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LEVELS OF DENTAL ANXIETY AMONG MEDICAL AND DENTAL STUDENTS OF JINNAH SINDH MEDICAL UNIVERSITY KARACHI, PAKISTAN: A CROSS-SECTIONAL STUDY

Original Research

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Acknowledgement: The authors acknowledge the cooperation of all participating students and the administrative support of Jinnah Sindh Medical University.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Dental fear and anxiety are common psychological responses that adversely influence oral health–seeking behavior, treatment compliance, and clinical outcomes. These responses are not limited to the general population and are frequently observed among healthcare undergraduates, including medical and dental students, where they may also affect future professional attitudes and patient empathy. Despite advances in anesthetic techniques, pain control, and dental technology, dental anxiety remains a persistent concern in both academic and clinical settings.

Objective: The study aimed to determine the prevalence and severity of dental anxiety and to identify associated factors among medical and dental undergraduates at Jinnah Sindh Medical University (JSMU), Karachi, with particular emphasis on gender, academic program, clinical exposure, and procedure-specific anxiety triggers.

Methods: A descriptive cross-sectional study was conducted among 321 undergraduate students enrolled in MBBS and BDS programs from the second to final academic years. Data were collected using validated instruments, including the Modified Dental Anxiety Scale (MDAS) and the Dental Fear Survey (DFS). Sociodemographic characteristics and prior dental experiences were also recorded. Statistical analysis was performed using SPSS version 20. Descriptive statistics summarized anxiety levels, while independent-sample t-tests and chi-square tests were applied to examine associations between anxiety scores and demographic or academic variables. Statistical significance was set at $p < 0.05$.

Results: Severe dental anxiety was observed in 75.1% of participants, while 13.1% reported moderate anxiety, 4.0% low anxiety, and 7.8% reported no anxiety. Dental students demonstrated significantly higher anxiety responses toward tooth drilling and local anesthetic injections compared to medical students ($\chi^2 = 32.95$, $p < 0.001$; $\chi^2 = 11.24$, $p = 0.024$). Fear of injections was the most frequently reported trigger (83.6%), followed by fear of tooth drilling (54.5%). Male students exhibited significantly higher mean MDAS scores than female students.

Conclusion: Dental anxiety was highly prevalent among medical and dental undergraduates, with severity influenced by gender, academic discipline, and invasive dental procedures. Early identification, psychological support, and structured exposure-based interventions within health education programs may help reduce anxiety and enhance students' clinical preparedness.

Keywords: Anxiety, Dental Fear, Dental Students, Medical Students, Pain, Surveys and Questionnaires.

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INTRODUCTION

Within social psychology and dental research, the terms *dental fear* and *dental anxiety* are frequently used interchangeably, reflecting their close conceptual and clinical relationship (1). Although strongly interconnected, these constructs represent distinct yet overlapping emotional responses that influence patients' perceptions of and reactions to dental care. Anxiety is generally described as a negative emotional state characterized by apprehension and anticipation of a potential threat, regardless of whether an immediate physical danger is present (2). In the dental context, this anticipatory response often precedes clinical encounters and shapes patient behavior long before treatment begins. Dental anxiety (DA) is recognized as a central psychological component influencing oral health outcomes. Dental fear, which is closely associated with DA, is defined as an unpleasant emotional reaction to a perceived threat or danger related to dental procedures (3,4). While fear is considered a biologically adaptive, habitual, and emotional response to identifiable stimuli, pathological anxiety is distinguished by a disproportionate nervous reaction in which even non-threatening situations provoke distress (5). This heightened sensitivity can impair communication, reduce cooperation during treatment, and intensify avoidance behaviors.

