

Undergraduate Dental Students' Perspectives on Anxiety Triggers during Clinical Endodontic Treatment: A Qualitative Study

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Objectives Dental students experiencing stress and anxiety employ various coping strategies. Therefore, understanding these experiences is crucial for designing effective interventions. This qualitative study aimed to explore the coping strategies used by endodontic students at Shahid Beheshti University of Medical Sciences in Tehran, Iran.

Methods A qualitative content analysis was conducted on 10 purposively selected students from the Department of Endodontics at the Faculty of Dentistry in 2019. In-depth semi-structured interviews were conducted over three months. The interviews were recorded and transcribed verbatim. Data analysis was performed using the Dickelman's method.

Results After coding the interview transcripts, four major themes related to student anxiety were identified: "endodontic department", "education", "clinical practice", and "students". According to the findings, the main sources of anxiety among students in dental education were professor-student interactions, challenging preclinical courses, the clinical learning environment, and a perceived lack of support.

Conclusion While some students demonstrated resilience, others struggled with ineffective coping strategies, potentially affecting their learning and wellbeing. The study identified various sources of anxiety among dental students, including curriculum factors, interactions with the faculty and staff, clinic facilities and equipment, radiography procedures, and preclinical training. Overall, the findings emphasize the need for a comprehensive approach to improve the educational environment.

Keywords Qualitative research; Anxiety; Endodontics; Students; Dentistry

Introduction

Root canal therapy, or endodontic treatment, is a vital procedure in the field of dentistry. However, it is a common cause of anxiety among dental students.¹ The literature emphasizes that dental students often face significant stress and anxiety during their clinical training, especially when conducting endodontic treatments on patients.^{2, 3} Various factors contribute to the endodontic students' anxiety, including concerns about making technical errors or causing accidental patient injuries, challenges in achieving optimal root canal access, maintaining disinfection, managing patient pain and discomfort, and a general lack of experience with endodontic techniques.^{4, 5} Excessive anxiety during endodontic treatments has been associated with obstacles in the students' learning process, their clinical performance, and their professional growth.¹ Nonetheless, there is a major gap in qualitative research addressing the dental students' perspectives on the specific causes of student anxiety in endodontics.

While studies on dental students can inform curriculum enhancements⁶, promoting cooperation between teachers and students is crucial in refining educational methods to enhance the academic environment for professional health education.⁷ Surprisingly, no study in Iran has yet investigated the management strategies for stress and

anxiety among dental students, which highlights the need for comprehensive research in this area. Considering the high levels of stress and anxiety among students and their varied reactions, it is important to explore their experiences to comprehend the root of their difficulties and design efficient, personalized psychological interventions.^{8, 9}

In this study, we employed semi-structured interviews to delve into the dental students' viewpoints on the sources of anxiety in clinical endodontics. Through a qualitative analysis of the students' narratives, we aimed to fully understand the complex causes of anxiety in endodontic students. These insights are anticipated to guide changes in training programs, thereby enhancing student experiences, increasing their proficiency, and improving patient care quality.

Methods and Materials

In this qualitative, exploratory study, a purposeful sample of students from the Faculty of Dentistry at Shahid Beheshti University of Medical Sciences (Tehran, Iran) was selected. The inclusion criteria were as follows: successful completion of preclinical endodontic courses, active participation in practical endodontic courses, and completion of at least four endodontic treatments. The recruitment process involved direct communication with potential participants. Enrolment was dependent on

obtaining the students' fully informed consent, ensuring their voluntary participation in the study.

At the onset of each interview, the researcher introduced himself and allocated a brief period to introductions. The participants were then asked to introduce themselves and share a brief history of their experiences in the endodontic department. During the interviews, the students were asked semi-structured questions about their anxiety experiences at different stages of work in the endodontics department and their methods for managing this anxiety. Additionally, during the interviews, follow-up questions ("Can you elaborate more on this?" or "Can you provide an example of this?") were posed to gain a deeper understanding of the students' experiences. Following the interviews, the data coding process began with the interview transcripts, which involved three stages: initial coding, identifying the main and sub-themes, and deriving themes. For this purpose, the interviews were carefully listened to several times, and the handwritten transcripts were reviewed multiple times.

