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Evaluation of Dental Anxiety in Patients Undergoing Different Dental Treatments – A Prospective Study

Farklı Dental Tedaviler Uygulanan Hastalarda Dental Anksiyetenin Değerlendirilmesi – Prospektif Bir Çalışma

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ABSTRACT

Objective: This cross-sectional survey-based study aimed to investigate the levels of dental anxiety among patients undergoing various dental treatments and to identify potential factors associated with dental anxiety.
Methods: A total of 322 volunteer participants, aged 18-70 years, were recruited from İstanbul Aydın University Faculty of Dentistry Hospital. Participants completed the Modified Dental Anxiety Scale (MDAS) and a supplementary questionnaire to assess their dental anxiety levels and related factors. Statistical significance was set at $P<.05$.
Results: The mean MDAS score was highest among individuals aged 18-24 years and lowest among those aged 65-70 years. Dental anxiety was significantly associated with gender economic status, oral hygiene awareness, and past dental experiences ($P<.05$) but not with age, education level, marital status, or number of dental visits ($P>.05$). Implant and tooth extraction treatments elicited the highest anxiety levels. Approximately half of the participants reported mild stress levels before the dental treatment day and while in the waiting room. Female participants had significantly higher mean MDAS scores compared to males ($P= .001$).
Conclusion: Dental anxiety was found to be affected by gender, economic status, oral hygiene awareness, and past dental treatment experiences, but not by education level, age, marital status, or number of dental visits. This study contributes to the understanding of dental anxiety and its associated factors. The findings can inform targeted interventions to alleviate anxiety and improve oral health outcomes in diverse patient populations.
Keywords: Demographic factors, dental anxiety, dental treatments, Modified Dental Anxiety Scale (MDAS)

ÖZ
Amaç: Bu kesitsel ankete dayalı çalışmanın amacı, çeşitli diş tedavileri gören hastalarda dental anksiyete düzeylerini araştırmak ve dental anksiyete ile ilişkili potansiyel faktörleri belirlemektir.
Yöntemler: İstanbul Aydın Üniversitesi Diş Hekimliği Fakültesi Hastanesi'nden 18-70 yaş arası toplam 322 gönüllü katılımcı bu çalışmaya dahil edildi. Katılımcılar dental anksiyete düzeylerini ve ilgili faktörleri değerlendirmek için Modifiye Dental Anksiyete Ölçeğini (MDAS) ve bu ölçeği tamamlayıcı bir anketi doldurdu. İstatistiksel anlamlılık $P<,05$ düzeyinde kabul edildi.
Bulgular: Ortalama MDAS skoru 18-24 yaş arası bireylerde en yüksek, 65-70 yaş arası bireylerde ise en düşüktü. Dental anksiyete cinsiyet, ekonomik durum, oral hijyen bilinci ve geçmiş dental deneyimlerle anlamlı şekilde ilişkiliyken ($P<,05$), yaş, eğitim düzeyi, medeni durum veya dental ziyaret sayısı ile ilişkili değildi ($P>,05$). En yüksek anksiyete seviyeleri implant ve diş çekimi tedavilerinde ortaya çıktığı gözlendi. Katılımcıların yaklaşık yarısı diş tedavisi gününden önce ve bekleme odasındayken orta seviyede stres yaşadıklarını bildirdi. Kadın katılımcıların ortalama MDAS skorları erkeklere kıyasla anlamlı derecede yüksek bulundu ($P=,001$).
Sonuç: Dental anksiyetenin cinsiyet, ekonomik durum, oral hijyen bilinci ve geçmiş dental tedavi deneyimlerinden etkilendiği, ancak eğitim düzeyi, yaş, medeni durum veya dental ziyaret sayısından etkilenmediği saptanmıştır. Bu çalışma dental anksiyete ve ilişkili faktörlerin anlaşılmasına katkıda bulunmaktadır. Bulgular, farklı hasta popülasyonlarında anksiyeteyi azaltmak ve ağız sağlığını geliştirmeye yönelik uygulamalara ışık tutabilir.
Anahtar Kelimeler: Demografik faktörler, dental anksiyete, dental tedaviler, Modifiye Dental Anksiyete Ölçeği (MDAS)

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INTRODUCTION

Dental anxiety is a prevalent issue that affects children, adolescents, adults, and dental practitioners. It is characterized by fear or apprehension about dental treatment. While fear and anxiety are related, anxiety is an emotional state that precedes an encounter with a feared object or situation, while fear is the actual response to the object or situation.[1] Dental anxiety can involve physiological, cognitive, emotional, and behavioral components. This fear can stem from past negative experiences during dental visits and be influenced by various factors such as mood, stigma, and the nature of dental procedures.[2]

Dental anxiety can be triggered by several factors, including the appearance of dental instruments, the dentist's attitude towards the patient, noise during treatment, and the dental office environment. A significant proportion of patients avoid visiting the dentist due to anxiety. Among these patients pain has been identified as the primary cause of anxiety, followed by injection, tooth extraction, implant treatment, root canal treatment, drill sound, tooth scaling and root planning, and restorative treatment. Such factors have the potential to hinder individuals from seeking dental care.[3] Typically, dental anxiety is accompanied by physiological and psychological responses such as increased heart rate, increased blood pressure, altered respiration rate, sweating, trebling, feelings of impending danger, and tension. These responses can lead to extensive distress, resulting in avoidance of dental treatment and multiple failed appointments, impacting both oral and general health.[4] There have been significant advancements in managing patient anxiety, emphasizing the role of sedatives, analgesia, and innovative methods like music therapy and cognitive-behavioral therapy (CBT) in creating a less stressful experience for patients.[5] These advancements underscore a transition towards comprehensive dental care that caters to both the physical and psychological needs of patients, making dental procedures less anxiety-provoking and less painful.

