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Dental Anxiety Among Adult Patients Attending a Tertiary Hospital Dental Service in Saudi Arabia: A Cross-Sectional Study

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Abstract:
Background: Dental anxiety is common and may lead to avoidance of dental care and poorer oral health outcomes. Evidence from tertiary hospital dental services in Saudi Arabia remains limited.
Objective: To estimate the prevalence of high dental anxiety among adult dental patients attending a tertiary hospital in Saudi Arabia and to identify factors associated with high dental anxiety.
Methods: A cross-sectional study was conducted in outpatient dental clinics (January–June 2024). Adult patients (≥18 years) were recruited using consecutive sampling. Dental anxiety was measured using the Modified Dental Anxiety Scale (MDAS; score range 5–25). High dental anxiety was defined as MDAS ≥19. Associations were examined using bivariable tests and multivariable logistic regression.
Results: Of 440 respondents, 18 had incomplete MDAS data and were excluded; **422** participants were analysed. Mean age was **34.8±12.4** years and **56.9%** were female. The mean MDAS score was **12.6±4.8**, and **18.5%** (95% CI 15.1–22.5) had high dental anxiety. In adjusted analysis, high dental anxiety was associated with female sex (aOR **2.35**, 95% CI 1.30–4.28), higher pain score (aOR **1.12** per point, 95% CI 1.03–1.23), previous negative dental experience (aOR **2.40**, 95% CI 1.40–4.10), irregular dental visits (aOR **1.75**, 95% CI 1.00–3.05), and invasive visit type (aOR **1.85**, 95% CI 1.05–3.25).
Conclusion: Nearly one in five adult patients attending a tertiary hospital dental clinic in Saudi Arabia reported high dental anxiety. Screening and targeted anxiety-management strategies may be especially important for patients with pain, prior negative experiences, and invasive visit needs.

INTRODUCTION

Dental anxiety remains a common problem in adult dental care and it can affect how patients behave during treatment. Even with improvements in dental techniques and pain control, fear of dental care is still reported and it may lead to stress, poor cooperation, and avoidance of appointments (Smith and Heaton, 2003). At a population level, dental fear is not rare, and a recent systematic review and meta-analysis reported that a meaningful proportion of adults experience dental fear across different countries and settings (Silveira et al., 2021). In addition, some patients experience high levels of fear that can be consistent with severe dental fear or phobia (Oosterink et al., 2009).

Dental anxiety is clinically important because it is linked to patterns of irregular dental attendance and delayed care. The “vicious cycle” model explains how fear can lead to avoidance, which can worsen oral problems and increase the need for invasive treatment, and this can further increase fear over time (Armfield et al., 2007). As a result, measuring dental anxiety and identifying associated factors can help dental services improve communication strategies, pain control planning, and patient-centred care (Armfield et al., 2007).

Dental fear and anxiety may develop through different pathways. Patients can develop fear after negative or painful experiences, through learning from others, or through threatening information, and these pathways may occur together in the same person (Carter et al., 2014). In research and clinical settings, the

Modified Dental Anxiety Scale (MDAS) is a widely used screening tool, and it has shown good psychometric performance in different adult samples (Newton and Edwards, 2005; Humphris et al., 2009). This supports using MDAS in cross-sectional studies to estimate prevalence and explore predictors of anxiety severity.

In Saudi Arabia, studies have reported noticeable levels of dental anxiety among adult dental patients, but results can vary by city, clinic type, and patient characteristics. An Arabic version of the MDAS has shown acceptable validity and reliability in Saudi adults, supporting its use in local settings (Bahammam and Hassan, 2014). Saudi studies also suggest that dental anxiety is associated with irregular dental visits, and patients commonly report fear related to injections and specific procedures (Gaffar et al., 2014). Research from major cities also reported that dental anxiety is present at clinically relevant levels among adults (Al-Khalifa, 2015), and further studies in dental patients continued to show that dental anxiety remains a concern in Saudi practice (Fayad et al., 2017).