The initial coding process involved transcribing the data, after which a collection of words or sentences with similar meanings were identified; these similar meaning units formed the basis for categorization. The categorization process, also known as unit of analysis, unit of coding, initial coding, or sub-themes, was validated by both faculty members and the interviewees. After identifying the main themes, the final concept was derived through qualitative content analysis. The research protocol was granted ethical clearance and approval by the University Ethics Committee (reference No.: 1398.041).

Data collection

Data was collected through semi-structured, individual, in-depth interviews with students. The interviews lasted 20-40 minutes and were conducted over three months from April to June 2019 at the Faculty of Dentistry of Shahid Beheshti University of Medical Sciences. The main interview questions focused on understanding the students' experiences of anxiety during endodontic procedures, as well as their coping strategies.

At the end of each interview, it was transcribed verbatim. The data transcription process was carried out once by one of the researchers (S.S.) under the supervision of the relevant professor (M.S.) and then once more by another researcher (A.G.) to ensure the accuracy of the transcripts. The interview process continued until theoretical saturation was achieved. Following each interview, the accuracy of the transcribed texts was confirmed by both the professors and the interviewees. After this confirmation, the data was analyzed. In the final interviews, no fresh insights were presented, and most of the points were repetitions of those made by earlier interviewees. The professor specializing in qualitative research (M.S.) approved that theoretical saturation was achieved, indicating the adequacy of the sample size.

Data analysis

For data analysis, the method proposed by Diekmann et al. (10) was employed, which consists of seven steps:

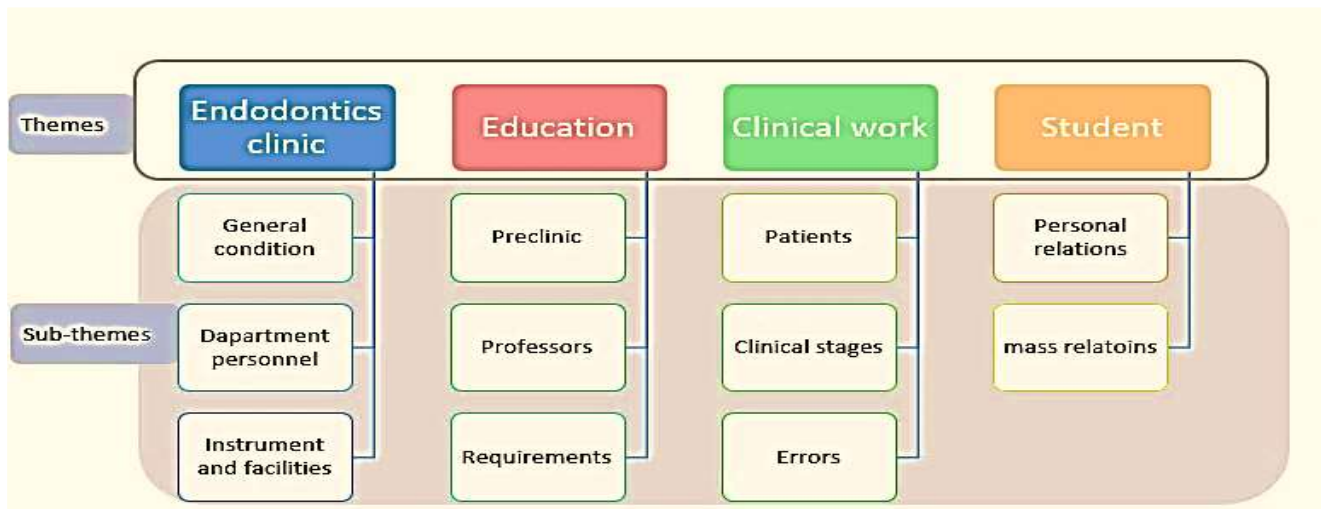
1. Reading all the interviews and texts to gain a general understanding.
2. Writing interpretive summaries for each interview.
3. Analyzing the recorded voices.
4. Revisiting the texts of the participants' interviews.
5. Comparing the texts of the interviews to identify and describe common meanings and functions.
6. Identifying patterns related to topics and presenting a draft version of the topics to commentators to gather their suggestions and incorporate them into the final version.
7. Conducting content analysis to extract data from the texts and transcripts.