Managing anxious patients poses challenges for dental practitioners, as these patients may require more time for treatment, miss appointments, and cause stress for dental teams.[6] The severity of anxiety is influenced not only by past traumatic experiences but also by environmental factors that trigger immediate anxiety. Therefore, objective measurement of dental anxiety is essential in the treatment process. To assess and quantify dental anxiety, various psychometric scales have been developed. DAS is one of the most widely used tools, but it has been criticized for not covering all aspects of dental fear and for inconsistencies in its response alternatives.[7] The MDAS was introduced as an alternative scale with standardized responses and additional items, such as questions related to anesthetic injections, to provide a more comprehensive assessment of dental anxiety.[8] The MDAS has demonstrated favorable psychometric properties compared to the DAS, with acceptable reliability and validity.[6]

Research indicates that dental anxiety can lead to prolonged treatment times, missed appointments, and increased stress levels for both patients and dental practitioners.[2] Studies have emphasized the importance of reliable tools like the MDAS in accurately evaluating and addressing dental anxiety in clinical and research settings.[9] The type of dental treatment may also influence anxiety levels, prompting investigations into the association between treatment types, demographic characteristics, oral hygiene behaviors, and dental anxiety.[10]

The purpose of this study was to assess and compare levels of dental anxiety in patients undergoing various dental procedures and to examine the relationship between demographic characteristics, oral hygiene practices, and dental anxiety. The research aimed to contribute to the existing literature by providing a comprehensive analysis of dental anxiety and its several factors. The study's insights can help dental professionals develop targeted interventions to reduce anxiety and improve oral health outcomes in diverse patient populations.

METHODS

Study Design and Population

The presented cross-sectional survey-based research was conducted on 322 volunteers aged 18 to 70 at Istanbul Aydın University Faculty of Dentistry between September 1, 2020, and December 30, 2020. The study design and population selection adhered to the ethical standards of the Declaration of Helsinki and received approval from the İstanbul Aydın University Non-Interventional Clinical Research Ethics Committee (18.06.2020, Number:2020/257). Participants were included in the study if they met the following criteria: voluntary participation, sufficient Turkish literacy, no recent psychiatric diagnoses within the previous year, no psychotherapy in the past six months, and no use of psychotropic drugs or illicit substances that could affect mental health in the previous year. An informed consent was obtained from each participant.

The study flow chart is shown in Figure 1. After a comprehensive oral and dental examination, an individualized treatment plan was developed for each patient. These plans included necessary dental procedures, such as restorative treatment, root canals, scaling and root planing, tooth extractions, and implant procedures. The participants were scheduled to receive their treatments on the seventh day, according to their individual needs. On that day, they completed a data collection form while waiting in the waiting room.

Data Collection Tool

All participants completed a data collection tool consisting of four sections, developed based on existing literature.[11–18] To ensure the validity of the survey items, an expert committee was formed using the Lawshe method.[19] The committee included a psychiatrist, two clinical psychology specialists, a periodontist, and three dentists. The survey was revised based on feedback from the expert committee. Five dentists, who were randomly selected from a pool of 50 dentists working at Istanbul Aydin University Oral and Dental Health Research and Education Center, completed the survey. The final version of the data collection tool was obtained with minor revisions after incorporating feedback from the non-participating dentists.

The data collection tool was administered in Turkish and took approximately 15 minutes to complete. The survey was self-administered, and participants were instructed to answer all questions honestly and to the best of their ability. The data was collected anonymously, and confidentiality was ensured by assigning a unique identification number to each participant.

Section 1: Demographic Characteristics: The first section of the data collection tool listed demographic characteristics such as age, gender marital status, number of children, education level, and occupation.

Section 2: Oral and Dental Health Experiences and Attitudes: The second section was aimed to assess participants' experiences and attitudes toward oral and dental health, including frequency of tooth-brushing and dental treatment, previous dental experiences, and pre-treatment anxiety levels.

Section 3: Dental Anxiety Assessment: The third section of the data collection tool assessed participants' experience of dental anxiety, including its level, cause, onset, physical symptoms, and coping mechanisms. Additionally, this section examined environmental triggers that contribute to dental anxiety, such as noise from equipment and the sight of sharp instruments, and the length of time it took for anxiety to peak. The objective of this section was to provide a comprehensive

understanding of the participants' dental anxiety, its causes, and their self-coping strategies, as well as the impact of environmental factors on their anxiety levels.

