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Assessment of Dental Anxiety among Patients Prior to Undergoing Dental Procedures: A Cross-Sectional Survey in Western Maharashtra, India

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ABSTRACT

This study investigated the prevalence of dental anxiety and its association with demographic factors and planned treatment types in an Indian dental school population. In a cross-sectional survey, 100 adult patients completed the Modified Dental Anxiety Scale (MDAS) prior to their scheduled procedures, with data analysed using ANOVA and Chi-square tests. Key results showed a high prevalence of anxiety, with 82% of participants reporting moderate-to-high levels. The single most significant predictor of anxiety was the type of dental procedure ($p<0.001$), as invasive treatments like surgery and extractions elicited markedly higher fear than routine restorations. Conversely, no significant association was found between anxiety scores and patient gender or education level. The primary conclusion is that dental anxiety in this cohort is a situational response driven by the perceived threat of the procedure itself, rather than stable demographic traits. This supports implementing universal, pre-operative screening with the MDAS to help clinicians identify at-risk patients and apply tailored anxiety-management protocols, ultimately enhancing patient care.

Keywords— **Dental Anxiety, Modified Dental Anxiety Scale (MDAS), Western Maharashtra, invasive procedures, oral care**

INTRODUCTION

Dental anxiety is a multidimensional phenomenon characterized by fear, nervousness, and apprehension associated with dental settings and procedures. It is a common psychological issue that affects a substantial portion of the global population and has been acknowledged as a critical barrier to seeking and continuing dental care [1]. Patients suffering from dental anxiety often delay or keep away from dental visits, which can result in the progression of oral diseases such as caries and periodontal disease, leading to compromised oral and general health outcomes [2].

The aetiology of dental anxiety is complex and multifactorial. It can originate from previous traumatic dental experiences [3], fear of pain, feelings of helplessness and loss of control, and even from vicarious learning through family members or media portrayals. These elements can vary widely based on individual personality traits, socio-cultural background [4], and the extent of awareness and understanding of dental procedures. Children who have unfavourable dental treatment experience are particularly prone to carry this anxiety into adulthood if it is not appropriately managed early on [5].

Globally, the frequency of dental anxiety ranges from 4% to 30%, based on the population studied and the tools used for assessment [6-8]. Some studies have researched dental anxiety in India but, there is still a lack of comprehensive data, particularly in Western Maharashtra.

Understanding the prevalence and severity of dental anxiety in specific populations is crucial for focused approaches to reduce fear and improve patient compliance [9]. Dental professionals lead to be pivotal in recognizing anxiety symptoms, building trust, and offering supportive interventions such as patient education, behavioural management techniques, and in severe cases, pharmacological support [10]. Patient-centred care models that integrate psychological assessments into routine dental practice have shown promise in addressing dental anxiety effectively [2].

The Modified Dental Anxiety Scale (MDAS) is a leading tool for quantifying dental anxiety [2]. Its origins lie in Corah's four question Dental Anxiety Scale (DAS). The DAS was most widely used to screen anxiety in the late 1970s and 1980s.Humphris, Morrison and Lindsay added a fifth item on this scale about local anaesthetic injection. This new five-point scale was published in 1995[11]. This was called the Modified Dental Anxiety Scale. It offers a simple, standardized, and validated method to gauge a patient's anxiety across different dental scenarios, ranging from routine check-ups to invasive procedures such as tooth extractions. The MDAS has been confirmed throughout various cultural settings, making it a reliable choice for epidemiological research in diverse populations [2].

This survey was intended to gauge the extent of dental anxiety among patients attending the School of Dental Sciences in Karad, a city in Western Maharashtra. The objectives were not only to evaluate the extent of anxiety using the MDAS but also to investigate whether demographic profiles such as age, gender, and education influenced anxiety levels. Furthermore, we sought to discover whether the type of dental treatment scheduled had any meaningful link with the patient's anxiety score.

