

Factors contributing to prosthodontic exam anxiety in undergraduate dental students

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Introduction: Prosthodontics is a challenging subject for dental students. This study explores the incidence of exam anxiety among prosthodontics students and the variables that moderate it.

Methods: A cross-sectional, self-administered questionnaire was distributed to fourth-year undergraduate students immediately before examinations, with a 77% response rate (55.7% female, 44.3% male).

Results: A lack of time to prepare before exams and an inability to recall before exams were the main factors affected by gender. In addition, 63.5% of male students agreed that social media and mobile phones are distractions, while 81.8% of female students disagreed ($P < 0.001$). Within the removable prosthodontic courses (preclinical or clinical), 61.0% of students agreed that a lack of time to prepare before exams is an issue with the clinical course, while 58.5% of the students moderately agreed it is an issue with the preclinical course ($P = 0.044$). A lack of time to prepare, fear of failure, and the time of the examination were of greater concern with regard to quizzes than with mid-term examinations.

Conclusion: This study highlights the presence of exam anxiety among prosthodontics students, as well as how that anxiety is influenced by gender, clinical courses, and the type of exam. This study suggests that students should be taught strategies to improve their study, life and time-management skills in order to overcome exam anxiety. This study additionally suggests that improving success rates in dental school requires placing an increased focus in the curriculum on test competency and examination patterns.

Keywords: anxiety, dental students, examination, prosthodontics, Saudi Arabia, undergraduate

Introduction

Anxiety among dental students is an issue of major concern for dental educators. The dental school curriculum and atmosphere are known to be highly challenging, with demanding learning conditions.¹

This is primarily due to the early clinical exposure and the style of academic training that many programs implement, with rigorous academic proficiencies required during a thorough 5-year program.²⁻⁴

The highest pressure-provoking influences have been identified as examinations and grades, workload, patient care, and graduation requirements.^{5,6} Some dental students stated that they felt unsettled by their experience in dental school, to the point that their physical and mental wellbeing was adversely affected.⁷

A recent study by Turner et al⁸ showed that fifth-year dental students reported greater anxiety than first-year dental students. The study also found non-course-related sources of stress, including problems with transportation to King Abdulaziz University

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faculty of dentistry (KAUFD) and dental hospital, family tasks, money problems, social issues and preparation for examinations might contribute to the issue.

Although there is a body of research into the reasons behind stress-related issues among dental students, there has been relatively little scholarly attention paid to certain subjects, such as removable prosthodontics, which impose enormous demands on students during their undergraduate dental degree study.

Additionally, and most significantly, a study by Kay and Lowe⁹ determined that teaching stress-management skills and individual alertness ought to be included in the dental curriculum. A tense educational setting can be evaluated by an individual as either “challenging” or “threatening.” Being presented with challenges can enhance wisdom capability and increase a student’s capacity to study. However, if schooling is perceived as a threat, it can elicit feelings of weakness that will affect the whole experience.¹⁰

Preclinical prosthodontics in the undergraduate dental curriculum aims to convey hypothetical information and enable students to learn the advanced skills involved in complete denture fabrication.^{11,12}

Students likewise experience concern during the shift from preclinical to clinical years. Moreover, it has been reported that students are sometimes unable to recall basic scientific concepts related to clinical fields.^{12–14}

Psychological health enables students to recognize their capacities and to maintain a semblance of control over the ordinary pressures of learning. “Exam apprehension” refers to a profound phase of fright and apprehension before, during or after assessment settings, mostly in an academic environment.¹⁵

It has been reported that 20%–35% of all students in academia experience exam anxiety in some intensity, with up to 40% affected in the younger groups.^{16,17} Recognizing issues hindering students’ education has been a key focus of academic research over the years.¹⁸

Prosthodontics as a discipline occupies a major portion of the dental school curriculum, and it is generally accepted that prescribing, designing and fabricating dental prostheses are complex and difficult processes. In addition, prosthodontics is a challenging and demanding subject that requires a high level of skill, preparation and planning.¹⁹

The following hypotheses will be tested:

1. Gender has a significant impact on test anxiety.
2. Clinical courses have a significant impact on test anxiety.
3. The type of exam has a significant impact on test anxiety.