Section 4: MDAS: The final component of the tool was an 8-question, 4-point Likert-type scale based on the MDAS, which has been validated for reliability and accuracy.[15] The questions were designed to assess the anxiety levels of participants prior to scheduled dental procedures.

The participants' responses were scored on a scale of 0-3 to indicate their level of anxiety and stress. A score of 0 indicated no anxiety, 1 indicated mild anxiety, 2 moderate indicated anxiety, and 3 indicated severe anxiety and stress. The dental anxiety level was determined based on the sum of scores given to the eight relevant questions, which ranged from 0 to 24 and were used to calculate the MDAS score. The MDAS score was then compared to the following cut-off values to determine the level of dental anxiety: a score of 0 indicated no anxiety, 1-8 indicated mild anxiety, 9-16 indicated moderate anxiety, and 17-24 indicated severe anxiety.

Statistical Analysis

The statistical analysis for this study was conducted using NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA). Descriptive statistics were calculated, and the Shapiro-Wilk test was applied to determine the distribution of the data. Due to the non-parametric nature of obtained data, the Mann-Whitney U test and the Kruskal-Wallis test were used to compare two or more than two independent groups, respectively. The threshold for statistical significance was set at $P<.05$.

RESULTS

Table 1 provides an overview of the demographic characteristics of the study participants. The majority of participants were aged between 35-54 years (59.94%) and were predominantly male (55.59%). Most participants were married (64.91%), although 42.54% did not have children. In terms of educational attainment, the majority of participants held a bachelor's degree (69.56%). Notably, only a small percentage of participants were health professionals (2.48%), with the vast majority being actively employed (90.06%).

Table 2 presents the dental visit and oral care attitudes of the participants. A significant proportion (40.68%) preferred private dental clinics for treatment. The primary reason for seeking dental care was toothache, reported by approximately half of the participants (50%). 27.02% of the participants visited the dentist more than twice a year, and the majority of them (83.9%) brushed their teeth at least once a day. More than half (52.2%) described their past dental experiences as positive. Notably, only 14.9% of participants experienced high anxiety levels prior to treatment.

Table 3 presents a comprehensive analysis of the triggering factors for dental anxiety, showcasing the variations in patient responses to different dental procedures and their respective impacts on anxiety levels. 52.2% of participants reported having positive past dental experiences, while only 14.9% experienced high levels of anxiety prior to treatment. The primary causes of dental anxiety were injections/pain (39.58%) and negative past experiences (35.41%). Anxiety levels were found to peak during treatment for the majority of participants (52.08%), with only a small percentage (6.25%) experiencing peak anxiety post-treatment. It is noteworthy that among those who were classified as "severely anxious and stressed," 87.5% did not receive any support in coping with dental anxiety.

Table 1. Demographic findings of the participants

		N	%
Total		322	100
Age			
	18-24	39	12.11
	25-34	55	17.08
	35-44	100	31.06
	45-54	93	28.88
	55-64	26	8.07
	> 64	9	2.80
Gender			
	Female	143	44.41
	Male	179	55.59
Marital status			
	Married	209	64.91
	Single	113	35.09
Number of children			
	No child	137	42.54
	One	81	25.16
	Two	83	25.78
	Three	17	5.28
	Four	3	0.93
	Five	1	0.31
Education level			
	Elementary school	8	2.48
	Secondary school	10	3.11
	High school	70	24.85
	Undergraduate	200	62.11
	Postgraduate	24	7.45
Employment Status			
	Unemployed	27	8.38
	Student	35	10.87
	Healthcare professional	8	2.48
	Employed (other)	220	68.33
	Retired	32	9.94

***N:** number; **%:** percentage*

Table 2. Dental visits and dental care habits of the participants

	N	%
Total	322	100
Prior dental treatment location		
Dental health care center	36	11.18
Public hospital	76	23.60
Private hospital	41	12.73
Private clinic	131	40.68
Faculty of dentistry	38	11.80
Dental visit reason		
Toothache	161	50.00
Aesthetics	13	4.04
Regular checkup	60	18.63
Other	88	27.33
Number of dental visits		
None	1	0.31
Once	126	39.13
Twice	108	33.54
> 2	87	27.02
Tooth-brushing frequency		
None	27	8.4
Three times/week	25	7.8
Once/day	105	32.6
Twice/day	147	45.7
Three times/day	18	5.6
Prior dental visit experience		
Very bad	21	6.5
Bad	56	17.4
Normal	77	23.9
Good	124	38.5
Very good	44	13.7
Pre-visit stress level		
Very stressed	48	14.90
Stressed	122	37.88
Mildly stressed	39	12.11
Not stressed	113	35.09

***N:** number; **%:** percentage*

Table 3. Data Regarding Dental Anxiety

	N	%
Total	48	100
Dental treatment anxiety level		
Very high	8	16.6
High	22	45.8
Normal	15	31.25
Mild	3	6.25
Dental treatment anxiety reasons		
Dental instrument noise	3	6.25
Infection/pain anxiety	19	39.58
Blood/hospital anxiety	4	8.33
All of the above	22	45.83
Initial anxiety reason		
Do not know	16	33.33
Social environment/media	12	25
Family anecdotes	3	6.25
Bad experiences	17	35.41
Peak moment of anxiety		
Previous night	6	12.5
During in the waiting room	14	29.16
During treatment	25	52.08
After treatment	3	6.25
Dental anxiety coping method		
Receiving professional support	1	2.08
Using medicine	1	2.08
Meditation/therapy	4	8.33
No support	42	87.5

N: *number;* ***%:*** *percentage*

Table 4 illustrates the distribution of stress-related responses among all participants scheduled for dental treatment. Approximately half of the participants reported mild stress levels before the dental treatment day (46.9%) and while in the waiting room (48.1%). Moderate levels of dental anxiety were reported for all treatment types except for implant treatment (32.9%). Additionally, (30.1%) of the participants reported tooth extraction as the primary cause of anxiety.