The public health relevance of dental anxiety is well established. High levels of DA have been linked to delayed dental visits, reliance on emergency care, and poor adherence to follow-up appointments, even in economically developed countries with advanced dental services (6). Anxiety related to dental care affects individuals across all age groups, including children, adolescents, and adults. While adults often attempt to consciously manage their stress during dental procedures, adolescents are more likely to postpone or completely avoid treatment, further exacerbating oral health problems (7). Despite significant advances in preventive dentistry, pain control, and therapeutic techniques over the past two to three decades, dental anxiety and panic remain persistent challenges within clinical practice. These emotional responses can negatively affect the dentist–patient relationship, complicate diagnosis, delay necessary interventions, and ultimately contribute to deterioration in oral health status (8,9). Moreover, severe dental anxiety extends beyond the dental setting, interfering with daily functioning and overall quality of life, raising critical questions about the environmental and psychosocial factors that trigger or sustain these responses (10). Given the continued prevalence of dental anxiety and its substantial impact on oral health behaviors and outcomes, there remains a need to better understand how dental fear and anxiety interact and influence patients' engagement with dental care. The objective of the present study is to examine the relationship between dental fear and dental anxiety and to identify key contributing factors that may inform targeted strategies for reducing anxiety and improving patient-centered dental care.

METHODS

This study employed a cross-sectional analytical design to determine the level of dental anxiety and its associated determinants among undergraduate students. Cross-sectional designs are well suited for estimating prevalence and examining associations between psychosocial variables, such as anxiety, and demographic or educational characteristics (2)(9). Data were collected during the academic session of 2024–2025 at Jinnah Sindh Medical University (JSMU), involving students enrolled in Bachelor of Dental Surgery (BDS) and Bachelor of Medicine, Bachelor of Surgery (MBBS) programs. The university setting was selected due to its heterogeneous student body, representing multiple academic years and two distinct health disciplines, which allowed the capture of a broad snapshot of psychological responses toward dental treatment. The target population consisted of undergraduate BDS and MBBS students from the second, third, fourth, and final years of study to reflect varying degrees of clinical exposure. Students who were enrolled in these years and consented to participate were included, whereas those who were absent during data collection or declined participation were excluded. The required sample size was calculated using an online sample size calculator, assuming 80% statistical power and a moderate effect size based on findings from prior literature (7). A target of 323 participants was set to account for potential non-response. Ultimately, 321 students completed the survey, yielding a response rate of 99.4%, which was considered adequate to ensure robust statistical power and reasonable generalizability within the university context. Purposive non-probability sampling was used to recruit participants from both disciplines and across academic years, ensuring proportional representation and capturing potential variations in anxiety related to educational background and clinical exposure (11). Dental anxiety was assessed using the Modified Dental Anxiety Scale (MDAS), a validated five-item instrument designed to quantify anxiety related to common dental situations (7). Each item was rated on a five-point Likert scale ranging from 1 (not anxious) to 5 (extremely anxious), producing a total score between 5 and 25.

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Standardized cut-off values were applied to categorize anxiety levels as low (5–10), moderate (11–14), high (15–18), and severe (19–25). The MDAS has demonstrated good psychometric properties, with high internal consistency (Cronbach's $\alpha = 0.86$), and has been validated in diverse populations, including health science students (12,13). In the present study, the questionnaire was administered in English, consistent with the official language of instruction at JSMU.

Data collection was conducted over a four-week period following approval from the institutional review board of JSMU. All procedures adhered to established ethical standards. Participants were informed about the purpose of the study, the voluntary nature of participation, and the assurance of confidentiality. Written informed consent was obtained prior to participation. A self-administered paper-based questionnaire was used, requiring approximately 10 minutes to complete, and included items on demographic characteristics, prior dental experiences, and MDAS responses. Statistical analysis was performed using SPSS software (version 20). Data were screened, cleaned, and validated for completeness before analysis. Descriptive statistics were used to summarize demographic variables and anxiety-related measures, with frequencies and percentages reported for categorical variables and means with standard deviations calculated for continuous variables, including total MDAS scores. The prevalence of dental anxiety severity categories was presented as proportions of the study sample. Group comparisons were undertaken to evaluate differences in dental anxiety between medical and dental students, as well as across gender and year of study. Independent sample t-tests were applied for comparisons involving two groups, while one-way analysis of variance (ANOVA) was used for comparisons across more than two groups. Associations between categorical variables, including anxiety severity categories and demographic factors, were assessed using the chi-square test of independence. Reported reasons for dental anxiety were analyzed using frequencies and percentages, and their associations with demographic variables were also examined using chi-square analysis. The internal consistency of the MDAS within the study sample was evaluated using Cronbach's alpha reliability coefficient. A p-value of less than 0.05 was considered statistically significant for all inferential analyses.