Given the increasing emphasis on holistic dental care that prefers patient's need and psychological well-being, discoveries from this survey can layout valuable insights for dental practitioners, public health policymakers, and academic researchers to reduce dental anxiety [10]. Identifying the patterns and predictors of dental anxiety can help inform the growth of preventive and therapeutic strategies adapted to the wants of the people. Such efforts could ultimately increase patient satisfaction and promote better oral health outcomes.

MATERIALS AND METHODS

This study adopted a cross-sectional, observational design and was conducted in the outpatient department of School of Dental Sciences, located in Karad, a town in the Satara district of Western Maharashtra, India. The survey was executed over a period of three months, from May to July 2025.

A. Ethical Considerations

This survey received approval from the Ethics Committee of Krishna Vishwa Vidyapeeth. Before patients participated in this survey, the signed an informed consent. All participants were educated regarding the motive of the survey, the confidentiality of their responses, and their right to exit from the study at any point of time on their will without any repercussions to their ongoing treatment.

B. Sampling and participants

100 patients participated in this study who were about to undergo dental treatment.
The acceptance criteria were in the following manner:

- Patients aged 18 to 60 years.
- Scheduled for any routine or elective dental treatment on the day of the visit.

Exclusion criteria included:

- Patients with cognitive impairments or psychiatric illnesses
- Those undergoing emergency dental care.
- Patients who had already received sedation or pharmacological anxiety management earlier.

C. Data Collection

The questionnaire consisted of two parts:

1. **Demographic Questionnaire** – These included questions related to the participant's age, gender, and level of education.
2. **Modified Dental Anxiety Scale (MDAS)** – A validated five-item questionnaire designed to assess dental anxiety. Each question addresses a different aspect of a dental visit (e.g., anticipation of a visit, waiting room anxiety, and specific treatment fears like injections or drilling). Each response to the questionnaire is rated on a 5-point Likert scale's spectrum fluctuating from 1 (not anxious) to 5 (extremely anxious), with the total score ranging from 5 to 25. Scores of 5–10 indicate low anxiety, 11–14 moderate anxiety, 15–18 high anxiety, and 19–25 extreme anxiety or dental phobia.

Uneducated participants were assisted in completing the forms.
Patients were approached in the waiting area of the outpatient department. After explaining intent of the survey and obtaining informed consent, patients were handed with the questionnaire.

D. Data Management and Statistical Analysis

Collected information was entered into Microsoft Excel and subsequently analysed. Descriptive statistics were calculated from the data collected.

To explore associations between anxiety levels and treatment types, ANOVA test was done. The independent variable was the type of dental treatment (e.g., scaling, restorations, extractions, root canal treatments, prosthodontic procedures, and surgical interventions), and the dependent variable was the Total MDAS Score. Post hoc Tukey HSD test was done further.

Chi-square was done to assess whether anxiety level varies significantly across these demographic and treatment groups. Degrees of freedom and p-values were reported accordingly.

All analyses were double-checked for accuracy and interpreted based on standard statistical guidelines. The results were visualised using tables, charts, and graphs for better clarity and understanding.

RESULTS

A. Descriptive Statistics

The sample size of this survey was 100 patients. The demographic characteristics of the sample revealed a balanced distribution across genders, a wide age range (18 to 60 years), and diverse educational backgrounds. Most patients reported previous dental visits, indicating some degree of familiarity with dental care settings.

The analysis of the MDAS scores indicated that the mean score was 13.88 with a standard deviation of 2.72. The mean range of scores extended from a minimum of 9 to a maximum of 19. The 25th percentile was 11.75, the median (50th percentile) was 14, and the 75th percentile was 16. This distribution suggests that most participants fell within the upper end of moderate anxiety range, with few exhibiting extremely low or high levels of anxiety. This is illustrated in Table 1.