Table 5 presents a comparison of the mean MDAS scores among participants based on various demographic variables and oral care attitudes. The results indicate that the mean MDAS scores were similar across groups in terms of most demographic variables (P>.05), with the exception of gender. Female participants had a significantly higher mean MDAS score compared to their male counterparts (P=.001).

In terms of oral care attitudes, participants who visited dentists for regular check-ups had significantly lower mean MDAS scores than those who visited for dental pain or aesthetic demands (P=.002 and P=.022, respectively). Furthermore, participants who brushed their teeth once a day had the highest mean MDAS score compared to those who brushed twice or more daily (P<.05 for all).

Interestingly, participants who rated their initial dental treatment experience as “very bad” and those with a “very stressed” anxiety level before the dental session had the highest mean MDAS scores among all subgroups for each variable (P=.001 for both).

Figure 1-A shows the distribution of dental treatments received by the participants. Scaling and root planing (33%) was the most common treatment whereas implant treatment (6%) was the least one in the population. Symptoms associated with dental anxiety reported by the study group were also examined. As demonstrated in Figure 1-B, 32 participants (38%) reported palpitations, 22 (26%) reported chest tightness and shortness of breath, 17 (20%) reported trembling and shaking, and 13 (16%) reported stomach problems.

Table 4. Stress-related findings during the treatment

	N	%
Stress level before visit		
Not stressed	123	38.2
Mildly stressed	151	46.9
Stressed	28	8.7
Very stressed	20	6.2
Stress level in the waiting room		
Not stressed	122	37.9
Mildly stressed	155	48.1
Stressed	28	8.7
Very stressed	17	5.3
Dental treatment-related anxiety		
Scaling and root planing	17	5.3
Restorative treatment	14	4.3
Root canal	88	27.3
Tooth extraction	97	30.1
Implant	106	32.9
Stress level in the dental chair before filling		
Not stressed	102	31.7
Mildly stressed	153	47.5
Stressed	43	13.4
Very stressed	24	7.5
Stress level in the dental chair before scaling and root planing		
Not stressed	137	42.5
Mildly stressed	139	43.2
Stressed	31	9.6
Very stressed	15	4.7
Stress level in the dental chair before root canal treatment		
Not stressed	53	16.5
Mildly stressed	143	44.4
Stressed	84	26.1
Very stressed	42	13
Stress level in the dental chair before tooth extraction		
Not stressed	56	17.4
Mildly stressed	122	37.9
Stressed	83	25.8
Very stressed	61	18.9
Stress level in the dental chair before implant		
Not stressed	42	13
Mildly stressed	91	28.3
Stressed	111	34.5
Very stressed	78	24.2

*P < .05, *Mann-Whitney U test, **Friedman test, ***Wilcoxon signed-rank test*

DISCUSSION

Dental anxiety is a significant issue that can have a profound impact on patients’ oral health behaviors, affecting their willingness to seek dental care and adhere to treatment plans.[1,3,6] The prevalence of dental anxiety varies widely, with epidemiological studies reporting rates ranging between 4%-56% globally.[20] This complex phenomenon is influenced by a range of factors, including personal experiences, social influences, and inherent individual traits. Research has consistently demonstrated that negative experiences, particularly those involving pain, are major contributors to the development of dental anxiety.[21] These experiences can lead to increased anticipation of pain in future dental procedures, perpetuating a cycle of avoidance and deterioration in oral health.

The MDAS is a critical tool in the objective assessment of dental anxiety, enabling clinicians and researchers to quantify the extent of anxiety across different populations.[22] The Turkish translated version of the questionnaire has been found to be valid and reliable, with a Cronbach alpha value of .81.[22] The reliability and validity of the MDAS across various cultural contexts underscore the universal nature of dental anxiety, highlighting the need for globally applicable strategies to manage this issue.[23] In the current study population, tooth pain emerged as the most prevalent clinical symptom instigating patients to seek

dental care. Notably, dental anxiety, which can serve as a deterrent to regular dental check-ups, was found to be lower among those participants who maintained regular dental visits.

