



# Dental Anxiety and Fear among Patients in Jazan, Kingdom of Saudi Arabia: A Cross-sectional Study

Thiyezen A Aldhelai<sup>1</sup>, Manea M Al-Ahmari<sup>2</sup>, Hafiz A Adawi<sup>3</sup>, Mannaa K Aldowsari<sup>4</sup>, Nasser M Al Ahmari<sup>5</sup>, Lujain I Aldosari<sup>6</sup>, Ramzi F Alqatta<sup>7</sup>, Mohammed M Al Moaleem<sup>8</sup>

## ABSTRACT

**Aim:** The current study aims to address the patient's dental anxiety (DA) And dental fear (DF) under the treatment of a general practitioner (GP) among different parameters.

**Materials and methods:** The cross-sectional study included 500 patients recruited from different clinics in Jazan, Saudi Arabia. Data were collected through a questionnaire-based form consisting of three parts; the first part was personal and demographic questions whereas the second and third parts were a modified dental anxiety scale (MDAS) and a dental fear survey (DFS) to measure DA and DF among patients. Spearman's correlation was used to measure the relation between DA and DF as well as Chi-square tests and logistic regression analyses for analyzing the effect of each variable on DA and DF.

**Results:** All patients fulfilled their eligibility criteria. A high percentage was found in moderate anxiety (36.8%) as well as in moderate fear (46.2%) among different anxiety and fear scales. The association between DA and DF was positively significant ( $p < 0.01$ ). There was a significant effect of gender, age, education, khat use, marital status, monthly income, and type of clinic on patients' DA and DF.

**Conclusions:** There is a positive relation between MDAS and DFS, thus the DA affects the DF. Female patients had a lower DA and DF than male patients. Furthermore, the government clinics had the highest DA and DF prevalence levels for patients. Moreover, the high school-graduated patients seem to have a high DA and DF vs other patient educational levels.

**Clinical significance:** It would be beneficial to include an educational training program about psychological patient management in the study curriculum as well as to be offered as a special course to newly graduated dentists. This modification will aid to improve the GPs to get rid of DA and DF patients.

**Keywords:** Dental anxiety, Dental fear, Educational level, Khat chewer.

*The Journal of Contemporary Dental Practice* (2021): 10.5005/jp-journals-10024-3066

## INTRODUCTION

Dental anxiety (DA), dental fear (DF), and apprehensive patients are terms that have been used to describe DA. None of these terms have been adequately defined or made distinctive. Sometimes, a more specific term like "dental-injection phobia" is used. Some authors considered anxiety as the result of pain, while others did not link it to pain.<sup>1</sup>

DA is a general state in which a person experiences a level of apprehension and is prepared for something bad to happen during a dental visit. Although the terms anxiety and fear are used interchangeably, they differ categorically. Anxiety and fear are both distinguished from each other; DF represents a normal emotional reaction to a specific threatening external dental stimulus.<sup>2</sup> Anxiety is a response to a perceived danger that is unknown to the individual. Fear is a biological reaction to a particular threat and is a reaction to a known danger or a threat.<sup>3</sup> Klingberg and Broberg described DA as a state of unreasonable and excessive apprehension that something terrible is going to occur concerning dental treatment; it is associated with the sense of losing control.<sup>4</sup> Alternatively, Cianetti et al. described DF as a normal unpleasant emotional reaction in a dental situation to a perceived threat or a danger.<sup>5</sup> In this study, the terms "dental anxiety and dental fear" are used to refer to all the above-mentioned relations.

The most frequent scales used in surveys that examine DA and DF in the worldwide populations are the dental anxiety scale (DAS),<sup>6</sup> modified dental anxiety scale (MDAS),<sup>7</sup> and dental fear

<sup>1</sup>Department of Orthodontic and Pediatric Dentistry, College of Dentistry, Qassim University, Buraydah, Kingdom of Saudi Arabia; Department of Orthodontics and Pediatric Dentistry, Faculty of Dentistry, Ibb University, Ibb, Yemen

<sup>2</sup>Department of Periodontics and Community Dental Sciences, College of Dentistry, King Khalid University, Abha, Kingdom of Saudi Arabia

<sup>3,8</sup>Department of Prosthetic Dental Science, College of Dentistry, Jazan University, Jazan, Saudi Arabia

<sup>4</sup>Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Saudi Arabia

<sup>5,6</sup>Prosthetic Department, College of Dentistry, King Khalid University, Abha, Saudi Arabia

<sup>7</sup>Department of Oral Surgery and Dental Implant, College of Dentistry, University of Bari Aldo Moro, Bari City, Italy

**Corresponding Author:** Thiyezen A Al Dhelai, Department of Orthodontics and Pediatric Dentistry, Faculty of Dentistry, Ibb University, Ibb, Yemen Phone: +966581168075, e-mail: t.aldhelai@qu.edu.sa; aldhelai@hotmail.com

**How to cite this article:** Aldhelai TA, Al-Ahmari MM, Adawi HA, et al. Dental Anxiety and Fear among Patients in Jazan, Kingdom of Saudi Arabia: A Cross-sectional Study. *J Contemp Dent Pract* 2021;22(5): 549–556.