To validate the study, the acceptability, reliability, and transferability criteria outlined by Lincoln and Guba (1985) were utilized. Acceptability was ensured by selecting an appropriate research setting, as well as qualified participants. Reliability was established through close and continuous interaction with the participants. For transferability, the participants were involved in the interpretation of the findings. A team-based approach was used to further validate the research process. This approach allowed for multiple researchers to review the data, collaboratively code the themes, and resolve any discrepancies through comprehensive discussions and consensus.¹²

It is worth noting that the interviews were conducted by a dentist who had insights into dental education. However, this could potentially introduce biases stemming from their preexisting knowledge and assumptions. Furthermore, any personal experiences, beliefs, or attitudes towards dental education and endodontic procedures could unintentionally influence the interpretation of the findings. To reduce these potential biases, the interviewer committed to maintaining transparency and reflexivity throughout the research process. This involved regular engagement in critical self-reflection, challenging their own assumptions, and acknowledging any personal biases that might emerge during data collection, analysis, and interpretation.

Results

In this study, we interviewed 10 students of the Faculty of Dentistry at Shahid Beheshti University of Medical Sciences. After transcribing the interviews and classifying the variables, the data was analyzed and coded into four main themes related to factors contributing to anxiety in endodontic treatments. The participants' quotes revealed four primary themes that captured the core of their experiences: "endodontic departments", "education", "clinical practice", and "students" (Figure 1).



The first theme pertains to the endodontic departments. It delves into the unique dynamics and challenges specific to this field and uncovers the intricacies of working within the department, highlighting the demanding environment and its effect on the students' anxiety levels. The second theme is related to education, which encompasses a wide range of learning experiences and teaching methods encountered by the participants. This theme offers insights into the educational strategies, emphasizing their impact on the students' anxiety and overall learning outcomes.

The third theme, namely clinical work, delves into the practical aspects of student training. This encompasses their hands-on experiences, patient interactions, and the complexities of delivering high-quality dental care. It reveals the unique stressors and challenges of students in the clinical setting and their impact on anxiety levels. The final theme, the student's role, examines the various responsibilities and expectations placed on the participants. It scrutinizes their self-perception, their sense of competence, and the factors that shape their professional identity. This provides a comprehensive understanding of the various factors that contribute to their anxiety.

Overall, the extracted themes highlighted the main sources of anxiety among students when performing root canal treatments, often stemming from concerns about their skills and knowledge, as well as the precision required for endodontic procedures. Factors that intensified anxiety were seen as detrimental, while positive experiences that boosted confidence helped to reduce anxiety. The themes extracted from the interviewees' responses are enclosed in quotation marks below. They were categorized based on the frequency and repetition of the responses.

Theme 1: Endodontic departments

1. General conditions of the department:

A. Nature of work in the endodontic department:

In this context, one of the students commented:

"Prior to joining the endodontics department, there was a

common perception among students that it was an environment fraught with stress, anxiety, challenges, and risk of treatment errors. Endodontics is known for being highly technique-sensitive, requiring advanced manual dexterity and meticulous approaches. Students understood that the margin for error in procedures like root canal treatments is minimal and that even minor mistakes could lead to complications."

B. Previous background knowledge about the endodontic department:

In this regard, one student shared their experience, stating the following:

"As expected, the endodontic department turned out to be a highly stressful environment, which affected my mental state and concentration during my training there. My existing anxiety about the complexity of endodontic procedures prevented me from fully immersing myself in learning."

C. Non-clinical conditions of the department

In this regard, one of the students expressed the following:

"Despite the stressful nature of clinical work, efforts were made in the endodontic department to foster a pleasant non-clinical environment. For instance, music was played in the mornings, which helped to create a lighter mood. The reception area and break room were designed to be welcoming, and efforts were made to create a warm and inviting atmosphere."

2. Department personnel

A. Sterilization room staff cooperation:

In this context, one of the students commented:

"The staff in the **Sterilization** room were cooperative and created a supportive environment that helped reduce anxiety. For example, the students were given ample notice that their time was nearing its end, rather than being abruptly asked to wrap up. This allowed them to complete their procedures in a calm and unhurried manner."

B. Department secretary:

In this context, a student expressed the following view:

“The department secretary is the person responsible for managing the patients until they reach us. The secretary’s role is crucial in coordinating patient appointments and ensuring a smooth process for students. However, this semester, there was a level of discontent among students due to the uncertainty of patient arrivals and the perceived lack of preparation prior to appointments.”