Table 5. Comparison of the Means for the MDAS scores

			N	Mean±Sd	Min-Max (Median)
All					
MDAS Score	**Age**	18-24	39	17.5±5.19	8-30 (18)
		25-34	55	19.11±7.48	8-32 (17)
		35-44	100	16.52±5.9	8-31 (16)
		45-54	93	16.27±5.38	8-30 (16)
		55-64	26	16.46±5.07	8-32 (15.5)
		65-70	9	15.78±3.8	11-24 (14)
		P*		.122	
	Gender	Female	143	18.57±6.09	8-32 (18)
		Male	179	15.82±5.52	8-32 (16)
		P		**.001**	
	Marital status	Married	209	17.08±5.87	8-32(16)
		Single	112	16.95±6.06	8-32(16)
		P		.799	
	Number of children	No children	137	16.56±5.83	8-32 (16)
		1	81	17.16±6.02	8-32 (17)
		2	83	18.12±6.04	8-32 (17)
		3	17	14.88±5.4	8-23 (14)
		4	3	18.67±6.35	15-26 (15)
		5	1	14.00±0.00	14-14 (14)
		P*		.227	
	Education level	Elementary school	8	17.88±5.89	11-27 (16)
		Secondary school	18	16.2±7.45	9-32 (14)
		High school	72	16.84±6.78	8-30 (15)
		Bachelor's degree	200	17.09±5.91	8-32 (17)
		Postgraduate	24	15.17±5.06	8-32 (14.5)
		P*		.231	
	Employment status	Unemployed	27	15.78±5.53	8-28 (16)
		Student	35	17.43±6.64	8-32 (17)
		Working	220	17.18±6.03	8-32 (17)
		Healthcare professional	8	14.63±3.42	11-21 (14.5)
		Retired	32	17.31±5.22	9-29 (16.5)
		P*		.556	
	Dentist preference	Public hospital	112	16.62±5.96	8-30 (16)
		Private hospital	41	17.63±6.05	8-32 (17)
		Private clinic	131	16.77±5.94	8-32 (16)
		University hospital	38	18.53±6.19	9-32 (17)
		P*		.649	
	Reason for dentist visit	Dental pain	161	17.93±6.31	8-32 (17)
		Aesthetics	13	18.08±3.95	12-26 (17)
		Regular checkup	60	15.28±6	8-32 (14.5)
		Other	88	16.44±5.09	8-30 (16)
		P*		**.008**	
	Frequency of dentist visits	None	1	8.00±0.00	8-8 (8)
		Once/year	6	19.5±10.27	8-32 (19)
		Twice/year	28	18.5±6.37	8-32 (18)
		Three times/year	25	18.44±6.6	8-31 (17)
		>Three times/year	262	16.73±5.66	8-32 (16)
		P*		.234	
	Tooth-brushing frequency	None	27	16.48±5.42	8-30 (15)
		Three times/week	25	15.16±5.99	8-32 (14)
		Once/day	105	18.15±5.69	8-31 (18)
		Twice/day	147	16.8±5.77	8-32 (16)
		Three times/day	18	15.94±8.34	9-32 (13)
		P*		**.025**	
	Prior dental visit experience	Very bad	21	22.71±6.25	9-32 (23)
		Bad	56	20.54±6.29	8-32 (20.5)
		Normal	77	17.62±4.72	8-29 (17)
		Good	124	15.15±4.95	8-32 (15)
		Very good	44	14.16±5.75	8-30 (13)
		P*		**.001**	
	Pre-visit anxiety status	Very stressed	47	25.06±5.01	14-32 (25)
		Stressed	113	18.35±3.68	9-30 (18)
		Normal	38	15.97±5.99	8-30 (16)
		Calm	24	15.38±3.52	9-26 (15.5)
		Very calm	100	12.59±4.13	8-30 (12)
		P*		**.001**	
	Dental treatment anxiety reasons	Dental device noise	3	20.33±1.16	19-21 (21)
		Injection/pain	19	23.53±5.86	14-32 (24)
		Blood/hospital	4	26.5±2.89	23-30 (26.5)
		All of the above	22	26.5±4.25	18-32 (26)
		P*		.089	
	Initial anxiety reason	Do not know	16	25.06±5.12	14-32 (25.5)
		Social environment	12	25.58±4.27	20-32 (24.5)
		Family anecdotes	3	28.33±1.53	27-30 (28)
		Previous experiences	17	23.76±5.75	15-32 (24)
		P*		.486	
	Peak moment of anxiety	Previous night	6	25±5.22	19-32 (24)
		Before treatment	15	25.53±5.74	14-32 (25)
		During treatment	25	23.88±5.17	14-32 (24)
		After treatment	3	27±3.61	24-31 (26)
		P*		.654	
	Method of Coping with Dental Anxiety	Psychotherapy	1	19±0	19-19 (19)
		Medication	1	30±0	30-30 (30)
		Meditative method	4	26.5±5.45	19-32 (27.5)
		Without support	42	24.81±5.01	14-32 (24.5)
		P*		.405	
	Anxiety Causing Dental Treatment	Scaling & Root planing	17	16.06±5.92	8-30 (16)
		Restorative treatment	14	13.71±4.58	8-22 (14.5)
		Root canal treatment	88	17.4±5.97	8-32 (16.5)
		Tooth extraction	97	17.08±5.76	8-32 (17)
		Implant	106	17.31±6.18	8-32 (17)
		P*		.267	

The pool of participants in the study was composed primarily of young adults, with approximately 70% of the participants having an advanced level of education. Most participants were employed and preferred to seek dental care at private hospitals or clinics. About half of the participants cited tooth pain as the main reason for their dental visits. The data collected revealed that 39% of participants adhered to an annual schedule for dental visits, while 30% reported brushing their teeth at least once daily. Approximately 20% of participants reported negative experiences related to dental visits. It is important to note that an individual's response to external stimuli, such as dental procedures, may vary in intensity and may change over time. Research has shown that patients may exhibit different reactions to the same stimulus at different stages in their lives.[13] Consequently, this study was designed with the aim to assess and contrast the levels of dental anxiety among individuals who have undergone different dental treatments.