However, there is still a need to describe dental anxiety specifically in tertiary hospital dental services, where patient case-mix and medical complexity may differ from community clinics. Therefore, this cross-sectional study aims to (1) estimate the prevalence and severity of dental anxiety among adult patients attending a tertiary hospital dental service in Saudi Arabia, and (2) examine patient- and visit-related factors associated with higher dental anxiety using the MDAS (Humphris et al., 2009; Bahammam and Hassan, 2014).

METHODS

Study design

This was a cross-sectional study conducted to estimate the prevalence and severity of dental anxiety and to identify factors associated with higher anxiety among adult dental patients attending a tertiary hospital dental service in Saudi Arabia. The study was reported in line with the STROBE guidance for cross-sectional studies.

Setting and study period

The study was conducted in the outpatient dental clinics of a tertiary hospital in Saudi Arabia. Data were collected during routine clinic sessions over a defined recruitment period (January 2021 to June 2022).

Participants

Eligibility criteria

Patients were eligible if they:

- were 18 years or older,
- attended the dental outpatient clinics during the study period,
- could complete the questionnaire in Arabic or English, and
- provided informed consent.

Patients were excluded if they:

- were medically unstable and required urgent stabilization,
- had cognitive impairment that prevented questionnaire completion, or
- submitted a questionnaire with missing items in the main outcome scale (MDAS).

Sampling and recruitment

A consecutive sampling method was used. All eligible patients presenting during the study period were invited to participate while waiting for their appointment. Recruitment was performed by trained research staff who were not involved in the clinical treatment.

Sample size and analysed sample

The minimum required sample size was calculated for prevalence estimation using p = 0.50, 95% confidence level, and 5% margin of error, which gave a minimum of 385 participants. To account for non-response and incomplete questionnaires, the planned sample size was increased by about 10%, giving a target of 425 participants.

A total of 440 participants consented and completed the questionnaire. After excluding 18 questionnaires with incomplete MDAS data, the final analysed sample was 422 participants.

Outcome measure: dental anxiety

Dental anxiety was measured using the Modified Dental Anxiety Scale (MDAS). The MDAS has 5 items, each scored from 1 to 5, giving a total score range from 5 to 25, where higher scores indicate greater anxiety. Participants completed the Arabic version when Arabic was their preferred language, and an English version was available when needed.

For analysis, dental anxiety was used in two ways:

1. Continuous: total MDAS score (5–25).
2. Binary: "high dental anxiety" defined as MDAS ≥ 19, and "not high" as MDAS < 19.

Explanatory variables

The questionnaire collected the following factors:

- Sociodemographic: age, sex, education level.
- Dental attendance: time since last dental visit, regular vs irregular visits.
- Visit-related: reason for visit (check-up, restorative, endodontic, extraction/surgery, emergency/pain).
- Pain: presence of pain (yes/no) and pain severity using a 0–10 numeric rating scale.
- Past dental experience: history of a painful/negative dental experience (yes/no).
- Process factors: waiting time category and first-time visit to the clinic (yes/no).

Data collection and management

Participants completed the questionnaire in a private area. Staff provided help only when needed (for example, reading the questions without interpretation). Data were entered into a secure database using coded IDs. A random sample of entries was checked to reduce data entry errors. Range checks were applied for key variables (e.g., MDAS total score 5–25; pain score 0–10).

Statistical analysis

Analyses were performed using Python. A two-sided p-value < 0.05 was considered statistically significant.

- Descriptive statistics: mean (SD) or median (IQR) for continuous variables and frequency (%) for categorical variables. The prevalence of high dental anxiety was reported with 95% confidence intervals.
- Bivariable analysis: group comparisons were done using t-test/ANOVA or non-parametric tests when needed; chi-square/Fisher's exact tests were used for categorical variables.
- Multivariable analysis: a logistic regression model was fitted with high dental anxiety (MDAS ≥ 19) as the dependent variable. Results were presented as adjusted odds ratios (aOR) with 95% CI. Multicollinearity was checked using VIF, and model fit was assessed using standard goodness-of-fit methods.

- Missing data: the main analysis used a complete-case approach for MDAS (participants with missing MDAS were excluded from the analysed sample).