**Source of support:** Nil

**Conflict of interest:** None

survey (DFS).<sup>8</sup> Some studies use DAS<sup>9-12</sup> whereas MDAS is used to measure the DA level because it is valid, reliable, brief, accessible, and easy to use.<sup>13-26</sup> However, the DFS is consistent and effective in surveys that assess DF for samples from college students and dental patients.<sup>11,26-29</sup>

Most DA- and DF-published papers compared male and female participants,<sup>13-18</sup> some surveys evaluated DA among university students<sup>9,11,14,15,18,19,30,31</sup> and preclinical and clinical phases of the education period,<sup>9,10,16,24,28,30</sup> but most studies assessed the DA and DF among patients with different age-groups.<sup>10,16,19,20,29,30</sup> Only a few published articles included marital status in their researches<sup>13,31</sup> and place of dental treatments,<sup>12,25</sup> family income,<sup>13,25,30,31</sup> level of education,<sup>9,13,17,22,23</sup> and grade point average in their surveys related to DA and DF.<sup>31</sup>

From the literature, we notice that only a few studies assessed both DA and DF together. The first was conducted among females from Riyadh (2002),<sup>11</sup> the second was among dental students in Al Madinah Al Munawarah,<sup>28</sup> the third was in Greek,<sup>26</sup> and the last one was done among university students in Yemen (2020).<sup>27</sup> In the Jazan region, a group of studies was conducted regarding the effect of khat chewing in DA and depression as well as the comparison between genders among university students.<sup>12,13,18,30,31</sup> A single study compared the DA between patients from private and government clinics,<sup>12</sup> where no previous study was reported on DF. This knowledge is essential to analyze the main causes of DA and DF among patients and based on that we can manage their DA and DF effectively. Thus, this study assesses DA and DF under the treatment of a general practitioner (GP) among patients in three different types of clinics (government, university, and private). It also compares the effect of variables, such as gender, age, educational level, khat use, marital status, and family monthly income on the level of DA and DF.

## MATERIALS AND METHODS

### Study Design

A cross-sectional survey-based study was used to collect information relative to our variables. This survey agreed with the standards of the World Medical Association Declaration of Helsinki.<sup>32</sup> Ethical approval was granted by the committee of evidence-based research, AFJH # July/10/2019(#01903). Furthermore, informed consent was signed by the participants.

### Study Size

The sample size of about 500 subjects was verified based on a G\*Power software (<http://www.gpower.hhu.de/en.html>) with the self-confidence amount modified at 95%, power adjusted at 80%, and a moderate effect amount. A total of 500 subjects recruited through nonprobability convenience random sampling were chosen anonymously and voluntarily.

### Setting and Participants

The patients were recruited from various clinics in Jazan, namely primary health centers of government hospitals, private dental centers, and students and intern clinics at the College of Dentistry, Jazan University. The main focus of this study was on the GPs, not the specialists. The subjects were contacted during their regular dental appointments. Respondents were chosen from both genders who were beyond 18 years of age, medically fit, and khat and nonkhat users, had a minimum of a single dental visit before, and received systematic dental treatments in any types of dental clinics in the Jazan city. Participants with any medical- or dental-

relating illness complications or undergoing medical therapies that could interfere with their ability to understand the study questionnaires were excluded. Subjects who had been chewing khat twice or more in a week for a minimum of 36 months or more were considered to be khat users.<sup>13,33</sup>

### Data Sources/Measurement

The information was collected by six dentists (two GPs in each clinic) who were taught about using the predesigned survey sheet. The questionnaire for DA and DF was generated in English and then translated into Arabic, which is the main language of the subjects. Both English and Arabic translations of the questionnaire were assessed by the English language to confirm the clarity of the translation. It was then tested for face validity by the colleagues of the college. In this study, the Arabic version of the investigation was then processed to all subjects.<sup>27,34,35</sup> The objectives of this survey were discussed with the contributing subjects and a consent form was then authorized and signed by every participant. Patients were informed that they have the right to withdraw from the survey at any time without any consequences or explanations.

The questionnaire consisted of three parts (presented as an appendix). The first part related to personal and demographical data and contained the following: subject's gender (male or female), age-groups, educational level (not educated, high school, university degree, diploma, or postgraduate), khat use (yes or no), type of clinic (private, government, or university student clinic), marital status (single, married, or divorced), and monthly income in Saudi rials (SR) (up to 3,000, 3,000–10,000, 10,000–20,000, or  $\geq 20,000$ ).

The second part related to questions of DA via MDAS. This is the most valid and consistent measurement instrument used to assess the levels of DA among subjects.<sup>6,13,15,26,27,36</sup> It evaluated applicants' anxiety based on specific dental procedures and situations. The modified scale had contained five items and principally dealt with the participants' feelings throughout each of the following conditions: (1) if you were going to your dentist for therapy tomorrow, (2) if you were sitting in the waiting area, (3) if you were about to have a tooth drilled, (4) if you were just about to have your teeth scaled and polished, and (5) if you were about to get a local anesthetic injection in your gums. Every question had five answers scored from 1 to 5 as "not anxious, slightly anxious, fairly anxious, anxious, and extremely anxious." The DA score was the total of five answers and can range from 5 to 25. A score lower than 5 was measured as low, 5 to 11 was considered to be moderate, 12 to 18 was high, and 19 or above was recorded as severe DA or borderline of phobia.<sup>13,15,26,27,36</sup>

The third part involved questions concerning the current DFS and contained 20 questions. The DFS score was the sum of five responses and can range from 20 to 100. Each question had five Likert responses scored from 1 to 5, ranging from score 1 (never or not at all) to score 5 (nearly, every time, or very much). A score lower than 35 revealed a low DF, a score between 35 and 53 was referred to as moderate DF, whereas a score above 53 was referred to as high DF.<sup>8,26,27,37</sup>

### Statistical Methods

The returned data were coded, collected, and entered into a personal computer using Excel (Office 2019). The data were investigated using a Statistical Package for Social Science (SPSS) program version 23 (IBM Inc., Chicago, Illinois) for statistical analysis. Cross-tabulations were used to determine the descriptive statistics together with means and standard deviation (SD), percentage for

khat-chewing habits, type of clinic, marital status, genders, age-groups, monthly income, and level of education. Also, MDAS was recorded into no anxiety (score 1) and anxiety (scores 2, 3, and 4). Similarly, the DFS score was reported as no fear (score 1) and fearful (scores 2 and 3).