C. Number of personnel in the department:

In this context, a student shared the following observation:

“Throughout my endodontic training, I identified certain inefficiencies in the departmental workflow that hindered the speed of procedures. For instance, we frequently had to interrupt treatments to call for the professor or to personally fetch equipment and dental materials. The introduction of a dedicated nurse for each partition could potentially rectify these issues. With a nurse on hand to assist each provider, the delivery of equipment and supplies could be more efficient. This would enable us to concentrate on the clinical procedure, thereby accelerating the workflow and facilitating earlier patient discharge.”

D. Music:

In this regard, a student offered the following insight:

“Playing music in the endodontic department can have positive outcomes for both patients and providers. On a personal level, I find that soothing music helps to alleviate my stress and fosters a serene environment as I carry out intricate endodontic procedures. Beyond the individual advantages, the incorporation of music in healthcare settings can also aid in relaxing the patients and may even diminish their perception of pain and anxiety during treatment.”

3. Department instruments and facilities:

In this context, the students shared the following perspectives:

“Throughout my endodontic training, I identified several opportunities for improving the department’s equipment and facilities. For example, there were occasions when essential instruments were not available, necessitating personal purchases, such as when a spreader was missing. The introduction of a more robust inventory system could help mitigate such problems.”

“On a positive note, the recent incorporation of apex locators for the students marks significant progress. This technology has the potential to improve the precision and outcomes of endodontic procedures. Consistent investment in such advanced equipment, along with improvements in the logistics of supplies and instruments, can enhance the department’s facilities. This would not only serve patients more effectively, but also enhance educational opportunities. With a few targeted improvements, the resources of the endodontic department could be optimized to provide outstanding clinical training and care.”

4. Department radiography

A. Lack of radiographic equipment at the department:

In this context, the students shared the following perspectives:

“A significant cause of frustration and wasted time in the department was the insufficient availability of radiographic equipment for taking X-rays. This greatly impeded our workflow and productivity. A substantial part of our clinic sessions was wasted waiting for access to the limited X-ray machines.”

“The queue and delay in acquiring radiographs made it impossible to complete procedures efficiently, even when we were prepared to proceed. This transformed a simple task into time-consuming labor. The necessity to extend the work of one session into the next due to imaging delays was incredibly stressful and disruptive to the learning process.”

B. Cooperation of the radiology technician:

Another finding of this study is the problems stemming from insufficient collaboration with the radiography technician. According to the participants, this significantly contributes to their anxiety associated with radiography-related issues in the department. In this regard, a student offered the following insight:

“For instance, it would be helpful if there was a radiography operator who would provide explanations and assistance during work. However, currently, when the operator arrives, they do not provide explanations, which leads to a waste of time.”

C. Transition from analog to digital radiography:

In this context, a student shared the following perspective:

“The shift from traditional analog X-ray films to digital radiography with RVG sensors had a profoundly positive impact on our clinic workflow and stress levels. The use of the analog method was laborious and induced stress due to concerns about perfect angulation, development, and interpretation of films.”

Theme 2: Education

1. Preclinical endodontics:

A. Preclinical professors’ approach:

In this context, a student offered the following insight:

“The preclinical professors did not deliver the level of instruction and attention that I believed was essential for effective learning. The professors engaged closely with only a handful of students during class time, leaving the majority of the class overlooked. With such restricted interaction, it was challenging to acquire a comprehensive understanding of the material.”

Professors need to show greater commitment in terms of teaching methodology and student interaction to effectively implement the preclinical curriculum and prepare students for clinical rotations. The existing approach results in knowledge gaps that can be avoided with more dedicated

and participatory teaching styles.

B. Preclinical professors' evaluation methods

The preclinical professors' evaluation methods were not fully aligned with the course learning objectives and practical skills development. The grading criteria seemed disconnected from the scientific knowledge and techniques the students were expected to acquire.

C. Discrepancy between the preclinical professors' opinions and the department's policies:

In this context, a student shared the following perspective:

"There was a discrepancy between the viewpoints of preclinical professors and those of the clinical department faculty. We were instructed in certain techniques during our preclinical courses that did not correspond with the actual practices in the clinical setting."

The preclinical education requires improved synchronization with the clinical department to guarantee consistency between the teachings imparted to students and the clinical realities they will encounter.

D. Preclinical features:

In this context, a student offered the following insight:

"The preclinical facilities were deficient in multiple aspects. With merely two radiograph machines available for the entire class, extensive queues were formed, thereby restricting opportunities to practice this crucial skill. The radiography system itself was susceptible to producing unclear images, yet professors unjustly attributed any errors to the students. Overall, the preclinical environment was exceedingly stressful due to challenges, such as the inability to locate teeth."