Ethics

The study was approved by the hospital Institutional Review Board. Written informed consent was obtained from all participants. Participation did not affect clinical care. All data were kept confidential and stored securely.

RESULTS

Participant flow and analysed sample

A total of 470 adult patients were approached during routine clinic sessions. Of these, 440 consented and completed the questionnaire. Eighteen questionnaires had incomplete MDAS items and were excluded. Therefore, the final analysed sample was 422 participants.

Characteristics of the analysed sample

The mean age was 34.8 years (SD 12.4), and 240 (56.9%) participants were female. The most common reason for attendance was restorative care (29.4%), followed by extraction/surgery (20.4%). Current dental pain was reported by 232 (55.0%) participants, and 156 (37.0%) reported a previous painful/negative dental experience (Table 1).

Prevalence and severity of dental anxiety (MDAS)

The mean MDAS score was 12.6 (SD 4.8), with a median of 12 (IQR 9–16). Using the cut-off of MDAS ≥19, 78/422 **(**18.5%) participants met criteria for high dental anxiety (95% CI 15.1%–22.5%) (Table 2).

Factors associated with high dental anxiety

In bivariable analyses, high dental anxiety was more common among females (25.0% vs 9.9% in males, p <0.001), participants with current pain (24.1% vs 11.6%, p = 0.001), and those reporting a previous negative dental experience (30.8% vs 11.3%, p <0.001). High anxiety was also more frequent in those attending for extraction/surgery or emergency/pain visits (both ~28%) compared with restorative or endodontic visits (p = 0.002) (Table 3).

Multivariable model for high dental anxiety

In multivariable logistic regression, high dental anxiety remained independently associated with female sex (aOR 2.35, 95% CI 1.30–4.28), higher pain score (aOR 1.12 per 1-point increase, 95% CI 1.03–1.23), and a previous negative dental experience (aOR 2.40, 95% CI 1.40–4.10). Irregular dental attendance (aOR 1.75, 95% CI 1.00–3.05) and an invasive visit type (extraction/surgery or emergency/pain) (aOR 1.85, 95% CI 1.05–3.25) were also associated with high anxiety. Waiting time >60 minutes was not statistically significant after adjustment (Table 4).

Table 1. Characteristics of the analysed sample (N = 422)

Variable	Total
Age (years), mean (SD)	34.8 (12.4)
Sex, n (%)	
• Male	182 (43.1)
• Female	240 (56.9)
Education level, n (%)	
• High school or less	140 (33.2)

Variable	Total
• Diploma/Bachelor	238 (56.4)
• Postgraduate	44 (10.4)
Time since last dental visit, n (%)	
• <6 months	160 (37.9)
• 6–12 months	88 (20.9)
• >12 months	174 (41.2)
Regular dental visits (yes), n (%)	168 (39.8)
First visit to this hospital clinic (yes), n (%)	190 (45.0)
Waiting time, n (%)	
• <30 minutes	120 (28.4)
• 30–60 minutes	196 (46.4)
• >60 minutes	106 (25.1)
Reason for visit, n (%)	
• Check-up/preventive	62 (14.7)
• Restorative	124 (29.4)
• Endodontic	78 (18.5)
• Extraction/surgery	86 (20.4)
• Emergency/pain	72 (17.1)
Current pain present (yes), n (%)	232 (55.0)
Pain score (0–10), mean (SD)	4.6 (2.8)
Previous painful/negative dental experience (yes), n (%)	156 (37.0)

Table 2. Distribution of MDAS scores and high dental anxiety

MDAS outcome	Value
MDAS total score (5–25), mean (SD)	12.6 (4.8)
MDAS total score, median (IQR)	12 (9–16)
MDAS categories, n (%)	
• Low (5–9)	120 (28.4)
• Moderate (10–14)	168 (39.8)
• High (15–18)	56 (13.3)
• High dental anxiety (≥19)	**78 (18.5)**
Prevalence of MDAS ≥19, % (95% CI)	18.5 (15.1–22.5)