Table 1: Descriptive Statistics Of MDAS Scores

Statistic	Value
Mean	13.88
Standard Deviation	2.72
Minimum	9
25th Percentile	11.75
Median (Q2)	14
75th Percentile	16
Maximum	19

B. Distribution of MDAS Scores

The histogram in Figure 1 illustrates the distribution of Total MDAS Scores across the study population. The bell-shaped curve with a slight skew to the left supports the finding that most individuals experience moderate levels of dental anxiety. A small proportion of the sample scored at the extremes, representing low or extreme anxiety.

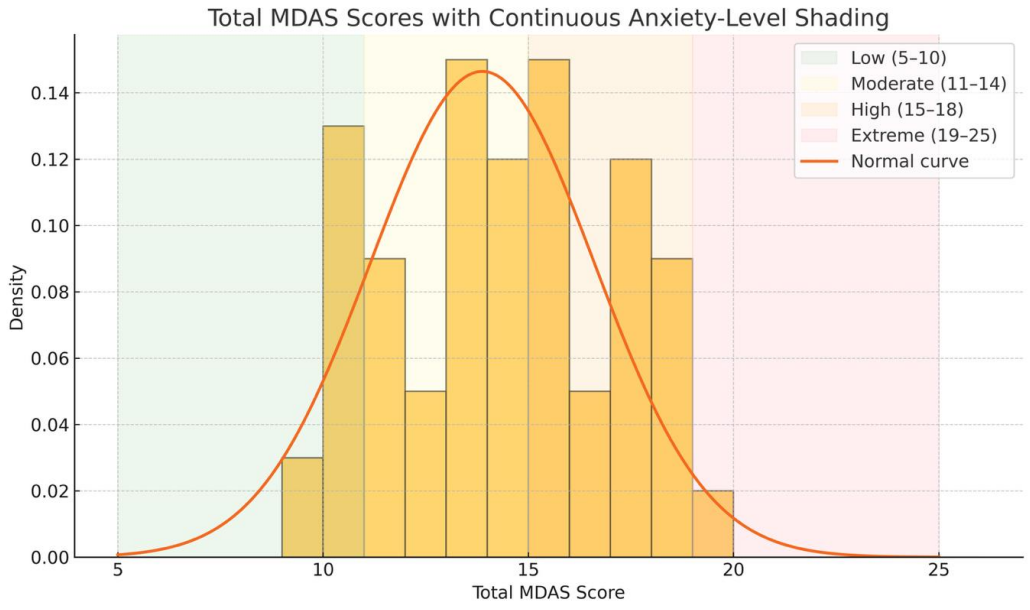

Figure 1: Histogram Of Total MDAS Scores

C. MDAS Interpretation Categories

Patients were classified into anxiety brackets based on their Total MDAS Score:

- Low Anxiety (5–10): 16 participants (16%)
- Moderate Anxiety (11–14): 41 participants (41 %)
- High Anxiety (15–18): 41 participants (41 %)
- Extreme Anxiety (19–25): 2 participants (2.0%)

The results emphasise that majority of the individuals fell in moderate and high, while a small proportion of individuals reported low or extreme anxiety.

D. Anxiety by Treatment Type

The distribution of MDAS scores across different treatment types was assessed using one-way ANOVA. The treatment categories included (Table 2):

- Scaling and polishing
- Restorative procedures (e.g., fillings)
- Root canal treatment
- Extractions
- Prosthodontic procedures
- Surgical interventions (like implants, periodontal surgery, or minor oral surgery)

The ANOVA test yielded an F-statistic of 137.68 with a p-value of $p<0.001$, indicating significant effect of treatment type on MDAS scores.

The ranking of mean anxiety scores confirms a graded pattern: Surgical procedures and Extractions produce the highest anxiety (means ≈ 17.8 and 16.6), followed by Root-canal and Prosthodontic procedures (≈ 14–15), then scaling & polishing (≈ 12) and finally Restorative fillings (≈ 10). This pattern conforms with the clinical expectations—patients anticipate greater discomfort from more invasive treatments.

