Median = 22) reported higher levels of malpractice fear than specialists (Median = 20) ($p < 0,05$).

In contrast, there were no statistically significant differences in malpractice fear levels based on gender (U

Table 3 Malpractice fear and defensive dentistry scores in terms of dentists'characteristics

Characteristic	n	Fear of Malpractice			Defensive Dentistry		
		Median (Min-Max.)	Test Sig.	Post- Hoc	Median (Min-Max.)	Test Sig.	Post- Hoc
Gender							
Male	121	20(9-30)	15748^{U} 0,438	-	28(19-40)	16484,5^{U} 0,123	-
Female	248	21(6-30)			29(19-40)		
Age							
23-28 old ^{1}	67	21(12-29)	6,544^{H} **0,038**	**2>3***	29(21-38)	1,591^{U} 0,451	-
29-35 old ^{2}	139	21(11-33)			30(19-39)		
36 age and older ^{3}	163	20(6-30)			28(19-40)		
Experience							
0–5-year ^{1}	96	21(12-30	7,360^{H} **0,025**	**2>3***	30(21-38)	7,120^{H} **0,028**	**2>3***
6–10-year ^{2}	77	22(15-30)			31(23-39)		
11 years and longer ^{3}	196	20(6-30)			28(19-40)		
Institution							
Private ^{1}	117	20(8-30)	5,950^{H} 0,051	-	30(19-40)	3,526^{H} 0,172	-
Public ^{2}	242	21(11-30)			28,5(19-40)		
Private and Public ^{3}	10	17(6-24)			29(25-35)		
Professional Status							
General Dentist	74	22(11-29)	12814^{U} **0,020**	-	29(19-40)	11362,5^{H} 0,585	-
Specialist	295	20(6-30)			29(19-40)		
Total	369	-			-		-

H: Kruskal-Wallis H for three or more independent groups, with post hoc pairwise analyses of Mann-Whitney U Test with Bonferroni correction within a 95% confidence interval, U: Mann-Whitney U Test for two independent groups, ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$. The numbers used as superscript represent the group for age, experience and institution

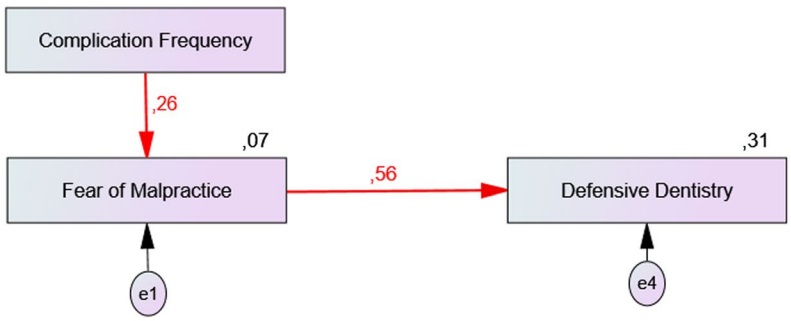


Fig. 2 Malpractice fear and defensive dentistry pathway mode

=15,748, p= 0.438), institution type (H =5.950, p= 0.051), or area of specialization (H =14.239, p= 0.114).

Statistically significant differences in defensive dentistry scores among dentists were identified in terms of professional experience (H =7.120, p= 0.028). Dentists with 6–10 years of experience (Median =31) reported significantly higher levels of defensive dentistry scores than those with 11 years or more of experience (Median =28) (p< 0,05).

In contrast, gender (U =16,484.5, p= 0.123), age (H =1.591, p= 0.451), institution type (H =3.526, p= 0.172), and professional status (H =11,362.5, p= 0.585) were not associated with statistically significant differences in defensive dentistry scores.

The relationships among complication frequency, malpractice fear, and defensive dentistry scores were evaluated in path analysis in SEM using ML estimation method (Fig. 2). The fit index values of the path model were found to be at a good fit level *(CMIN=1,159, DF=1, CMIN/DF=1,159, RMSEA=0.021, CFI=0.999, GFI=0.998, NFI=0.993, AGFI=0.987, and SRMR=0.018).* Complication frequency accounted for 7% of the variance in

malpractice fear scores, while malpractice fear explained 31% of the variance in defensive dentistry scores. A statistically significant and low-level positive association was identified between dentists'reported complication frequency and their fear of malpractice ($\beta = 0.26$, $p < 0.001$). Additionally, a statistically significant and high-level positive correlation was found between dentists'fear of malpractice and their tendency to adopt defensive dentistry practices ($\beta = 0.56$, $p < 0.001$).

Discussion

This study aimed to evaluate the relationship between the level of defensive dentistry and fear of malpractice among dentists in Türkiye. For this purpose, a DDAS was developed in this study. A review of the existing literature indicates that several scale development studies have been conducted to assess physicians'attitudes toward defensive medicine in clinical practice [28, 40]. In addition, various survey-based studies have sought to explore defensive medicine behaviors among physicians [41–43]. However, these studies were not specifically designed to evaluate defensive dentistry attitudes within the field of dentistry. The literature on defensive dentistry reveals that while some studies have aimed to assess dentists'perceptions and attitudes, these efforts have generally relied on instruments not validated explicitly for dental professionals. For example, in the study conducted by Toraman [44], a defensive medicine scale originally developed for physicians was employed to measure defensive dentistry practices.