Spearman's correlation was applied to evaluate the associations among DA and DF measurements. The interrelationships between DAS and DFS were examined with Spearman's correlation. Chi-square and Fisher's exact tests for independence were utilized to check the significance of differences between the measured variables. Regression analyses were executed to analyze the relationship between the self-administered questionnaire variables and the recorded response from participants. A logistic regression analysis was done to assess the effect of all variables on the outcome (DA and DF). The significance level for all tests was set at  $p < 0.05$  with a 95% confidence interval. Bar charts were used for the graphical presentation of overall data.

### RESULTS

The current study included 500 participants who were recruited for this survey from October 2019 to February 2020 and then divided according to their response to MDAS and DFS into low anxiety/fear, moderate anxiety/fear, high anxiety/fear, and severe anxiety. The age-group was divided into three groups. The first group was the young adult group (from 18 to 39 years), the second group was the adult group (from 40 to 59 years), and the third group was the elderly group (from 60 and above).

The gender mean  $\pm$  SD was  $1.37 \pm 0.48$ , whereas for age-group and marital status it was  $1.30 \pm 0.47$  and  $1.78 \pm 0.45$ , respectively. Khat chewing, educational level, and monthly income had a mean  $\pm$  SD of  $1.45 \pm 0.49$ ,  $2.23 \pm 0.71$ , and  $2.22 \pm 0.84$ , respectively. The prevalence of DA and DF among the variables is shown in Fig. 1 A high percentage was found in moderate anxiety and fear (36.8 and 46.2%) followed by high and severe anxiety and high fear (17.4, 26.6, and 34%, respectively). The prevalence of low DA and DF is almost identical (19%).

The relation between DA and DF was measured using a Spearman's correlation to look at the interrelation between MDAS and DFS (Table 1). There was a positive relation between DA and

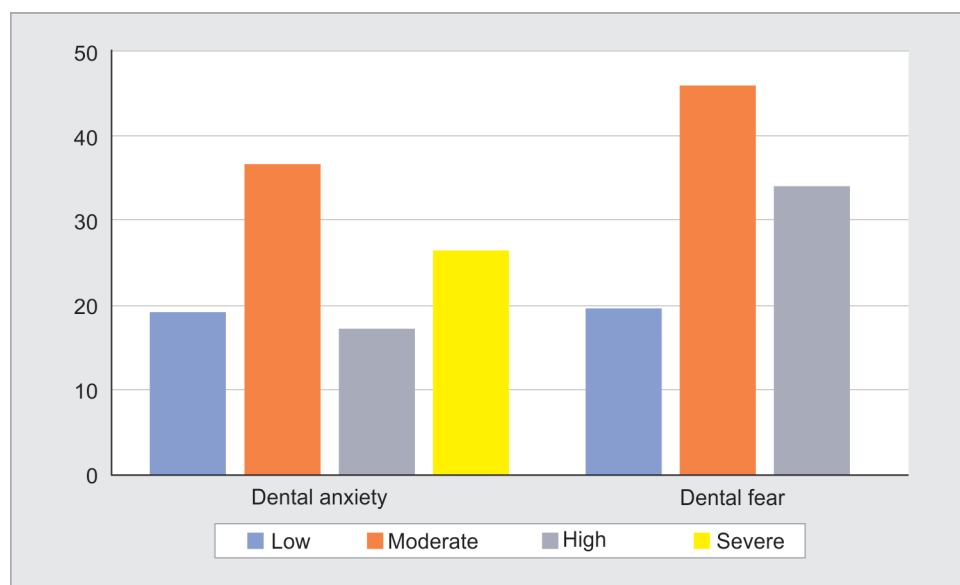
**Table 1:** Spearman's correlations between DA (MDAS) and DF (DFS) in the studied sample

Variables	Anxiety (MDAS)	Correlation coefficient	Anxiety (MDAS)	Fear (DFS)
Spearman's rho	Anxiety (MDAS)	Correlation coefficient	-	0.515**
		Sig. (2-tailed)		0.000

\*\*Correlation is significant at the 0.01 level (two-tailed)

DF ( $p < 0.01$ ). The effect of different variables including gender, age, education, khat use, type of clinic, marital status, and monthly income on the prevalence of DA and DF is shown in Tables 2 and 3. Males have more anxiety and fear than females ( $p < 0.001$ ). Most of the cases were young adults (352 out of 500), and the level of DA and DF were low or moderate ( $p < 0.001$ ). There was a significant difference between different age-groups ( $p < 0.03$ ). A severe anxiety score has been found among high school-educated patients with significant differences among their educational levels ( $p < 0.02$ ). Most patients who chewed khat had severe DA and DF ( $p < 0.000$ ). Furthermore, patients who had been treated in the government hospitals had a high level of DA and DF followed by patients at private dental clinics and the university dental clinic with low DA and DF scores. There was a significant difference between various marital statuses with an increase in DA and DF scores among the married patient groups ( $p < 0.03$  and  $0.00$ , respectively). Patients with high monthly income had low DA and DF scores.

Table 4 shows the logistic regression model for factors affecting DA levels. Education had a significant effect on DA: a high school education had led to a significantly higher odd of DA than uneducated patients ( $p = 0.04$  and  $30.47$ ). Likewise, patients with a university degree and diploma had a significantly lower odd of DA than high school patients ( $p = 0.01$  and  $56.70$ ). Patients with a postgraduate degree had a low and significant odd of DA vs those with a university degree ( $p = 0.02$  and  $34.71$ ). Type of clinic has a significant effect on DA. Patients from both private and university