RESULTS

A total of 321 undergraduate students were included in the final analysis, with complete data available for all key study variables. Assessment of dental anxiety using the Modified Dental Anxiety Scale demonstrated a high overall burden of anxiety within the study population. Severe dental anxiety was observed in 241 participants (75.1%), while moderate anxiety was reported by 42 students (13.1%). Low anxiety levels were identified in 13 participants (4.0%), and 25 students (7.8%) reported no dental anxiety. The mean MDAS level score was 2.87, reflecting anxiety severity between moderate and high. The median score was 3.00, indicating that at least half of the participants experienced high or severe dental anxiety, highlighting a strong skew toward elevated anxiety levels in this cohort. With respect to demographic characteristics, female students constituted a slightly larger proportion of the sample, with 173 participants (53.9%), compared to 148 male students (46.1%). Regarding academic discipline, medical students represented the majority of the participants, with 197 students (61.4%), while 124 students (38.6%) were enrolled in the dental program. This distribution ensured representation from both medical and dental educational backgrounds, allowing comparison across programs. Analysis of self-reported reasons for dental anxiety revealed that fear related to invasive procedures was particularly prominent. Anxiety associated with tooth drilling was reported by 54.5% of participants, making it one of the most common anxiety-provoking stimuli. Fear related to anticipation of dental visits, emotions experienced while waiting in the treatment room, and concerns about scaling and polishing were reported less frequently but still contributed to overall anxiety profiles. Notably, needle-related fear emerged as the most prevalent anxiety trigger, affecting 83.6% of respondents, indicating a dominant procedural factor underlying dental anxiety in this population.

Inferential analysis demonstrated a statistically significant association between academic program and anxiety responses to specific dental procedures. Responses to tooth drilling showed a strong association with the program of study, with dental students more frequently reporting higher anxiety levels compared to medical students ($\chi^2 = 32.95$, $df = 4$, $p < 0.001$). The strength of this association was moderate, as indicated by Cramer's V of 0.32. A similar pattern was observed for anxiety related to local anesthetic injections, where a significant association was also identified ($\chi^2 = 11.24$, $df = 4$, $p = 0.024$), with dental students again demonstrating a greater tendency toward higher anxiety categories. Effect size estimation for this association indicated a small to moderate relationship (Cramer's $V = 0.19$). Assumptions for chi-square analysis were met in both comparisons. Comparison of overall dental anxiety scores by gender revealed a statistically significant difference. Male students reported higher mean MDAS scores (mean = 16.30, SD = 2.76) compared to female students (mean = 15.36, SD = 2.51). Independent sample t-test analysis confirmed this difference to be statistically significant ($t(319) = 3.12$, $p = 0.001$), with a mean difference of 0.95 and a 95% confidence interval ranging from 0.37 to 1.52. These findings indicated greater overall dental anxiety among male participants in this cohort.

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Table 1: Distribution of Dental Anxiety Levels Among Undergraduate Students (MDAS Categories)

MDA Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low anxiety	13	4.0	4.0	4.0
	Moderate anxiety	42	13.1	13.1	17.1
	Severe anxiety	241	75.1	75.1	92.2
	No anxiety	25	7.8	7.8	100.0
	Total	321	100.0	100.0	

Table 2: Gender Distribution of Study Participants

Gender					
		Frequency	Percent	Valid percent	Cumulative Percent
Valid	1	148	46.1	46.1	46.1
	2	173	53.9	53.9	53.9
	Total	321	100.0	100.0	

Table 3: Academic Program Distribution of Study Participants

PROGRAM OF THE STUDY					
		Frequency	Percent	Valid Percent	Cumulative percent
Valid	1	124	38.6	38.6	100
	2	197	61.4	61.4	61.41
	Total	321	100.0	100.0	