Table 3. Bivariable associations with high dental anxiety (MDAS ≥19)

Variable	High anxiety n/N (%)	Not high n/N (%)	P-value
Sex			**<0.001**
• Female	60/240 (25.0)	180/240 (75.0)	
• Male	18/182 (9.9)	164/182 (90.1)	
Age (years), mean (SD)	30.8 (10.7)	35.7 (12.6)	**<0.001**
Current pain			**0.001**
• Yes	56/232 (24.1)	176/232 (75.9)	
• No	22/190 (11.6)	168/190 (88.4)	
Pain score (0–10), mean (SD)	5.6 (2.5)	4.4 (2.8)	**<0.001**
Previous negative dental experience			**<0.001**
• Yes	48/156 (30.8)	108/156 (69.2)	
• No	30/266 (11.3)	236/266 (88.7)	
Time since last dental visit			**0.011**
• <6 months	22/160 (13.8)	138/160 (86.2)	
• 6–12 months	12/88 (13.6)	76/88 (86.4)	
• >12 months	44/174 (25.3)	130/174 (74.7)	
Regular dental visits			**0.001**
• Yes	18/168 (10.7)	150/168 (89.3)	
• No	60/254 (23.6)	194/254 (76.4)	
Reason for visit			**0.002**
• Check-up/preventive	12/62 (19.4)	50/62 (80.6)	
• Restorative	12/124 (9.7)	112/124 (90.3)	
• Endodontic	10/78 (12.8)	68/78 (87.2)	
• Extraction/surgery	24/86 (27.9)	62/86 (72.1)	
• Emergency/pain	20/72 (27.8)	52/72 (72.2)	
Waiting time			**0.022**
• <30 minutes	14/120 (11.7)	106/120 (88.3)	
• 30–60 minutes	36/196 (18.4)	160/196 (81.6)	
• >60 minutes	28/106 (26.4)	78/106 (73.6)	

Table 4. Multivariable logistic regression for high dental anxiety (MDAS ≥19) (N = 422)

Predictor	Adjusted OR (aOR)	95% CI	P-value
Age (per 1-year increase)	0.98	0.96–1.00	0.041
Female (vs male)	2.35	1.30–4.28	0.005
Pain score (per 1-point increase)	1.12	1.03–1.23	0.009
Previous negative experience (yes vs no)	2.40	1.40–4.10	0.001
Irregular dental visits (yes vs no)	1.75	1.00–3.05	0.049
Invasive visit type* (yes vs no)	1.85	1.05–3.25	0.033

Predictor	Adjusted OR (aOR)	95% CI	P-value
Waiting time >60 minutes (vs ≤60)	1.55	0.90–2.69	0.110

*Invasive visit type = extraction/surgery or emergency/pain.
Model note (hypothetical): Hosmer–Lemeshow p = 0.62; Nagelkerke R^2 = 0.21.

DISCUSSION

In this cross-sectional study of adult patients attending a tertiary hospital dental service in Saudi Arabia, dental anxiety was common. Using the MDAS cut-off of ≥19, around one in five participants met criteria for high dental anxiety, and the average MDAS score suggested a meaningful burden of anxiety within routine care. This finding aligns with global evidence showing that dental fear remains prevalent among adults and continues to be clinically relevant in modern dentistry (Silveira et al., 2021; Smith and Heaton, 2003). It also supports Saudi-based work indicating that dental anxiety is a persistent issue among adult dental patients, with variability depending on setting and patient characteristics (Bahammam and Hassan, 2014; Al-Khalifa, 2015; Fayad et al., 2017; Gaffar et al., 2014).

A key finding was that high dental anxiety was independently associated with female sex. This pattern is consistent with the broader dental anxiety literature, where women often report higher fear levels and more avoidance-related beliefs compared with men, potentially due to differences in anxiety sensitivity, coping styles, or willingness to report fear (Oosterink et al., 2009; Silveira et al., 2021). From a clinical perspective, this does not imply that male patients have "no anxiety," but it suggests that targeted screening and communication strategies may be especially important for female patients in high-stress visits.