E. Differences between the conditions of the preclinical and clinical wards:

In this context, a student shared the following perspective:

"We had prior experience working in the preclinical setting, where we were prepared both scientifically and practically. However, if we had the opportunity to work in conditions more closely resembling an actual oral environment, it would significantly enhance our learning experience and contribute to a more positive psychological state within the department."

F. Preclinical assignments:

In this regard, a student offered the following insight:

"The preclinical course involved an overwhelming number of assignments that posed a challenge for students. Moreover, the system for determining the order of access to limited resources, such as radiograph machines, was disorganized, with some students bypassing the proper sequence despite the implementation of a lottery system. The excessive workload, coupled with disorganization around shared resources, led to avoidable stress."

The situation could be improved by streamlining preclinical requirements to focus on core competencies, increasing the number of radiograph stations, and

enhancing the supervision of assignment sequencing. Generally, students require a balanced workload and equitable access to equipment for effective learning.

2. Professors:

A. Professors' cooperation:

In this regard, a student shared the following perspective:

"Professors play a key role in the learning experience, yet our preclinical professor fell short in providing the necessary support and guidance. The professor interacted with us in a calm manner, but was more aloof than actively involved. There was an absence of psychological pressure, but also a lack of meaningful engagement in our progress. However, some commendable professors proactively engaged with students who were struggling and assisted them through challenging tasks. While not technically mandatory, this significantly alleviated the students' stress and bolstered their confidence. An ideal professor provides explanations to deepen our understanding and offers constructive feedback to foster improvement. Regrettably, some professors demeaned students for posing questions, cultivating an environment where inquiries were discouraged, and the students felt judged. Students need professors who foster a positive, nurturing learning environment where they can ask questions without fear of embarrassment."

B. Professors' presence and supervisory role:

Regarding this sub-theme, a student stated the following:

"Continuous supervision by professors during preclinical skill development is crucial, yet it is currently insufficient. Only a handful of preclinical professors actively observe and guide students during access exercises or other hands-on tasks. In the absence of adequate supervision, students find it challenging to receive feedback and verify the accuracy of their techniques."

C. Fear of punishment:

Regarding this sub-theme, a student shared the following perspective:

"The fear associated with preclinical endodontic evaluations hindered learning. The fear of potential repercussions for errors overwhelmed my concentration during practical exams. Instead of immersing myself in the material, I found myself preoccupied with evading unfavorable judgment from the professor. This mindset prevented knowledge acquisition and skill development. Students should be encouraged to learn to become proficient doctors, not out of fear of reprimand."

3. Requirements:

In this context, a student stated the following:

"Students faced difficulties in fulfilling the clinical requirements due to problems with the department secretary. While our group was nearing the course end, other groups still needed patients to fulfill their remaining two or three requirements. The students perceived that the

secretary was not assigning enough patients to them to meet their requirements. This imbalance in patient distribution led to frustration among the groups. The secretary should ensure that all groups are assigned sufficient patients to meet their requirements through a well-organized and fair process. Another cause of stress was the expectation for consistent progress. The demand for students to meet the requirements at the same pace, without considering individual progress rates, added unnecessary pressure. Reasonable scheduling adjustments and coordination from the secretary are necessary to allow students to fulfill clinical obligations without excessive stress."

Theme 3: Clinical work

1. Patients

A. Stress of conscience for the patients:

In this regard, a student expressed the following:

"The patient's condition and the result of their treatment were sources of concern for me. I am not troubled by the prospect of failing the course, but the thought of the patient having to undergo significant surgery is anxiety-provoking."

B. Patient's gender:

In this regard, one of the students stated the following:

"At first, I felt anxious about interacting with patients due to concerns over how the patient's gender and behavior might influence our interaction."

2. Clinical stages:

A. Rubber dam application:

In this context, a student expressed the following:

"During the early stages of my training, the rubber dam application caused me significant stress, particularly when dealing with patients who had a narrow tooth anatomy, which increased the complexity of its correct placement."

B. Anesthetic injection:

Achieving adequate and painless anesthesia through injection was a major source of concern for the students, provoking fear and anxiety due to the risks associated with this procedure.

C. Access cavity preparation:

In this regard, a student shared the following statement:

"In my initial attempt at preparing an access cavity, I feared that I had caused irreparable damage to a tooth, leading to a potential extraction. This instigated great stress and anxiety that lingered, to the extent that in subsequent sessions, the mere thought of attempting access again would cause my hands and feet to tremble."