Table 4: Reported Procedure-Specific Triggers of Dental Anxiety Among Participants

Dental Situation / Question	**Number of Responses (N)**	**Percent (%)**	**Percent of Cases (%)**
Response to visiting the dentist tomorrow for treatment	10	9.8	18.2
Emotions experienced while waiting in the treatment room	7	6.9	12.7
Feelings regarding scaling and polishing of teeth	9	8.8	16.4
Feelings if going to have a tooth drilled	30	29.4	54.5

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Table 5: Chi-Square Test Results for Association Between Academic Program and Dental Anxiety Response

Test	Value	df	Asymptotic Significance (2-sided)	Exact Significance (2-sided)
Pearson Chi-Square	35.075[a]	4	0.000	0.000
Likelihood Ratio	36.241	4	0.000	0.000
Fisher's Exact Test	35.269	—	—	0.000
Number of Valid Cases	321	—	—	—

Table 6: Comparison of Mean MDAS Scores by Gender

Group Statistics					
Gender		N	Mean	Std. Deviation	Std. Error Mean
MDAS_total	1	148	16.3041	2.75942	.22682
	2	173	15.3584	2.51250	.19102

Table 7: Independent Samples t-Test Comparing MDAS Scores by Gender

Variance Assumption	Levene's Test F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Equal variances assumed	1.704	0.193	3.212	319	0.001	0.94567	0.29439	0.36649	1.52486
Equal variances not assumed	—	—	3.189	300.342	0.002	0.94567	0.29654	0.36211	1.52924