**Fig 1:** The overall percentage of DA and DF items among participants

## Dental Anxiety and Fear among Saudis

**Table 2:** Association between modified dental anxiety scale and different variables (n = 500)

MDAS/variables		Low anxiety N (%)	Moderate anxiety N (%)	High anxiety N (%)	Severe anxiety N (%)	Total N (%)	$\chi^2$ (p value)
Gender	Male	48 (15.3%)	107 (34.1%)	58 (18.5%)	101 (32.2%)	314 (100.0%)	18.8 (0.000)*
	Female	48 (25.8%)	77 (41.4%)	29 (15.6%)	32 (17.2%)	186 (100.0%)	
Age-group	Young adult	77 (21.9%)	122 (34.7%)	61 (17.3%)	92 (26.1%)	352 (100.0%)	13.4 (0.030)*
	Adult	17 (11.7%)	62 (42.8%)	25 (17.2%)	41 (28.3%)	145 (100.0%)	
	Elderly	2 (66.7%)	0 (0.0%)	1 (33.3%)	0 (0.0%)	3 (100.0%)	
Educational level	Not educated	17 (22.1%)	34 (44.2%)	10 (13.0%)	16 (20.8%)	77 (100.0%)	26.4 (0.002)*
	High school	35 (14.5%)	93 (38.6%)	42 (17.4%)	71 (29.5%)	241 (100.0%)	
	University degree and diploma	38 (21.8%)	55 (31.6%)	35 (20.1%)	46 (26.4%)	174 (100.0%)	
	Postgraduate	6 (75.0%)	2 (25.0%)	0 (0%)	0 (0%)	8 (100%)	
Khat chewer	Yes	34 (12.4%)	83 (12.4%)	62 (22.6%)	95 (22.6%)	274 (100.0%)	45.9 (0.000)*
	No	62 (27.4%)	101 (44.7%)	25 (11.1%)	38 (16.8%)	226 (100.0%)	
Type of clinic	Private clinic	24 (17.8%)	63 (46.7%)	18 (13.3%)	30 (22.2%)	135 (100.0%)	52.0 (0.000)*
	Government clinic	26 (11.0%)	76 (32.1%)	50 (21.1%)	85 (35.9%)	237 (100.0%)	
	University clinic	46 (35.9%)	45 (35.2%)	19 (14.8%)	18 (14.1%)	128 (100.0%)	
Marital status	Single	30 (25.6%)	53 (45.3%)	17 (14.5%)	17 (14.5%)	117 (100.0%)	20.1 (0.003)*
	Married	64 (17.1%)	131 (34.9%)	67 (17.9%)	113 (30.1%)	375 (100.0%)	
	Divorced	2 (25.0%)	0 (0.0%)	3 (37.5%)	3 (37.5%)	8 (100.0%)	
Monthly income	Up to 3,000	14 (11.9%)	48 (40.7%)	18 (15.3%)	38 (32.2%)	118 (100.0%)	18.5 (0.030)*
	3,000–10,000	42 (24.7%)	50 (29.4%)	36 (21.2%)	42 (24.7%)	170 (100.0%)	
	10,000–20,000	36 (18.5%)	80 (41.0%)	33 (16.9%)	46 (23.6%)	195 (100.0%)	
	≥20,000	4 (23.5%)	6 (35.3%)	0 (0.0%)	7 (41.2%)	17 (100.0%)	
Total		96 (19.2%)	184 (36.8%)	87 (17.4%)	133 (26.6%)	500 (100%)	

\*Statistically significant at  $p \leq 0.05$

**Table 3:** Association between dental fear survey and different variables (n = 500)

DFS/variables		Low fearful N (%)	Moderate fearful N (%)	High fearful N (%)	Total N (%)	$\chi^2$ (p value)
Gender	Male	45 (14.3%)	132 (42.0%)	137 (43.6%)	314 (100.0%)	38.9 (0.000)*
	Female	54 (29.0%)	99 (53.2%)	33 (17.7%)	186 (100.0%)	
Age-group	Young adult	76 (21.6%)	156 (44.3%)	120 (34.1%)	352 (100.0%)	5.8 (0.03)*
	Adult	23 (15.9%)	72 (49.7%)	50 (34.5%)	145 (100.0%)	
	Elderly	0 (0.0%)	1 (100.0%)	0 (0.00%)	3 (100.0%)	
Educational level	Not educated	18 (23.4%)	34 (44.2%)	25 (32.5%)	77 (100.0%)	8.2 (0.22)
	High school	46 (19.1%)	103 (42.7%)	92 (38.2%)	241 (100.0%)	
	University degree and diploma	33 (19.0%)	88 (50.6%)	53 (30.5%)	174 (100.0%)	
	Postgraduate	2 (25.0%)	6 (75.0%)	0 (0.00%)	8 (100%)	
Khat chewer	Yes	30 (10.9%)	118 (43.1%)	126 (46.0%)	274 (100.0%)	50.8 (0.000)*
	No	69 (30.5%)	113 (50.0%)	44 (19.5%)	226 (100.0%)	
Type of clinic	Private clinic	43 (31.9%)	64 (47.4%)	28 (20.7%)	135 (100.0%)	86.4 (0.000)*
	Government clinic	14 (5.9%)	101 (42.6%)	122 (51.5%)	237 (100.0%)	
	University clinic	42 (32.8%)	66 (51.6%)	20 (15.6%)	128 (100.0%)	
Marital status	Single	43 (36.8%)	53 (45.3%)	21 (17.9%)	117 (100.0%)	36.5 (0.000)*
	Married	56 (14.9%)	172 (45.9%)	147 (39.2%)	375 (100.0%)	
	Divorced	0 (0.0%)	6 (75.0%)	2 (25.0%)	8 (100.0%)	
Monthly income	Up to 3,000	13 (11.0%)	60 (50.8%)	45 (38.1%)	118 (100.0%)	14.9 (0.02)*
	3,000–10,000	46 (27.1%)	65 (38.2%)	59 (34.7%)	170 (100.0%)	
	10,000–20,000	38 (19.5%)	98 (50.3%)	59 (30.3%)	195 (100.0%)	
	≥20,000	2 (11.8%)	8 (47.1%)	7 (41.2%)	17 (100.0%)	
	Total	99 (19.8%)	231 (46.2%)	170 (34.0%)	500 (100%)	