Nevertheless, no validity or reliability analyses were conducted to confirm the appropriateness of the scale for a dental population. Similarly, in the study by Ekici [29], items from a scale designed to assess physicians'defensive medicine attitudes were adapted to investigate defensive attitudes among dentists, yet without any psychometric evaluation of the adapted items. The present study introduced the DDAS and evaluated its psychometric properties within dentists in this context. The results demonstrated that DDAS is a methodological instrument exhibiting validity and reliability in measuring defensive dentistry attitudes among dental practitioners. Accordingly, the DDAS holds a potential tool for future empirical investigations and clinical applications within the domain of defensive dentistry—an area that has gained growing significance in contemporary dental practice.

Dentists have also exhibited a defensive attitude as a means of self-protection. According to Saruhan, Altındiş [34], 11.7% of dentists always, 23.5% most of the time, 24.7% sometimes, 21.5% rarely, and %18,6 never exhibited a defensive attitude [34]. In their study, Başer, Başer Kolcu [23] reported that 45.5% of dentists practiced defensive dentistry at the best level ($n = 30$), 33.3% at a good level ($n = 22$), 15.2% at a fair level ($n = 10$), and 6.1% at a poor level ($n = 4$) [23]. Özata, Terlemez [45] reported that 43.7% of clinicians used defensive dentistry to protect themselves from malpractice claims, and 42.4% had a negative defensive dentistry attitude toward patients with high complications. As observed from the findings of these studies, the defensive attitude approach among dentists was high. In this study, the defensive attitudes of dentists were above average. In this regard, the findings of this study are consistent with the literature.

In some studies, having previously encountered a lawsuit or complaint has been associated with defensive practices [42, 46]. In a study conducted by Ekici et al., which investigated knowledge, attitudes, and behaviors related to defensive dentistry, age was not found to influence defensive orientation. However, this result was attributed to the characteristics of the selected sample, which may have limited the detection of such an effect. Other studies have reported that younger or less experienced dentists tend to engage in defensive practices more frequently [47, 48]. This study also found that younger dentists exhibited more defensive behaviors, consistent with the literature.

In the study by Hellyer and Radford [49], dentists'perceptions of risk affected their professional practices. One of the key determinants of dentists'risk perceptions is the number of complications perceived. This study concluded that an increase in the number of complications reported by dentists was associated with a heightened fear of malpractice. This finding suggests that the number of complications dentists perceive influences their risk perceptions, thereby increasing their fear of malpractice. Similarly, in this study, dentists were to have a high level of malpractice fear.

A review of the literature indicates that malpractice has increasingly gained importance in the field of dentistry. With the advancement of healthcare technologies, many high-risk procedures, particularly in surgical branches, are being performed in the field of dentistry. In a study by Aldahmashi et al., prosthodontics was identified as the specialty with the most complaints [50]. Oral and maxillofacial surgery (OMFS) is considered the highest-risk specialty in terms of malpractice, complications, and permanent tissue damage compared to general dentistry and other specialties [29]. Common treatment errors in the endodontic clinic include incomplete root canal fillings, overflow of root canal material from the apex, tooth perforation, and instrument breakage within the canal [51–53]. Rodriguez et al. reported that intern physicians exhibited a moderately defensive attitude and had a higher fear of malpractice [43]. In this study, fear of malpractice was higher among young dentists. In addition, a statistically significant positive correlation was found

between the level of fear of malpractice and the level of defensive dentistry among dentists. As in literature and this study, fear of malpractice decreases with increasing experience in professional life.

As evidenced, the field of dentistry involves numerous inherent risks. These risks present the potential for malpractice claims to be directed at dental professionals. In Spain, Perea-Pérez, Labajo-González [54] classified 40% of 415 claims that led to legal proceedings between 2000 and 2010 as malpractice, 40% as complications, and 20% as accidents. Most claims were associated with oral and maxillofacial surgeons (50.3%), followed by endodontics (20.76%) and prosthodontics (12.53%) [54].

In Türkiye, it has been found that most cases of negligence, especially in surgical treatments, are not due to the treatment itself but rather the lack of informed consent. Additionally, this study showed that defensive dental attitudes were less common in public health and prosthodontics, which could be attributed to the small number of participants. According to the study, fear of malpractice and defensive dentistry is the third most common concern among orthodontists, after general and restorative dentistry [55].