Tukey HSD tests further delineated significant differences among procedure types, categorizing surgical procedures, extractions, and root canal treatments as a high-anxiety cluster. Prosthodontic procedures, scaling and polishing, and restorative procedures constituted a distinctly lower-anxiety group.

Table 2: Summary For MDAS Scores By Treatment Type

Treatment Type	Count	Mean	Std
Surgical procedures	17.00	17.53	0.72
Extractions	12.00	16.50	1.31
Root canal treatment	19.00	14.37	1.12
Prosthodontic procedures	17.00	14.00	0.71
Scaling and polishing	16.00	11.69	1.20
Restorative (fillings)	19.00	10.21	0.71

E. Anxiety by Gender

Further analysis was done to establish the relationship between MDAS scores and demographic factors like gender and education level. While female participants showed slightly higher mean anxiety scores compared to males, the difference was not considered significant ($p = 0.5116$). This is illustrated in Table 3.

Table 3: Anxiety Levels And Gender

	Low Anxiety	Moderate Anxiety	High Anxiety	Extreme Anxiety
Female	10	21	24	2
Male	6	20	17	0

F. Anxiety by Education

Education levels were analysed across four categories: primary, secondary, higher secondary, and postgraduate. There was no significant statistical variation in anxiety levels among these groups, suggesting that education did not play a major role in determining dental anxiety in this population ($p = 0.1531$). This is illustrated in Table 4.

Table 4: Anxiety Levels And Education

	Low Anxiety	Moderate Anxiety	High Anxiety	Extreme Anxiety
Primary	3	11	13	2
Secondary	1	14	8	0
Graduate	4	6	7	0
Postgraduate	8	10	13	0

G. Chi-Square Analysis of Anxiety by Procedure Category

Chi-square analysis was employed to explore whether there was a considerate relationship between categorical anxiety levels (low, moderate, high, extreme) and the type of dental procedure being performed. The chi-square test yielded a value of 104.95 with 15 degrees of freedom and a p-value of 1.49×10^{-20} (Table 6). Clinically, invasive treatments (e.g., surgical procedures, extractions) are over-represented in the *High/Extreme* bands, whereas routine restorative work clusters in the *Low* band confirming patterns seen in the descriptive boxplots and ANOVA results.

Table 6: Chi-Square Summary Of Anxiety By Procedure Category

Statistic	Value
Chi-square	104.95
Degrees of Freedom	15
p-value	1.49×10^{-20}
Cramer's V	0.59

H. Visualization: Boxplot of anxiety by Treatment Type

The boxplot shown in Figure 2 further visualizes the dispersion of anxiety scores across treatment types. Each treatment type demonstrated a similar interquartile range with few outliers, corroborating the ANOVA findings.