\*Statistically significant at  $p \leq 0.05$

**Table 4:** Logistic regression model for factors affecting DA among patients

Variables	Wald $\chi^2$	p value	OR	95% CI for OR	
				Lower	Upper
Gender: male vs female	0.065	0.798	0.920	0.488	1.737
Age: young adult vs adult	0.614	0.433	2.854	0.207	39.356
Age: elderly vs adult	1.527	0.217	5.255	0.378	73.035
Education: not educated vs high school	8.451	0.004*	30.472	3.044	305.052
Education: university degree vs high school	12.239	0.000*	56.702	5.904	544.538
Education: university degree vs postgraduate	9.532	0.002*	34.711	3.652	329.914
Khat chewer: yes vs no	0.668	0.414	1.328	0.673	2.623
Type of clinic: private clinic vs government clinic	9.039	0.003*	2.631	1.400	4.944
Type of clinic: university clinic vs government clinic	10.972	0.001*	3.845	1.733	8.531
Marital status: single vs married	1.125	0.289	0.280	0.027	2.943
Marital status: divorced vs married	0.584	0.445	0.400	0.038	4.202
Monthly income: Up to 3,000 vs 3,000–10,000	0.543	0.461	0.519	0.091	2.971
Monthly income: 3,000–10,000 vs 10,000–20,000	2.793	0.095	0.238	0.044	1.281
Monthly income: 20,000 vs $\geq 20,000$	1.409	0.235	0.361	0.067	1.942

OR, odds ratio; CI, confidence interval; \*Statistically significant at  $p \leq 0.05$

**Table 5:** Logistic regression model for factors affecting DF among patients

Variables	Wald $\chi^2$	p value	OR	95% CI for OR	
				Lower	Upper
Gender: male vs female	0.000	0.995	1.002	0.534	1.878
Age: young adult vs adult	0.000	0.999	0.000	0.000	0.000
Age: elderly vs adult	0.000	0.999	0.000	0.000	0.000
Education: not educated vs high school	0.434	0.510	2.268	0.198	25.965
Education: university degree vs high school	1.959	0.162	5.341	0.511	55.794
Education: university degree vs postgraduate	1.884	0.170	5.190	0.494	54.490
Khat chewer: yes vs no	0.591	0.442	1.307	0.660	2.588
Type of clinic: private clinic vs government clinic	0.077	0.798	1.080	0.600	1.944
Type of clinic: university clinic vs government clinic	1.780	0.000*	5.928	2.482	14.160
Marital status: single vs married	0.000	0.999	0.000	0.000	0.000
Marital status: divorced vs married	0.000	0.999	0.000	0.000	0.000
Monthly income: Up to 3,000 vs 3,000–10,000	0.727	0.394	0.475	0.086	2.631
Monthly income: 3,000–10,000 vs 10,000–20,000	5.138	0.023*	0.149	0.029	0.773
Monthly income: 20,000 vs $\geq 20,000$	3.285	0.070	0.217	0.041	1.133

OR, odds ratio; CI, confidence interval; \*Statistically significant at  $p \leq 0.05$

clinics had a lower odd of DA than patients from government clinics [odds ratio (OR) = 2.63 and 3.84,  $p = 0.003$  and  $0.001$ ].

The logistic regression model for factors affecting DF levels is shown in Table 5. There was a significant effect of the type of clinic on DF. Patients from the university clinic had a lower odd of dental fear than patients from the government clinic (OR = 5.928,  $p = 0.00$ , respectively). Patient's monthly income had some significant effect on their fear level. Patients with a monthly income of 3,000 to 10,000 SR had 15% higher odds of DF than the 10,000 to 20,000 SR monthly income group (OR = 0.149).

## DISCUSSION

Jazan is a province in Saudi Arabia (SA). The district/state is located in the southwest of the country and aligns with the southern

seaboard of Yemen.<sup>31</sup> DA and DF have a great impact on the development of dental problems because they can prevent patients from seeking proper dental treatment. Therefore, this study assessed DA and DF among patients from different types of clinics. It compared the effect of gender, different age-groups, khat use, marital status, and family monthly income on the level of DA and DF.

MDAS is based on the Corah's dental anxiety scale and is the most popular measure for assessing DA worldwide.<sup>13,26,27</sup> It is effective and reliable, and replying to the questionnaire is informal, easy, and fast; thus, it is appropriate for scientific and clinical practice.<sup>6,7,38</sup> On the other hand, the DFS evaluates additional stimuli and its enhanced comprehensiveness might be selected for research objectives.<sup>8</sup> The overall percentage of DA items was 36.8% for moderate anxiety, which was the highest percentage



followed by 26.6% as severe anxiety, and 19.2 and 17.4% for low and high anxiety, respectively. Regarding DF items, 46.2% of the participants recorded moderate DF followed by 34 and 19% for fearful and low DF (Graph 1).

In relation to DA scores, a similar percentage for low and moderate anxiety (40 and 38%) was obtained by Jumaymi et al., Inamdar et al., and Al-Jasser et al. and low (65.2, 21.4, and 40%) and moderate (18.3, 50.1, and 36%) by Kamel et al. and Alalwan et al.<sup>13,15,16,18,39</sup>. Also, high percentages were recorded in this study (high 17.4% and severe anxiety 26.6%) for fairly anxious and severe anxiety. Marginally similar scores were seen by Fayad et al., (high 17.1% and extremely anxious 12.4%), Kamel et al., (high anxiety 28.5%), Sghaireen et al., (anxious 6% and extremely anxious 5%), Alshammary et al., (high anxious 11% and phobia 5%), Alalwan et al., (15% anxious and 5% high anxiety), and finally Alaki et al. who recorded 12.7% for high anxiety and 21.6% for severe anxiety.<sup>12,16,20,21,24,39</sup>

Al-Khalifa recorded a value of 34.8% for extremely anxious items that was higher than the current study score (26.6%).<sup>22</sup> In contrast, DA results of Allam et al., Ibrahim et al., Alshammary et al., and Al-Nasser et al., were lower than our scores in items of DA and not in parallel with our DA values.<sup>9,10,19,25</sup> This could be explained by some of the previous researches that have been conducted on medical and dental students.<sup>9,19,24</sup> Their knowledge of dental treatment might affect their responses in positive or negative ways.