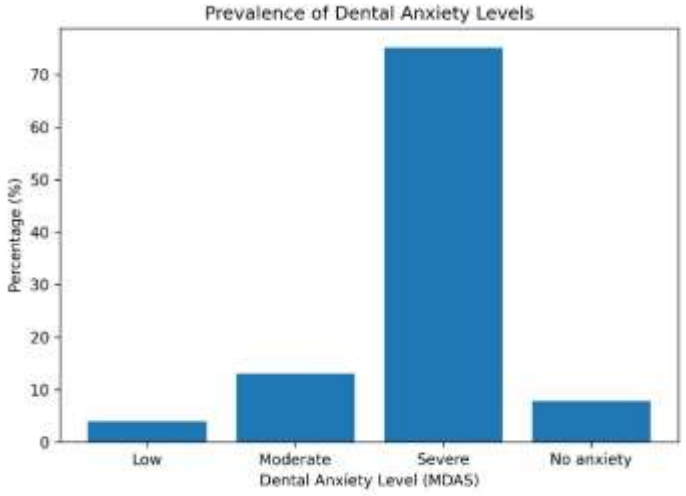

Figure 2 Prevalence of Dental anxiety Levels

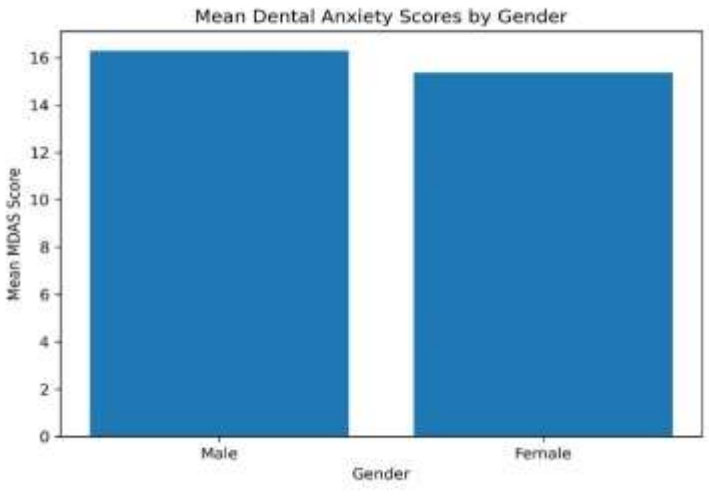

Figure 2 Mean Dental Anxiety Scores by Gender

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DISCUSSION

The present study examined the prevalence, severity, and determinants of dental anxiety among undergraduate medical and dental students at a large public-sector medical university in Pakistan and demonstrated a notably high burden of anxiety within this population. The finding that more than three-quarters of participants experienced dental anxiety, with the majority categorized as severe, underscores that dental anxiety remains a pervasive psychological concern even among individuals with formal education in health sciences. This observation aligns with existing evidence suggesting that professional knowledge alone does not necessarily mitigate anxiety related to dental procedures and may, in some cases, heighten anticipatory fear due to increased awareness of procedural details and potential discomfort. The predominance of severe dental anxiety observed in this cohort appears higher than that reported in several international studies conducted among university students and healthcare trainees, where moderate anxiety levels are more commonly documented. Such variation may reflect contextual factors, including differences in prior dental experiences, cultural perceptions of dental care, accessibility of preventive services, and exposure to pain management practices (14-16). The elevated anxiety levels among health sciences students also support the argument that repeated exposure to clinical information without parallel positive personal dental experiences may reinforce fear rather than alleviate it, particularly when invasive procedures such as injections and drilling are perceived as threatening. Differences observed between medical and dental students further highlight the complex nature of dental anxiety. Dental students demonstrated higher anxiety in response to specific procedures despite greater familiarity with dental environments (17,18). This paradox has been reported in earlier research and suggests that close clinical exposure may sensitize individuals to procedural discomfort rather than desensitize them. In contrast, medical students, while less exposed to dental settings, appeared more frequently represented in lower anxiety categories, possibly reflecting reduced procedural anticipation or emotional distancing from dental interventions (19-21).

From a clinical and educational perspective, these findings carry important implications. High levels of dental anxiety among future healthcare professionals may influence their own health-seeking behaviors and shape their attitudes toward patient care, empathy, and interprofessional collaboration. Addressing dental anxiety during undergraduate training through structured behavioral interventions, stress-management education, and early positive clinical exposure may therefore be beneficial. Incorporating anxiety-awareness modules within health curricula could help normalize these experiences and promote healthier coping strategies. The study had several strengths, including the use of validated psychometric instruments, a high response rate, and inclusion of students from multiple academic years and disciplines, which enhanced internal validity and allowed meaningful subgroup comparisons. However, certain limitations should be acknowledged. The cross-sectional design restricted causal inference and limited the ability to assess temporal changes in anxiety levels. The reliance on self-reported data introduced the possibility of response and social desirability bias. Additionally, the single-institution setting may constrain the generalizability of findings to other universities or regions. The absence of detailed analysis by academic year and prior clinical exposure also limited exploration of potential dose–response relationships between training level and anxiety severity. Future research would benefit from multi-center longitudinal designs to track changes in dental anxiety across the course of professional training and to evaluate the impact of targeted educational or psychological interventions (22,23). Qualitative approaches could further enrich understanding by exploring personal experiences and contextual factors underlying anxiety responses. Together, such efforts may contribute to the development of evidence-based strategies aimed at reducing dental anxiety among healthcare students and improving both personal oral health behaviors and future patient care outcomes.

CONCLUSION

This study concluded that dental fear and anxiety are highly prevalent among medical and dental undergraduates, with most students experiencing moderate to severe anxiety related to dental care. Fear was primarily associated with invasive procedures, particularly local anesthetic injections and tooth drilling, reflecting a persistent anticipation of pain and discomfort. Notable differences were observed across gender and academic discipline, indicating that dental anxiety is not uniformly distributed within health science students. These findings highlight that dental anxiety remains a significant concern even among future healthcare professionals. The study underscores the importance of implementing targeted awareness programs, early psychological support, and anxiety-reduction strategies within medical and dental institutions to promote healthier attitudes toward dental care and improve long-term oral health behaviors.

AUTHOR CONTRIBUTIONS

Author	Contribution
Marium Azfar*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Darrosham Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Micah Irfan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Hafsa Atif	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Amna Tahseen	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Munazzah	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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