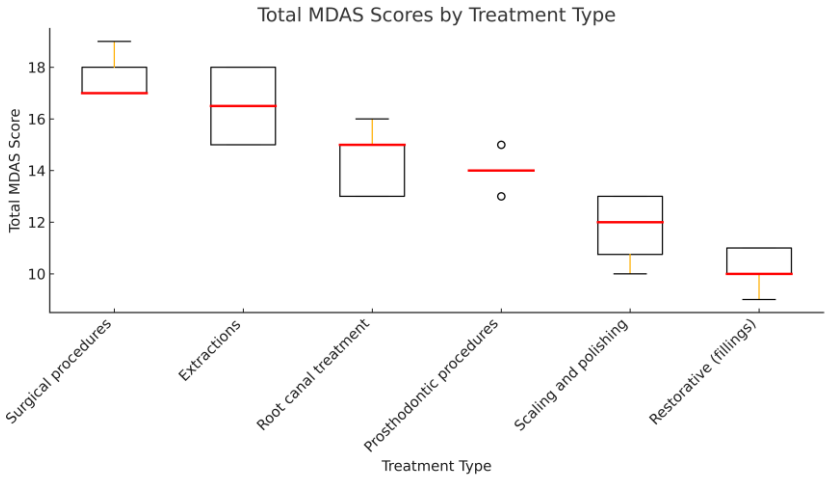

Figure 2: Boxplot Of Total Mdas Scores By Treatment Type

I. Interpretation and Clinical Implications

MDAS scores revealed a mean of 13.88 (SD 2.72)—the upper end of the moderate range. Forty-one per cent of participants fell into the *moderate* band (11–14) and another 41 % into the *high* band (15–18), while only 2 % exhibited *extreme* anxiety (≥19). One-way ANOVA showed a large, highly significant effect of treatment category on anxiety ($F = 137.68$, $p < 0.001$; $\eta^2 = 0.88$). Post-hoc Tukey tests clustered surgical procedures, extractions, and root-canal therapy as the most anxiety-provoking, outscoring prosthodontic work, scaling–polishing and routine restorations. Chi-square analysis confirmed a strong association between procedure type and categorical anxiety ($\chi^2 = 104.95$, $p < 0.0001$; Cramer's V = 0.59) but found no significant links with gender or education. Overall, 82 % of patients therefore present with anxiety levels that could compromise cooperation and treatment outcomes, especially when invasive care is scheduled.

The dominant influence of procedure invasiveness over demographic factors suggests that anxiety in this setting is primarily a situational response rooted in anticipated pain, loss of control and previous negative experiences rather than in stable personal traits. Because surgical, extraction and endodontic appointments elicit *high-to-extreme* MDAS scores, these sessions warrant anticipatory interventions—such as enhanced pre-operative explanation, tell–show–do, cognitive-behavioural techniques, and, where indicated, pharmacological anxiolysis or conscious sedation. Conversely, scaling, and restorative visits can be leveraged as "confidence-building" encounters to desensitise nervous patients. The lack of significant gender or education effects indicates that anxiety-screening should be universal, not targeted, and that socio-demographic stereotypes should not guide triage. Integrating the five-item MDAS into routine intake forms would add under one minute to chair-side workflow but equip clinicians with an evidence-based trigger for tailored anxiety management. It will help clinicians identify specific anxieties of the patient and doing so is likely to improve appointment adherence, operative efficiency, and patient-reported outcomes, while satisfying ethical obligations to provide patient-centred, psychologically informed 'holistic' dental care

DISCUSSION

Dental fear remains a pervasive barrier to oral-health utilisation worldwide, with point-prevalence estimates spanning 4–30 % in adult populations[6,7]. Our finding that *moderate-to-high* anxiety affected 82 % of attendees therefore places the present cohort at the upper end of the global spectrum and markedly above the 30 % ceiling reported in meta-analyses of public-clinic samples [12]. Several factors can be at play which are enlisted as follows: First, the study centre is a teaching hospital that routinely handles complex referrals; invasive workloads can amplify anticipatory anxiety through classical conditioning and negative vicarious learning [3,13]. Second, cultural norms in rural Western India may foster reluctance to seek timely care, thereby concentrating symptomatic patients with long-standing pathology whose pain memories heighten fear[14,15]

A. Anxiety determinants: procedure versus person

Consistent with the behavioural theory that *stimulus intensity* predicts fear magnitude [16], procedural category emerged as the single strongest predictor ($\eta^2 = 0.88$). This mirrors UK and Australian studies where extractions and oral surgery routinely score ≥16 on the MDAS[7,17].The non-significant influence of gender and education contrasts with early work suggesting higher scores among women and the less educated[11]. One plausible explanation is that hospital triage equalises exposure to anxiety-provoking stimuli across groups; alternatively, the small subset of *extreme* cases (n = 2) may have limited power to detect subtle demographic gradients. Longitudinal designs or larger multi-centre cohorts could clarify whether socio-economic resilience modifies anxiety trajectories over time.