DF is manifested by sweaty hands, fast breathing, and an increase in heart rates. Ibrahim et al. and our work both concluded that fear of pain is the highest reason for irregular dental visits.<sup>10,13</sup> The percentages for low, moderate, and high fear in this study were 20, 46, and 34%, respectively. The value of low DF is near the values recorded by Al-Madi et al. (21.8%), but much lower percentages were gained by El-Hakim et al. (45%) and Madfa et al. (32.6%). However, the moderate DF value in between the results was obtained by Al-Madi et al., El-Hakim et al., and Madfa et al. Nevertheless, the current study recorded the highest percentage for participants with high fear DF (34%) vs other studies published by Al-Madi et al., Madfa et al., and El-Hakim et al., with values 25, 21, and 3.2%, respectively.<sup>11,27,28</sup> The relation between DA and DF has been shown in Table 1; they had a positive relationship. The mean DF affects DA and vice versa. This result agrees with Coolidge et al. and Madfa et al.<sup>26,27</sup>

From the most previously published research worldwide, female patients were "more anxious" toward all items in the DA questionnaire.<sup>10,12-14,20,25-29</sup> The current study showed a high difference in the DA level between females (low and moderate anxiety were 25.8 and 41.4%) vs males (low and moderate anxiety were 15.3 and 34.1%), but the severe anxiety values were higher in male subjects (32.2%) vs only 17.2% among females. This result did not agree with the studies mentioning that females were more anxious.<sup>10,12-14,16,23,25</sup> This might be attributed to sampling size: We recruited more men and sample types that were either dental students or university students, health workers, or general patients. This outcome was similar to the results of Allam et al., Al-Towayan and Osman, and Inamdar et al., who concluded that males had higher DA.<sup>9,10,18,19</sup> However,<sup>15,30</sup> studies mentioned no differences among genders.

Our results showed an inverse relationship between age and DA score; this agrees with most of the published studies.<sup>10,15,16,20</sup> This finding is in contrast to the findings of Al Jasser et al. and El-Hakim et al.,<sup>15,28</sup> who reported that the DA was not affected by age, but Alalwan et al. said that young and old patients showed higher

stress levels during dental procedures than middle-aged patients.<sup>39</sup> Overall, there is a significant difference between age-groups; this was matched with the results of the most previous studies.<sup>10,20,30</sup>

The results of this study showed that education had a significant effect on DA toward dental procedures. There was a statistically significant difference in the DA as a function of education ( $p$  value = 0.002; Table 2). This result does not agree with the published studies which showed that patients with low or primary school of education had the highest DA scores in comparison to patients with a higher diploma or a bachelor's degree.<sup>10,13,20,25</sup> Besides, in our study, severe DAs were highest among high school-educated patients (29.5%) and lowest DAs were recorded among postgraduate patients (75.0%). Similar results were gained by Jumaymi et al. and Fayed et al., who concluded that the DA decreased as the educational level increased.<sup>13,20</sup>

Al Bahhawi et al. reported that khat use might be correlated with DA, increased heart rate, and depression.<sup>31</sup> Significant differences were detected among khat and nonkhat users in all items of DA. Jumaymi et al. found a significant difference between khat chewers and nonchewers with higher DA in both high and severe anxiety with a percentage of 22.6% in both groups with a significant difference between khat and nonkhat chewers.<sup>13</sup> Also, the khat-chewing group was documented to be low anxious, anxious, and extremely anxious with a high level and high proportion in all elements of DA.

Private dental centers are common throughout the country. Al-Nasser et al. reported that contributors from private clinics registered a moderate or high DA vs patients in government clinics, which is the opposite of our findings.<sup>25</sup> Moreover, our findings agree with Alaki et al., Al-Nasser et al., and Coolidge et al., in that significant differences between patients treated in different types of clinics are mainly between patients from government and private clinics.<sup>12,25,26</sup>

Concerning marital status, married patients in this study perceived higher levels of DA vs single or divorced patients regarding total DA score. These findings agree with previous studies from SA that reported a significant difference between married and single students.<sup>13,23,40</sup> Similar findings were obtained in the current study with significant differences between marital status subgroups ( $p$  value = 0.003; Table 2). Therefore, the role of marital status can be recognized, in that married individuals have more duties than single ones.

Table 3 shows significant differences between all variables of DF with most higher values and percentages for moderate fear (above 40 and 75%) in divorced patients, reaching 100% among elderly patients and high fear in patients from government clinics (51.5%), khat chewers (46.0%), male patients (43.6%), and married people (39.2%). This means that most of our participants had a high percentage of DF. The values of moderate DF among females were high at 53.2%. Males were higher than females in the high fearful DF item (males 43.6 and females 17.7%). These results were not agreed with Hakami et al., who recorded 26% only for moderate DF among males as well as for high fearful subjects (12% for the same gender).<sup>30</sup>

Logistic regression analysis (Table 4) indicated that there were only two factors that had a significant effect on the dental DA prevalence: education and type of clinics. High school-educated patients had a major increase in DA vs noneducated and university graduates. This might be due to the limited knowledge that they have, which places them in between the noneducated and fully educated patients. Furthermore, the postgraduate patients showed less DA than university graduate patients. Fewer postgraduate

patients were included in this study, and this might affect the results. Here, patients who were treated in the government clinics showed a higher DA and a higher DF (Table 5) than patients treated in the private or university clinics. However, others found just the opposite.<sup>12,25,26</sup> This might be due to the routine applied in government clinics with a waiting list; there is no regular dentist for patients on each visit. The DF increases when the monthly income is between 10,000 and 20,000 SR (Table 5). This result did not agree with the previous studies, which might relate to patients' high socioeconomic status which makes them more sensitive and fearful of the treatment.