D. Obturation:

In this context, a student expressed the following:

"Obturing teeth in the preclinical environment was less challenging as I could manipulate the typodont tooth. However, identifying the canal orifices for the insertion of a spreader proved to be quite difficult when working with

actual patients in the clinic."

E. Working length:

One of the students recounted the following experience:

"I faced major challenges when determining the working length during endodontic procedures, which involved struggles to reach the full length and difficulties in identifying the appropriate length. Despite my efforts, it took me a long time to accurately establish the correct working length."

F. Finding canals:

In this context, a student described the following experience:

"Despite my best efforts, I found it challenging to locate canals, which led to anxiety, particularly in cases with an ambiguous canal anatomy. Even thorough searching often failed to reveal the canals."

G. Canals with curves:

One of the students made the following statement:

"I faced great difficulties with a tooth that had two severely curved canals; it was a major challenge for me."

H. Access and position:

One of the students shared the following experience:

"In the field of endodontics, experience plays a crucial role. For example, when managing a tilted tooth, difficulty emerges due to our lack of familiarity with the exact positioning."

3. Errors:

A. Perforation errors:

Perforation, a crucial stage in endodontics, is frequently associated with major challenges. This study revealed the intimidating aspects of this procedure through students' anecdotal experiences. For instance, a student's perforation case led to differing opinions among the faculty. The incident highlighted the prevalent ambiguity in this area, with some professors favoring retention and others advocating for removal. This incident exemplifies the widespread anxiety rooted in the fear of failure from possible procedural mistakes.

B. Ledge formation:

One of the students shared the following experience:

"During my endodontic training, I occasionally struggled with the risk of canal ledging during their preparation, a situation that arises when the file tip unexpectedly snags the canal wall. A particularly challenging case involved a tooth with two separate canals. Despite my significant efforts, I unintentionally ledged one of the canals. Rather than facing criticism, my professor offered serene guidance and support. This incident underscores the importance of maintaining resilience in the face of treatment challenges. With a supportive mentor prioritizing my continuous learning, I managed to overcome the ledging incident without frustration. This experience enabled me to refine my skills and progress as an endodontist and equipped me with the knowledge to avoid similar procedural errors in

the future.”

Theme 4: Students' role

A. Personal relations:

One of the students described the following experience:

“Increasing experiential learning opportunities and upgrading departmental facilities can markedly alleviate anxiety.”

B. Public relations:

One student recounted the following experience:

“The senior students in the department are incredibly supportive, particularly when we're just starting out. Their guidance on procedures like suturing, which we have primarily learned from them, has been invaluable.”

Discussion

This qualitative study aimed to assess the causes of anxiety during the clinical stages of endodontic treatments. Commonly, dental students experience anxiety, which is associated with several factors. First, the technical difficulty and precision required for endodontic procedures can be intimidating to inexperienced students. The complex anatomy, need for magnification, and meticulous instrumentation involved make endodontics one of the more challenging disciplines in dentistry. Second, previous negative experiences shared by other students or professors may contribute to apprehension about the course. Finally, the perception of endodontics as an infamously stressful department could potentially manifest into a self-fulfilling prophecy.¹¹

Another major finding of this study was the impact of playing music in the clinical environment on the students' anxiety levels. The participants observed that the presence of calming music, played by the staff while students were working, contributed to a more serene environment. This aligns with previous research by Ghasemi et al. in 2017, which found that students who listened to music during dental procedures had significantly lower anxiety and depression levels, compared to those who did not. Their study provided experimental evidence that music can reduce stress in dental settings.¹² Therefore, incorporating music into the clinical curriculum can be a simple, low-cost intervention to help mitigate the students' anxiety.