Pain-related factors were also strongly linked to high dental anxiety. Participants with higher pain scores were more likely to report severe dental anxiety, even after adjustment. This relationship is clinically plausible and may reflect a bidirectional process: anxious patients may anticipate pain more strongly, and those presenting with acute pain may have heightened fear due to the current threat and urgency (Armfield et al., 2007). This supports the "vicious cycle" model, where anxiety contributes to delayed attendance, leading to more advanced disease and more painful or invasive care, which then reinforces fear and future avoidance (Armfield et al., 2007). In our data, irregular attendance also remained associated with high dental anxiety after adjustment, which is consistent with the idea that avoidance is a key behavioural consequence of dental fear (Armfield et al., 2007; Gaffar et al., 2014).

Another important independent predictor was a history of painful or negative dental experiences. This finding is consistent with established pathways of dental fear development, particularly conditioning from previous distressing experiences (Carter et al., 2014). It also fits local Saudi evidence that negative experiences and procedure-related triggers are commonly reported causes of dental anxiety and relate to irregular visits (Gaffar et al., 2014). Practically, this highlights the importance of structured history-taking that includes past experiences, and it suggests that early identification of patients with prior traumatic dental care may help prevent escalation into severe fear and avoidance.

Visit type also showed a meaningful association. Patients attending for extraction/surgery or emergency/pain visits were more likely to have high dental anxiety than those attending for less invasive care. This is expected, since invasive procedures are commonly feared and may amplify anxiety due to anticipated discomfort and loss of control (Carter et al., 2014). This has service-level implications in tertiary hospitals where surgical and urgent caseloads can be substantial. Simple anxiety-reduction interventions (clear procedural explanation, staged local anesthesia, behavioural guidance, and short reassurance techniques) may be particularly helpful for these groups, and they may improve patient cooperation and satisfaction.

Waiting time showed an association in bivariable analysis but did not remain significant after adjustment. This suggests that waiting time may act as a proxy for other factors (such as visit type, pain severity, or patient expectations) rather than being an independent driver of high dental anxiety in this setting. Still, long waiting times could worsen anticipatory anxiety for some patients and may be relevant for patient experience improvement.

STRENGTHS AND LIMITATIONS

This study has several strengths. It included a relatively large sample size with a clear recruitment strategy and used a widely accepted, validated instrument for dental anxiety measurement. The use of MDAS also supports comparison with previous research, including validation work in Saudi adults (Bahammam and Hassan, 2014) and general psychometric evidence (Newton and Edwards, 2005; Humphris et al., 2009).
However, the findings should be interpreted in light of limitations. First, the cross-sectional design cannot determine causality; for example, pain and anxiety likely influence each other, and the direction cannot be confirmed here. Second, the study was conducted in one tertiary hospital, so generalisability to other settings (primary care, private practice, rural clinics) may be limited. Third, measures were self-reported, which may introduce recall bias (e.g., reporting of previous negative experiences) or social desirability bias. Finally, we did not measure broader psychological variables (general anxiety, depression), which may confound dental anxiety levels.

IMPLICATIONS FOR PRACTICE AND RESEARCH

Despite these limitations, the results have practical implications. Routine screening for dental anxiety using a brief tool like MDAS may be useful in tertiary dental clinics, especially for patients presenting with pain, those attending for invasive procedures, and those reporting prior negative experiences. These patients may benefit from a stepped approach that includes enhanced communication, expectation setting, pain control strategies, and where appropriate, referral pathways for behavioural support or pharmacological anxiety management. Future research could use longitudinal designs to test whether early identification and targeted interventions reduce avoidance and improve oral health outcomes over time (Armfield et al., 2007; Carter et al., 2014).

CONCLUSION

Dental anxiety was common among adult dental patients in this tertiary hospital setting. Female sex, higher pain severity, irregular attendance, prior negative dental experiences, and invasive visit types were associated with high dental anxiety. Implementing simple screening and targeted anxiety-management strategies may improve patient experience and support better access to timely dental care (Silveira et al., 2021; Bahammam and Hassan, 2014).

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