B. Clinical Ramifications

High pre-operative MDAS scores predict greater intra-operative pain, increased local-anaesthetic requirements and longer chair time [18,19]. In the present study, surgical and extraction patients averaged ≥16.5—comparable to the cut-off for dental phobia—suggesting that standard behavioural distraction may be insufficient. Evidence-based strategies include brief cognitive-behavioural interventions[20], video-based pre-visit education [21], and minimally invasive pharmacological aids such as nitrous-oxide/oxygen inhalation[22]. Embedding MDAS screening within the electronic health record would enable automated alerts when scores exceed 15, prompting the clinician to allocate extended appointment slots or enlist an anaesthetist. Moreover, routine restorative or scaling appointments—which elicited *low-to-moderate* anxiety—could be scheduled first in phased treatment plans to build patient self-efficacy via graded exposure, an approach that has demonstrated durable reductions in dental fear [23].

C. Theoretical Contributions

Our data provides support to the *cognitive-vulnerability model*, which states that perceived uncontrollability, unpredictability and potential for pain drive dental fear[17]. Surgical procedures embody all three appraisals, thereby eliciting the steepest anxiety gradient. Conversely, gender and education—often proxies for trait neuroticism and health literacy—did not independently predict MDAS scores, underscoring the supremacy of immediate situational cues over dispositional factors in a clinical setting. From a public-health standpoint, this suggests interventions should focus on modifying *procedural meaning* (through explanation, preparatory information, and shared control) rather than solely targeting population sub-groups based on demographics.

D. Comparison with existing literature

While similar study reported a mean MDAS of 11.3 in mixed dental populations [6], our mean of 13.88 is closer to the 14.0 observed in tertiary-care cohorts in China and Sweden [12,17].The procedure-specific hierarchy we observed (surgery > extraction > endodontics > prosthodontics > scaling > restorations) parallels findings by other studies, reinforcing its likely generalisability. However, some studies note a pronounced gender gap, with female anxiety exceeding male scores by 2–3 points[14,24]; our null result may reflect cultural stoicism among men, response-bias, or sampling heterogeneity. Future qualitative work could explore gendered narratives of dental fear in the Indian context.

E. Strengths and limitations

Key strengths include the use of a validated, five-item MDAS with established cross-cultural reliability[11] and robust inferential statistics (ANOVA with post-hoc Tukey and χ^2 tests). The very large effect size for treatment type strengthens causal inference. Nevertheless, limitations must be acknowledged. Convenience sampling may inflate prevalence estimates by recruiting individuals already motivated to attend despite anxiety. Cross-sectional design precludes causal claims about whether anxiety deters attendance or merely coincides with urgent symptomatic visits. Self-report bias may underestimate embarrassment-related anxiety in men, while the exclusion of children and geriatric patients limits age-range generalisability. Finally, hospital settings tend to cluster complex procedures; community clinics might yield a flatter anxiety gradient.

F. Future directions

Prospective cohort studies should track MDAS trajectories from initial examination through treatment completion to evaluate whether tailored interventions moderate anxiety and improve clinical outcomes. Randomised trials comparing stepped-care models—ranging from brief information leaflets to chair-side cognitive-behavioural therapy and pharmacological sedation—would inform cost-effectiveness thresholds for resource-constrained public hospitals. Integrating psychophysiological measures such as heart-rate variability or salivary cortisol could validate self-reported MDAS data and illuminate underlying neuro-endocrine pathways. Finally, implementation research should examine barriers to routine anxiety screening among dental teams, including perceived time burden and training needs.

CONCLUSIONS

This study consolidates evidence that the *nature of the planned procedure*—rather than who the patient is—drives dental anxiety in an Indian clinical setting. Embedding a quick MDAS screen and procedure-specific anxiety-management protocols could substantially enhance patient experience, operative efficiency, and long-term oral-health behaviours. Scaling this model to primary-care clinics promises to shrink the "vicious cycle" between fear and delayed attendance described two decades ago, aligning everyday dentistry with modern principles of person-centred, trauma-informed care.

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