The cross-sectional design of this study is an important limitation and may increase the probability of reporting bias between the assessed independent variables and the stress domains of MDAS and FDS. It was carried in one city of SA, representing only the southern region of the kingdom. Hence, we suggest that a broad study including the different regions of SA with a longitudinal design should be performed. The results of this study highlight the importance of society-based studies in understanding the relation of DA and DF as the factors contributing to them. Furthermore, the dental team should be acquainted with the ideal method of patient management to decrease the level of anxiety and fear during dental treatment.

## CONCLUSION

We conclude that the overall DA and DF were high among participants. Male patients show a higher DA and DF than females. Married patients, those with only a high school diploma, those who use khat, those with a high monthly income, and those treated in the government clinic usually have a higher DA and DF. The MDAS was positively related to the DFS, and thus the DA affects the DF.

## ACKNOWLEDGMENTS

The authors would like to express a special appreciation to Prof. Maha El Tantwi, Professor of Dental Public Health Faculty of Dentistry, Alexandria University, for her great support in conducting the statistical part of this research.

## ORCID

Thiyezen A Aldhelai  <https://orcid.org/0000-0003-1493-9492>  
Mannaa K Aldowsari  <https://orcid.org/0000-0002-6265-729X>

## REFERENCES

- Cappelli D, Mobley C. Prevention in clinical oral health care. 1st ed. USA: Mosby Inc; 2007.
- Ohman A. Fear and anxiety, evolutionary, cognitive and clinical perceptions. In: Lewis M, Haviland-Jones JM, Barrett LF, editors. Handbook of emotions. 3rd ed. New York: The Guilford Press; 2000. p. 573–593.
- Rubin JG, Slovin M, Krochak M. The psychodynamics of dental anxiety and dental phobia. *Dent Clin North Am* 1988;32(4):647–656. Available from: <https://pubmed.ncbi.nlm.nih.gov/3053263/>
- Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *Int J Paediatr Dent* 2007;17(6):391–406. DOI: 10.1111/j.1365-263X.2007.00872.x.
- Cianetti S, Lombardo G, Lupatelli E, et al. Dental fear/anxiety among children and adolescents. A systematic review. *Eur J Paediatr Dent* 2017;18(2):121–130. DOI: 10.23804/ejpd.2017.18.02.07.
- Corah NL. Development of a dental anxiety scale. *J Dent Res* 1969;48(4):596. DOI: 10.1177/00220345690480041801.
- Humphris GM, Morrison T, Lindsay SJ. The modified dental anxiety scale: validation and United Kingdom norms. *Commun Dent Health* 1995;12(3):143–150. PMID: 7584581. Available from: <https://pubmed.ncbi.nlm.nih.gov/7584581/>
- Kleinknecht RA, Klepac RK, Alexander LD. Origins and characteristics of fear of dentistry. *J Am Dent Assoc* (1939) 1973;86(4):842–848. DOI: 10.14219/jada.archive.1973.0165.
- Allam R, Allam Y, Al-Samhan A, et al. Gender differences in anxiety levels about dentistry in Saudi Dental College students. *EC Dent Sci* 2018;17(6):663–667. Available from: <https://www.econicon.com/dental-science.php>
- Ibrahim NK, Al-Jdani M, Al-Aamoudi N, et al. Anxiety due to dental procedures and treatment among adult patients attending outpatient clinics in King Abdulaziz University Hospital, Jeddah, Saudi Arabia. *J Med Res* 2016;2(2):35–40. DOI: 10.1155/2013/647436. Epub 2013 Mar 14.
- Al-Madi E, Abdellatif H. Assessment of dental fear and anxiety among adolescent females in Riyadh, Saudi Arabia. *Saudi Dent J* 2002;14(2):77–81. DOI: 10.4103/sjos.SJOralSci\_33\_19
- Alaki SM, Alotaibi A, Almadadi ES. Dental anxiety in middle school children and their caregivers: prevalence and severity. *J Dent Oral Hyg* 2012;14(1):6–11. DOI: 10.5897/JDOH11.019.
- Jumaymi AK, Faqehi WH, Hamdi SA, et al. Level of dental anxiety and its relation to khat chewing in Jazan population: a cross-sectional study. *J Contemp Dent Pract* 2020;21(3):253–260. DOI: 10.5005/jp-journals-10024-2767
- Muhammad U, Rajan J. A cross-sectional study to assess the level of dental anxiety prevailing in undergraduate dental students in Riyadh Elm University. *Saudi J Oral Sci* 2020;7(1):35–39. DOI: 10.4103/sjos.SJOralSci\_32\_19.
- Al Jasser R, Almashaan G, Alwaalan H, et al. Dental anxiety among dental, medical, and nursing students of two major universities in the central region of the Kingdom of Saudi Arabia: a cross-sectional study. *BMC Oral Health* 2019;19(1):56. DOI: 10.1186/s12903-019-0757-x.
- Kamel A, Al-Harbi A, Al-Otaibi F, et al. Dental anxiety at Riyadh Elm University Clinics. *Saudi J Oral Sci* 2019;6(2):101–112. DOI: 10.4103/sjos.SJOralSci\_33\_19.
- Alshathri NM, Dada BM, Alghofaili RM, et al. The relationship between dental anxiety level and patients' knowledge of the procedure. *Int J Dent Oral Heal* 2017;3(9):105–115. DOI: 10.25141/2471-657X-2017-9.0092.
- Inamdar A, Alwadaani M, Asiri A, et al. Dental anxiety in medical and dental undergraduates at Jazan University. *J Oral Health Res* 2014;4(3):25–30. Available from: [https://www.researchgate.net/publication/264037317\\_Dental\\_anxiety\\_in\\_Medical\\_and\\_Dental\\_undergraduates\\_at\\_Jazan\\_University](https://www.researchgate.net/publication/264037317_Dental_anxiety_in_Medical_and_Dental_undergraduates_at_Jazan_University)
- Al-Towayan A, Osman KH. Prevalence of dental anxiety among medical and dental undergraduates in Gassim University. *Int J Med Health Res* 2018;4(3):15–18. Available from: <http://www.medicalsciencejournal.com/download/776/4-2-50-560.pdf>
- Fayad MI, Elbieh A, Baig MN, et al. Prevalence of dental anxiety among dental patients in Saudi Arabia. *J Int Soc Prev Commun Dent* 2017;7(2):100–104. DOI: 10.4103/jispcd.JISPCD\_19\_17.
- Sghaireen MG, Zwiri AM, Alzoubi IA, et al. Anxiety due to dental treatment and procedures among university students and its correlation with their gender and field of study. *Int J Dent* 2013;2013:647436. DOI: 10.1155/2013/647436.
- Al-Khalifa K. Prevalence of dental anxiety in two major cities in the kingdom of Saudi Arabia. *Saudi J Med Med Sci* 2015;3(2):135–140. DOI: 10.4103/1658-631X.156421.
- Al-Sowygh ZH, Alfadley A, Alsaif MA, et al. Perceived causes of stress among Saudi dental students. *King Saud Univ J Dent Sci* 2013;4(1):7–15. DOI: 10.1016/j.ksujds.2012.11.002.
- Alshammary MAA, Alhumaid ME, Alnejeem GSE, et al. Dental anxiety among medical field students in University of Hail, Saudi Arabia. *Sch J Dent Sci* 2017;4(6):291–296. DOI: 10.21276/sjds.
- Al-Nasser L, Yunus F, Ahmed AE. Dental anxiety and its behavioral consequences in a sample of Saudi adults. *Oral Health Dent Manag*