In response to the query, "Which dental procedure induces It has been consideredthe most anxiety?", participants identified tooth extraction as the most anxiety-provoking procedure. This was followed by implant treatment, root canal treatment, scaling and root planing, and restorative treatment, respectively.

Tooth extraction is a common dental procedure that can provoke dental anxiety, often due to the fear of pain associated with the process. Pain during dental procedures, especially invasive ones like tooth extractions or cavity fillings, is a common occurrence.[24] Research has shown that surgical tooth extraction is significantly linked to increased pain and bleeding during the initial healing period.[25] Patients may experience mild to moderate pain following tooth extraction, which can contribute to their overall anxiety.[26] The design of earlier dental equipment may have contributed to patient discomfort during dental procedures, potentially exacerbating anxiety. Studies have highlighted that the experience of wisdom tooth extraction is often associated with pain and discomfort.[27] Additionally, tooth extraction is associated with complications during and after the procedure, such as dry socket, which

can further contribute to patient anxiety.[28] Efforts to minimize pain and anxiety during tooth extraction procedures are crucial. Virtual reality has been studied as a distraction technique to reduce anxiety during dental procedures, including tooth extractions.[29] Numerous strategies have been identified to manage dental anxiety, including both technology-based and non-pharmacologic alternatives to traditional methods. Current studies emphasize the importance of addressing dental anxiety as a critical component of comprehensive dental care.[30] These interventions provide distraction and promote a sense of control and relaxation. They have the potential to alter patients' perceptions of dental procedures and reduce overall anxiety experienced.

To fully comprehend and address dental anxiety, it is necessary to understand its multifactorial etiology and employ a multi-faceted approach. Significant factors that influence the prevalence and intensity of dental anxiety include age, gender, and socio-economic status.[31] Tailored approaches may be required to address the specific needs and concerns of women and younger individuals who tend to report higher levels of dental anxiety.[32] Additionally, the influence of social circles, including family and peers, can either exacerbate or alleviate dental anxiety, highlighting the importance of a supportive social environment in managing this condition.

Psychological interventions, patient education, and modifications to the dental care environment are all critical components of a comprehensive approach to addressing dental anxiety. CBT has been shown to be effective in reducing dental anxiety by providing a structured method for patients to confront and manage their fears.[31,33] Education is essential in clarifying dental procedures and providing patients with knowledge, which can reduce fear and misconceptions about dental treatments. Modifications to the dental care environment, such as creating a welcoming and non-threatening atmosphere, can also help alleviate dental anxiety.

Dental anxiety has implications beyond individual distress, affecting oral health outcomes and the dental healthcare system. Patients with high levels of dental anxiety tend to postpone or avoid dental appointments, leading to delayed diagnosis and treatment of dental conditions.[34] This behavior can result in more complex and extensive dental problems, further reinforcing the cycle of anxiety and avoidance. Therefore, dental anxiety not only affects oral health but also leads to increased healthcare expenses and resource utilization, highlighting the importance of implementing effective healthcare management strategies.

This study also found that patients who reported no anxiety had lower dental anxiety levels compared to those with mild or high anxiety. This highlights the importance of identifying patients who may be at risk of dental anxiety and providing appropriate interventions to reduce their anxiety levels such as CBT.[5,31,33]

Our study found that dental anxiety is a common issue among patients undergoing various dental procedures. The highest level of fear was reported towards tooth extraction, followed by implant treatment, root canal treatment, tooth surface cleaning and restorative treatment, respectively. These findings are consistent with previous studies that have identified dental anxiety as a significant barrier to accessing dental care and maintaining good oral health.[20,23]

The study revealed that participants experienced the highest level of fear regarding implant treatment, followed by tooth extraction, as indicated by their MDAS scores 17.31 and 17.08, respectively. The MDAS scores revealed that a significant proportion of participants experienced high levels of anxiety towards implant treatment (58.7%) and tooth extraction (44.7%), reporting feelings of being very or quite anxious about these procedures. These findings suggest that these two treatments are significant sources of dental anxiety for patients, and dental professionals should take this into account when providing treatment.

Anxiety-related to implant treatment may be due to its status as a more recent, advanced, and continually evolving procedure compared to tooth extraction. As medical and dental advancements introduce new treatment options, treatments that were once feared are now more accessible. However, the use of implant treatment is limited by both the patient's financial situation and clinical suitability, making it less common than tooth extraction or restorative treatments. Patients may experience higher levels of anxiety regarding unfamiliar or perceived complex treatments.