The main problems with malpractice in orthodontics are that procedures are more expensive, treatment time is long, and dentists provide treatment without adequate training [56]. Pour et al. reported that the most common reason for malpractice against orthodontists was periodontal problems, and that doctor-patient harmony was the most important factor in malpractice claims [57–59]. He emphasized that orthodontists should control biofilm during orthodontic treatment and obtain periodontal consent from patients with periodontitis. In addition, taking comprehensive records, obtaining informed consent, explaining any complications of the recommended treatment, and discussing the treatment plan in detail were reported as other factors in avoiding litigation.

Globally, malpractice lawsuits have increased, and positive and negative forms of defensive medicine have begun influencing health policies [60, 61]. Although the scale developed in this study was applied in Türkiye, its primary aim is to assess positive and negative defensive dentistry behaviors and provide insight into global trends in this area. The prevalence of malpractice claims and defensive behaviors in dentistry appears similar across countries, as highlighted by international studies reporting common risks and concerns.

Therefore, this scale can be adapted for use in different countries to explore defensive dentistry, and the results can contribute to international literature. Such findings may guide reforms in dental education and health policies. For instance, increasing theoretical and practical training on malpractice and risk management and offering structured education in these areas could reduce the likelihood of professional negligence and related legal actions. Collaboration with professional associations and regulatory bodies could also improve legal regulations.

Importantly, this scale includes both dimensions of defensive dentistry: positive defensive behaviors, which may lead to unnecessary tests and procedures and increase healthcare costs, and negative defensive behaviors, which may result in patients being denied necessary care. Measuring these tendencies with a reliable and valid tool provides meaningful data supporting future research, policy development, and educational strategies.

Limitations

This study was conducted with dentists registered in the Ankara Chamber of Dentists in Türkiye (N= 3513). Equal probability sampling was used to determine the target sample size (n= 346), and convenience sampling was applied to reach it. Although the intended sample size was achieved (n= 369), the response rate was relatively low (11%). The use of convenience sampling and the low response rate may have introduced selection bias and limited the diversity of the sample. As a result, the findings may not fully represent the broader population of dentists in Türkiye and should be interpreted with this limitation in mind.

The development of the scale items was based on a comprehensive review of the international literature. The study was conducted in Türkiye's capital city, where advanced diagnostic and treatment services are commonly provided. While this supports the scale's relevance to modern clinical settings, it may not represent all regional variations in dental practice. Despite these limitations, the DDAS is considered suitable for dentistry. Future research should aim to test the scale with larger, more diverse, and randomly selected national samples to improve its generalizability.

Conclusion

The present study provides preliminary evidence supporting the validity and reliability of the DDAS as a tool for assessing defensive dentistry attitudes among dentists. The findings suggest potential associations between malpractice fear, defensive behaviors, and professional experience, with less experienced dentists reporting higher malpractice fear. Differences across dental specialties were also observed, indicating that specialty-specific dynamics may play a role in shaping perceptions of malpractice risk and defensive behaviors.

However, given the study's limitations, including the sample size and demographic constraints, these findings should be interpreted cautiously. Further research involving larger and more diverse populations is necessary to

confirm and expand upon these results. A deeper understanding of the relationship between malpractice fear and defensive dentistry could contribute to improving clinical decision-making, managing healthcare costs, and supporting the well-being of dental professionals.

Abbreviations

AGFI	Adjusted Goodness of Fit Index
CA	Cronbach's Alpha
CFA	Confirmatory Factor Analysis
CMIN/DF	Chi-Square/Degrees of Freedom
CR	Composite Reliability
CVI	Content Validity Index
CVR	Content Validity Ratio
DDAS	Defensive Dentistry Attitude Scale
EFA	Exploratory Factor Analysis
KMO	Kaiser Meyer Olkin
NFI	Normed Fit Index
OMFS	Oral and Maxillofacial Surgery
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modeling
SRMR	Standardized Root Mean Square Residual
VAS	Visual Analogue Scale

Supplementary Information

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Supplementary Material 1.

Publication statement

The results, data, and figures presented in this manuscript have not been published elsewhere and are not under consideration by another publisher.

Authors' contributions

SEM drafted and wrote the article. U.U. conducted data analysis and interpretation. K.G.T. and P.D. contributed to drafting and substantial revision of the manuscript. G.S.D. and S.G. contributed to the study design and critical revision of the work.

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Data availability

All data generated or analyzed during this study are included in this published article or the supplementary information files.

Declarations

Ethics approval consent to participate

Ethical approvals were obtained from Çankırı Karatekin University Health Sciences Ethics Committee on 20–06-2023 (Acceptance number: 8/2023). Written informed consent was obtained from all participants at the outset of the survey. Prior to accessing the survey questions, participants were presented with an information box outlining the following points:

- •Participation in the study was entirely voluntary,
- •The data collected would be used solely for scientific purposes,
- •The survey would take approximately 10 minutes to complete,
- •Participants could withdraw from the study at any time without any consequences.

Participants could proceed to the survey only after providing their consent by checking the designated confirmation box. Data collection commenced following the receipt of this consent. The study was conducted in full accordance with the ethical principles set forth in the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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