- 2016;2016:183–188. Available from: <https://www.longdom.org/open-access/dental-anxiety-and-its-behavioral-consequences-in-a-sample-of-saudi-adults-2247-2452-1000898.pdf>
26. Coolidge T, Arapostathis KN, Emmanouil D, et al. Psychometric properties of Greek versions of the Modified Corah Dental Anxiety Scale (MDAS) and the Dental Fear Survey (DFS). *BMC Oral Health* 2008;8:29. DOI: 10.1186/1472-6831-8-29.
  27. Madfa AA, Al-Zubaidi SM, Shibam AH, et al. Dental anxiety and fear among a university population in a sample from Yemen. 2020. DOI: 10.21203/rs.2.21375/v1.
  28. El-Hakim IE-SM, Bhayat I, Shaar AA, et al. Self-assessment of dental anxiety and fear among dental students in a Saudi Arabian college. *Br J Med Med Res* 2016;16(5):1–7. DOI: 10.9734/BJMMR/2016/26721.
  29. Quteish Taani DS. Dental fear among a young adult Saudian population. *Int Dent J* 2001;51(2):62–66. DOI: 10.1002/j.1875-595x.2001.tb00823.x.
  30. Hakami RM, Mahfouz MS, Adawi AM, et al. Social anxiety disorder and its impact in undergraduate students at Jazan University, Saudi Arabia. *Ment Illn* 2017;9(2):7274. DOI: 10.4081/mi.2017.7274.
  31. Bahhawi TA, Albasheer OB, Makeen AM, et al. Depression, anxiety, and stress and their association with khat use: a cross-sectional study among Jazan University students, Saudi Arabia. *Neuropsychiatr Dis Treat* 2018;14:2755–2761. DOI: 10.2147/NDT.S182744.
  32. Ploicy WMA. WMA declaration of helsinki – ethical principles for medical research involving human subjects Brazil: World Medical Association; 2013. Available from: <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>.
  33. Al Moaleem MM, Porwal A, Al Ahmari NM, et al. Khat chewing induces a floral shift in dental material-associated microbiota: a preliminary study. *Med Sci Monit* 2020;26:e918219. DOI: 10.12659/MSM.918219.
  34. Al-Namankany A, Ashley P, Petrie A. Development of the first Arabic cognitive dental anxiety scale for children and young adults. *World J Meta-Anal* 2014;2(3):64–70. DOI: 10.13105/wjma.v2.i3.64.
  35. Al-Nasser L, Yunus F, Ahmed A. Validation of Arabic version of the modified dental anxiety scale and assessment of cut-off points for high dental anxiety in a Saudi population. *J Int Oral Health* 2016;8(1):21–26. Available from: <https://www.jioh.org/article.asp?issn=0976-7428;year=2016;volume=8;issue=1;page=21;epage=26;aulast=Al-Nasser;type=0>
  36. Corah NL, Gale EN, Illig SJ. Assessment of a dental anxiety scale. *J Am Dent Assoc* 1978;97(5):816–819. DOI: 10.14219/jada.archive.1978.0394.
  37. Kleinknecht RA, Thorndike RM, McGlynn FD, et al. Factor analysis of the dental fear survey with cross-validation. *J Am Dent Assoc* 1984;108(1):59–61. DOI: 10.14219/jada.archive.1984.0193.
  38. Humphris GM, Freeman R, Campbell J, et al. Further evidence for the reliability and validity of the Modified Dental Anxiety Scale. *Int Dent J* 2000;50(6):367–370. DOI: 10.1111/j.1875-595x.2000.tb00570.x.
  39. Alalwan SAM, Albader FNB, Alkhalaf ZAH, et al. Dental anxiety among patients undergoing different dental treatments in college of dentistry, Riyadh Elm University. *Saudi J Oral Dent Res* 2018;3(12):379–385. DOI: 10.21276/sjodr.2018.3.12.2.
  40. Al-Saleh SA, Al-Madi EM, Al-Angari NS, et al. Survey of perceived stress-inducing problems among dental students, Saudi Arabia. *Saudi Dent J* 2010;22(2):83–88. DOI: 10.1016/j.sdentj.2010.02.007.