Additionally, it should be noted that the study was conducted on a specific population of patients who sought treatment at a dental school hospital. This factor may limit the generalizability of the findings to broader populations, and thus, it should be considered when interpreting the results. Patients who are willing to endure long wait times and the conditions of a dental school clinic tend to exhibit higher levels of dental anxiety. Research has shown that patients at student dental clinics may experience higher levels of anxiety compared to normative data[2]. Therefore, caution should be exercised when generalizing the findings to other populations. Further research in diverse clinical settings and with more representative samples is warranted to better understand dental anxiety and its associated factors across different populations.

The relationship between a dentist and their patient is crucial in managing dental anxiety. Effective communication, empathy, and reassurance from the dental practitioner can significantly alleviate anxiety, fostering trust and compliance among patients.[35] Dental professionals should aim to create a comfortable and welcoming environment for dental care, utilizing advanced pain management techniques to further enhance patient experiences and reduce anxiety.

Although our study provided valuable insights into dental anxiety, we acknowledge its limitations, including a sample size that was predominantly derived from an urban academic setting. This may introduce potential biases in representativeness and limit the generalizability of our findings. To enhance our comprehension of the multifaceted nature of dental anxiety, we suggest evidence-based interventions such as the integration of CBT and mindfulness practices into dental care routines, particularly for individuals with high levels of anxiety.

Cross-sectional studies can provide valuable information, but it is important to recognize their inherent limitations, particularly in establishing causal relationships. Since exposure and outcome data are collected simultaneously, it is not possible to determine the temporal sequence of events, which limits the ability to infer causality. Additionally, selection bias and confounding variables can complicate data interpretation and obscure the true nature of relationships. Therefore, it is essential to approach findings from cross-sectional studies with caution and critically evaluate them.

Based on the findings of this study, it is recommended that dental professionals assess patients' dental anxiety levels using a validated tool such as the MDAS. This will enable dental professionals to identify patients who may require additional support or interventions to manage their anxiety during dental procedures. Furthermore, dental professionals should provide appropriate interventions to reduce dental

anxiety, such as CBT or education about dental procedures. When planning treatment, dental professionals should consider the patient's level of anxiety and provide appropriate support and interventions to reduce it.

To further improve oral health outcomes, more research is needed to determine the effectiveness of various interventions in reducing dental anxiety. Specifically, future studies should examine the effectiveness of CBT in different populations. Investigating the effects of education and information dissemination on dental anxiety levels, as well as the influence of cultural and socio-economic factors on dental anxiety and access to dental care, is also recommended. By addressing dental anxiety through evidence-based interventions, dental professionals can improve patients' oral health outcomes and overall dental experience.

This study emphasizes the influence of dental anxiety on patients' oral health decisions and behaviors, particularly highlighting pain, and tooth extraction as primary triggers. Addressing these factors from an early age can alleviate individual distress and broader socio-economic challenges. Further research is needed to develop effective and comprehensive strategies to manage dental anxiety.

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REFERENCES

1. Appukuttan D. Strategies to Manage Patients with Dental Anxiety and Dental Phobia: Literature Review. *Clin Cosmet Investig Dent*. Published online March 2016:35.
2. Caltabiano ML, Croker F, Page L, et al. Dental Anxiety in Patients Attending a Student Dental Clinic. *BMC Oral Health*. 2018;18(1):48.
3. Armfield J, Heaton L. Management of fear and anxiety in the dental clinic: a review. *Aust Dent J*. 2013;58(4):390-407.
4. Hoffmann B, Erwood K, Ncomanzi S, Fischer V, O'Brien D, Lee A. Management strategies for adult patients with dental anxiety in the dental clinic: a systematic review. *Aust Dent J*. 2022;67(S1).
5. Gomes HS, Viana KA, Batista AC, Costa LR, Hosey MT, Newton T. Cognitive behaviour therapy for anxious paediatric dental patients: a systematic review. *Int J Paediatr Dent*. 2018;28(5):422-431.
6. Humphris G, Crawford JR, Hill K, Gilbert A, Freeman R. UK population norms for the modified dental anxiety scale with percentile calculator: adult dental health survey 2009 results. *BMC Oral Health*. 2013;13(1):29.
7. Porritt J, Buchanan H, Hall M, Gilchrist F, Marshman Z. Assessing Children's Dental Anxiety: A Systematic Review of Current Measures. *Community Dent Oral Epidemiol*. 2013;41(2):130-142.
8. Kassem El Hajj H, Fares Y, Abou-Abbas L. Assessment of Dental Anxiety and Dental Phobia Among Adults in Lebanon. *BMC Oral Health*. 2021;21(1):48.
9. Murad M, Ingle N, Assery M. Evaluating Factors Associated with Fear and Anxiety to Dental Treatment—A Systematic Review. *J Fam Med Prim Care*. 2020;9(9):4530.
10. Nermo H, Willumsen T, Rognmo K, Thimm JC, Wang CEA, Johnsen JAK. Dental Anxiety and Potentially Traumatic Events: A Cross-Sectional Study Based on the Tromsø Study—Tromsø 7. *BMC Oral Health*. 2021;21(1):600.
11. Ayer Jr WA, Domoto PK, Gale ED, Joy Jr BG, Melamed BG. Overcoming Dental Fear: Strategies for Its Prevention and Management. *J Am Dent Assoc*. 1983;107(1):18-27.
12. Berggren U, Meynert G. Dental fear and avoidance: causes, symptoms, and consequences. *J Am Dent Assoc*. 1984;109(2):247-251.
13. de Jongh A, Stouthard MEA. Anxiety about dental hygienist treatment. *Community Dent Oral Epidemiol*. 1993;21(2):91-95.
14. Eli I, Uziel N, Baht R, Kleinhauz M. Antecedents of dental anxiety: learned responses versus personality traits. *Community Dent Oral Epidemiol*. 1997;25(3):233-237.
15. Humphris G, Morrison T, Lindsay SJ. The Modified Dental Anxiety Scale: validation and United Kingdom norms. *Community Dent Health*. 1995;12(3):143-150.
16. Kleinknecht RA, Klepac RK, Alexander LD. Origins and Characteristics of Fear of Dentistry. *J Am Dent Assoc*. 1973;86(4):842-848.
17. Neverlien PO, Johnsen TB. Optimism-pessimism dimension and dental anxiety in children aged 10–12 years. *Community Dent Oral Epidemiol*. 1991;19(6):342-346.
18. Scott DS, Hirschman R. Psychological Aspects of Dental Anxiety in Adults. *J Am Dent Assoc*. 1982;104(1):27-31.
19. Lawshe CH. A quantitative approach to content validity. *Pers Psychol*. 1975;28(4):563-575.