Lack of proper equipment and materials emerged as a major source of student anxiety. Without adequate tools, the students felt confused, overwhelmed, and anxious during treatments, especially in critical situations. While the reasons for such shortages are complex, the psychological impact is clear. Maintaining a well-stocked clinic with essential tools is crucial for alleviating anxiety. Proactive anticipation of repair and replacement needs ensures a smoothly operating clinic, fostering student confidence in the equipment. This highlights the significant impact of equipment availability on clinical experiences.¹³

The teaching methods and student interactions of professors significantly influence the students' anxiety levels in both preclinical and clinical settings. The manner in which the faculty conducts student assessments and provides feedback is especially influential. Some professors reportedly add to the psychological pressure, indicating a need for immediate intervention by the educational department; to tackle this, comprehensive planning for faculty development is necessary. First, establishing clear expectations for constructive communication and respectful critique is essential. Professors should be trained to provide encouraging and supportive feedback, focusing on the students' progress and potential rather than on harsh criticism. Second, the evaluation of examination formats and grading rubrics is necessary to ensure fairness and transparency in assessments.¹⁴ In 2017, Inquimbert et al. identified the primary stressors among dental students as the volume of clinical assignments, the delay in receiving professors' feedback and responses, and issues related to collaboration and computer problems.¹⁵ The findings highlight the need for a dedicated platform for tooth extraction preparation and preclinical improvement, requiring better funding and management.

In this study, “professors” emerged as a significant theme in the realm of education. Based on the students' narratives and the frequency of their statements, we deduced that the central theme of “professors” could be the main finding of our research. It appears to be the key factor in both generating and alleviating students' psychological pressure, stress, and anxiety. Based on the participants' feedback, students who interacted with cooperative and supportive professors during their work and treatment reported significantly lower stress and anxiety levels, compared to those who did not receive such support.

A study by Frese et al. (2018) highlighted that the most significant psychological factor in psycho-social problems is the emotional feedback between dental students and professors. When students perceived their professors as colleagues, it significantly promoted their positive behaviors.¹⁶ Moreover, a study by Muirhead et al. (2008) revealed that students who received greater support and cooperation from their professors and peers, both within and outside the dental school, scored significantly lower on the stress and anxiety scales.¹⁷ These findings can be applied to improve teacher retraining programs and in-service courses for educators and trainers.

Among the other sub-themes of the “professors” theme, fear of reprimand and punishment from professors was a significant contributor to student anxiety. This issue is common in education and contributes to educational stress. In this regard, a study by Chen and et al. (2006), which surveyed 528 students, found that those who faced more

reprimands and punishments exhibited increased psychosocial problems, obsessions, and anxiety.¹⁸ Also, the present study found that the way students are reprimanded significantly affects their anxiety. Public criticism, especially in front of patients, was found to harm the students' confidence and morale. To mitigate this, implementing private feedback sessions to discuss student performance and improvement areas is suggested. The literature suggests constructive methods for student critique. Specifically, Hewson et al. recommend that feedback should be based on specific behaviors rather than personal judgments, be delivered in a supportive tone, and allow students to self-assess before receiving feedback and concentrate on problem-solving.¹⁹

In this study, the fear of severe punishments and repercussions for errors was identified as a significant source of student anxiety. The participants expressed a deep fear of course failure or harsh penalties for errors during endodontic treatments. This perception of a zero-tolerance culture and the immense pressure for perfection resulted in considerable psychological stress. Overall, addressing student anxiety requires a careful revision of the department's policies and attitudes towards error management. Errors should be viewed as learning opportunities rather than punitive measures. Faculty training should focus on supportive responses, discussing mistakes, guiding progress, and promoting growth mindsets. Shifting from punitive grading systems to progress-focused ones, allowing redo opportunities, and adjusting the assessment risks can enhance the students' psychological safety to learn from errors.

In our study, the last topic related to education was student evaluation, which is one of the basic factors in the discussion of stress and anxiety. The mental pressure stemming from grades was found to be a sub-theme. In this regard, a study by Rabiei et al. (2013) found that among 32 stress-inducing factors, the fear of exams and grades caused the highest average stress.²⁰ It appears that enhancing examination conditions and ensuring fairness in test design and grading can significantly contribute to improvements in the educational environment.

Another theme pertained to clinical work and patient-related problems. The patient is generally the primary focus in the clinical work of root canal treatment. The nature of patient interaction, the complexity of their condition, and the ethical dilemmas associated with treatment formed a significant part of this theme. Also, the patient's gender was identified as one of its related factors. Interviews with students revealed that the patient's level of cooperation, which can greatly impact the treatment experience, is a significant concern for students. A study by Harikiran et al. (2012) found that 70% of participants identified patient non-cooperation as a significant stressor. The study suggested better planning and practical steps to teach

coping mechanisms and patient management under various conditions.²¹

A unique finding of this study was the students' anxiety due to concerns about patient outcomes, termed as "stress of conscience". Novice students, despite correctly completing the procedures, were uncertain about the quality of their root canal treatments. They were concerned about potential complications or poor prognoses for their patients. This highlights their empathy, but also indicates a need for better support in building their clinical confidence.²² Overall, to address student anxiety, the following recommendations are proposed:

- Conducting comprehensive procedure debriefs with supervisors to highlight successes and areas for improvement, promoting constructive evaluation.
- Facilitating peer chart reviews to encourage collaborative case discussions and normalize occasional uncertainties.
- Adjusting the early curriculum to balance high expectations with psychological safety as skills develop.
- Incorporating concrete methods, such as procedural checklists, to track progress over time and build self-efficacy.
- Ensuring smooth transitions to licensed dentists for complex cases and reassuring students that their patients will receive proper care.

A significant sub-theme related to the patients involved the clinical stages of root canal treatment. This encompassed the various stages of clinical work on a patient, where students frequently faced challenges. The stress and anxiety during these stages not only impact their current work, but also have potential implications for their future careers. Students play a significant role both within and outside the faculty. We discussed the quantitative aspect of their experiences, particularly the frequency of their concerns about the various stages of root canal treatment. These stages, listed in order of the most frequently mentioned and thus the most anxiety-inducing, are as follows: access cavity preparation, filling the root canal (obturation), finding the entrance opening of the canal, access and position, closing the blade, determining the working length, injection and anesthesia of the patient, and preparation of curved canals.

With regard to the difficulty of the stages of root canal treatment, in a study by Garcia et al. (2016), it was reported that 58.6% of dental students identified the ergonomic position during work as a crucial factor in preventing future pain, problems, and occupational diseases. Additionally, 62.1% of the students agreed that these issues depend on the type of treatment and the area of the mouth being treated. The primary causes of these problems were identified as lack of attention, inadequate practice, forgetfulness, and poor visualization of the work environment.²³ In another study by Davey et al., senior

students exhibited more self-confidence and comfort during root canal treatment compared to their junior counterparts, which was attributed to experience

In a study by Grock. C.H. et al. in 2018, among the 23 students studied, 57.6% did not feel anxious during local anesthesia, 57.6% did not feel anxious during occlusion, and 72.7% did not feel anxious during coronal flooding. Meanwhile, 26.1% of all students were considered to be very anxious.²⁴ Moreover, in a study by Alrahabi et al. (2017), after examining 280 patients undergoing root canal therapy, 31.1% of the treatments were found to have errors.²⁵ Additionally, in a study by Haji-Hosni et al. (2015), after reviewing 1,335 cases of root canal treatment, the most common error was a void in the maxillary incisors (50.9%, followed by apical perforation (18.2%).²⁶ Also, in a study by Razaviyan et al. (2019), after reviewing root canal treatments performed at the Faculty of Dentistry of Isfahan University of Medical Sciences, 32.5% of the treatments had a clinical error. Of these errors, 43.9% were related to overfilling, while the least common error (0.37%) was related to furcal perforation. Furthermore, the prevalence of errors was reported in 41.6% of students.²⁷

In a study by Davey et al. (2014), senior dental students (n=208) exhibited greater self-confidence and comfort during root canal treatment compared to junior students; this difference was attributed to the seniors' greater experience. The study suggested that increasing preclinical hours and providing more training could better prepare students for these conditions.²⁸

Overall, the qualitative analysis in this study highlighted the main causes of anxiety among dental students, as perceived by the students themselves. The findings suggest

that enhanced training, preparation, and support could potentially alleviate student anxiety, thereby increasing their confidence and comfort during complex endodontic procedures.

Limitations:

The study had some limitations, such as the potential reluctance of participants to be fully transparent due to privacy issues, as well as the limited generalization of qualitative methods. Despite these limitations, the study provided valuable insights that can serve as a solid foundation for future research and interventions. These insights aim to support the dental students' mental health and promote psychologically safe, yet rigorous training programs.

Conclusion

This study revealed the pervasive and multifaceted nature of anxiety among dental students stemming from various factors, such as academic culture, curriculum, interactions with the faculty, and clinic facilities. While some students showed resilience, others resorted to unhealthy coping mechanisms that could hinder their learning. The interconnectedness of these factors underscores the need for a holistic approach to enhance education and foster competence and well-being. The study also emphasized the importance of examining the academic culture in conjunction with pedagogy.

Conflict of Interest

The authors declare that they have no conflict of interest.

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