20. Corah NL. Dental Anxiety. *Dent Clin North Am*. 1988;32(4):779-790.
21. Dereci O, Saruhan N, Tekin G. The Comparison of Dental Anxiety Between Patients Treated with Impacted Third Molar Surgery and Conventional Dental Extraction. Grassia V, ed. *Biomed Res Int*. 2021;2021:1-4.
22. İlgüy D, İlgüy M, Dinçer S, Bayirli G. Reliability and validity of the Modified Dental Anxiety Scale in Turkish patients. *J Int Med Res*. 2005;33(2):252-259.
23. Ogawa M, Sago T, Furukawa H. The Reliability and Validity of the Japanese Version of the Modified Dental Anxiety Scale among Dental Outpatients. *The Scientific World Journal*. 2020;2020:1-6.
24. Atzori B, Lauro Grotto R, Giugni A, Calabrò M, Alhalabi W, Hoffman HG. Virtual Reality Analgesia for Pediatric Dental Patients. *Front Psychol*. 2018;9:2265.
25. AlQutub AW. Pain Experience After Dental Implant Placement Compared to Tooth Extraction. Iorio Siciliano V, ed. *Int J Dent*. 2021;2021:1-5.
26. Ahrari F, Eshghpour M, Zare R, Ebrahimi S, Fallahrastegar A, Khaki H. Effectiveness of Low-Level Laser Irradiation in Reducing Pain and Accelerating Socket Healing After Undisturbed Tooth Extraction. *J Lasers Med Sci*. 2020;11(3):274-279.
27. Ashton-James CE, Forouzanfar T, Costa D. The Contribution of Patients' Presurgery Perceptions of Surgeon Attributes to the Experience of Trust and Pain During Third Molar Surgery. *PAIN Rep*. 2019;4(3):e754.
28. Kuśnierek W, Brzezińska K, Nijakowski K, Surdacka A. Smoking as a Risk Factor for Dry Socket: A Systematic Review. *Dent J*. 2022;10(7):121.
29. Qin Z, Zhou C, Zhu Y, et al. Virtual Reality for Hypertension in Tooth Extraction: A Randomized Trial. *J Dent Res*. 2022;101(4):400-406.
30. Karapicak E, Dulger K, Sahin E, Alver A. Investigation of the Effect of Music Listened to by Patients with Moderate Dental Anxiety During Restoration of Posterior Occlusal Dental Caries. *Clin Oral Investig*. 2023;27(7):3521-3530.
31. Musalam K, Sohal KS, Owibingire SS, Kileo B. Magnitude and Determinants of Dental Anxiety Among Adult Patients Attending Public Dental Clinics in Dar-Es-Salaam, Tanzania. Isola G, ed. *Int J Dent*. 2021;2021:1-7.
32. Koleoso ON, Akhigbe KO. Prevalence of Dental Anxiety and the Psychometric Properties of Modified Dental Anxiety Scale in Nigeria. *World J Dent*. 2014;5(1):53-59.
33. Park ES, Yim HW, Lee KS. Progressive Muscle Relaxation Therapy to Relieve Dental Anxiety: A Randomized Controlled Trial. *Eur J Oral Sci*. 2019;127(1):45-51.
34. Appukuttan D, Subramanian S, Tadepalli A, Damodaran L. Dental anxiety among adults: An epidemiological study in South India. *North Am J Med Sci*. 2015;7(1):13.
35. Akarslan ZZ, Biçer AZ. Influence of gag reflex on dental attendance, dental anxiety, self-reported temporomandibular disorders and prosthetic restorations. *J Oral Rehabilitation*. 2013;40(12):932-939.