Methods

A cross-sectional study was conducted among fourth year dental students from September 2017 until February 2018

after obtaining ethical permission from the research ethical committee in King Abdulaziz University Dental Hospital (REC 050-05-17). The purpose of the study was clarified to the subjects. The students were informed that their choice to contribute in the study was voluntary and it would not affect other parts of their academic studies. Oral informed consent was obtained from them after displaying the ethical approval letter on the screen in each classroom (verbal informed consent was acceptable and approved by the Research Ethical Committee in this situation because of the limited time before examination).

A pilot study was conducted among ten fifth-year students who were not part of the core study, in order to control the clarity of the statements and to test the feasibility of the survey and the time needed. Based on the results of the pilot study, the necessary modifications were made by reducing the number of statements and combining the related ones. Finally, 15 statements were selected, based on a review of relevant literature and the perspectives of the researchers, who developed the study idea and design from their own decade-long involvement with the dental students.

Self-administered questionnaires were distributed to students present in the class at the time of distribution, which was either a quiz time or a mid-term exam period in pre-clinical and clinical courses. Respondents were screened for physical and psychological issues that might have hindered participation, and had to be willing to participate in the study immediately before the assessment of the prosthodontics subject selected. Verbal informed consent was obtained from all the participants before administering the questionnaire. This study utilized a four-point Likert scale (extremely or always true, highly or usually true, moderately or sometimes true, not at all or never) because of its reasonableness for the statements shown in Table 1. The validated questionnaire, which sought data about study style, examination time, material load, psychological problems, parental factors and social media distractions, was used as a tool of evaluation, and took 5–6 minutes to complete.

The respondents were asked to not write their names or any identification numbers on the questionnaire, and full confidentiality of information was ensured. A workflow is presented in Figure 1.

Statistical methodology

This study was analyzed using IBM SPSS version 23 (IBM® Corp., Armonk, NY, USA). A simple descriptive statistic was used to define the characteristics of the study variables through a form of counts and percentages for the categorical variables. To establish a relationship between categorical variables, this

study used the chi-squared test. Lastly, a conventional P -value <0.05 was the criteria to reject the null hypothesis. A sample size of 350 was required to get the power of 90%.

Results

Self-administered questionnaires were distributed among fourth-year undergraduate dental students. A total of 640 questionnaires were distributed for both preclinical and clinical courses, in both quizzes and mid-terms. Of that

number, 492 were received back, for a total response rate of 77% (55.7% of female students and 44.3% of male students) (Table 2). The total number of fourth-year undergraduate dental students in the academic year included 84 female students and 76 male students. The dental students were between 21 and 23 years old.

Course type

The courses involved in the study were the preclinical and clinical removable prosthodontics which are required for fourth-year level. The response rate was 51.2% for the pre-clinical course and 48.8% for the clinical course. Regarding the questionnaire's focus on exam type (quiz or mid-term exam), there was a response rate of 56.7% for the quiz and 43.3% for the mid-term exam (Table 2).

Table 1 Research for exam assessment

Statement
Too much (excessive) course load
Lack of time to revise before exam
Lack of time management
Parental expectation
Unable to recall and review
Fear of failure
Lack of English language proficiency (skills)
Lack of knowledge about exam pattern (lack of guidance)
Studying all night before exam
Distractions in the form of mobiles, internet
Dietary habits (unhealthy diet)
Peer pressure (pressure from A grade students)
Memorizing the text without understanding
Finding Prosthodontic vocabulary difficult
Time of the exam (it is either early morning or late in afternoon)

Table 2 Characteristics of the 492 study respondents

Variable		No.	%
Gender	Male	218	44.3
	Female	274	55.7
Course	Preclinical	252	51.2
	Clinical	240	48.8
Exam type	Quiz	279	56.7
	Mid-term	213	43.3
Total		492	100

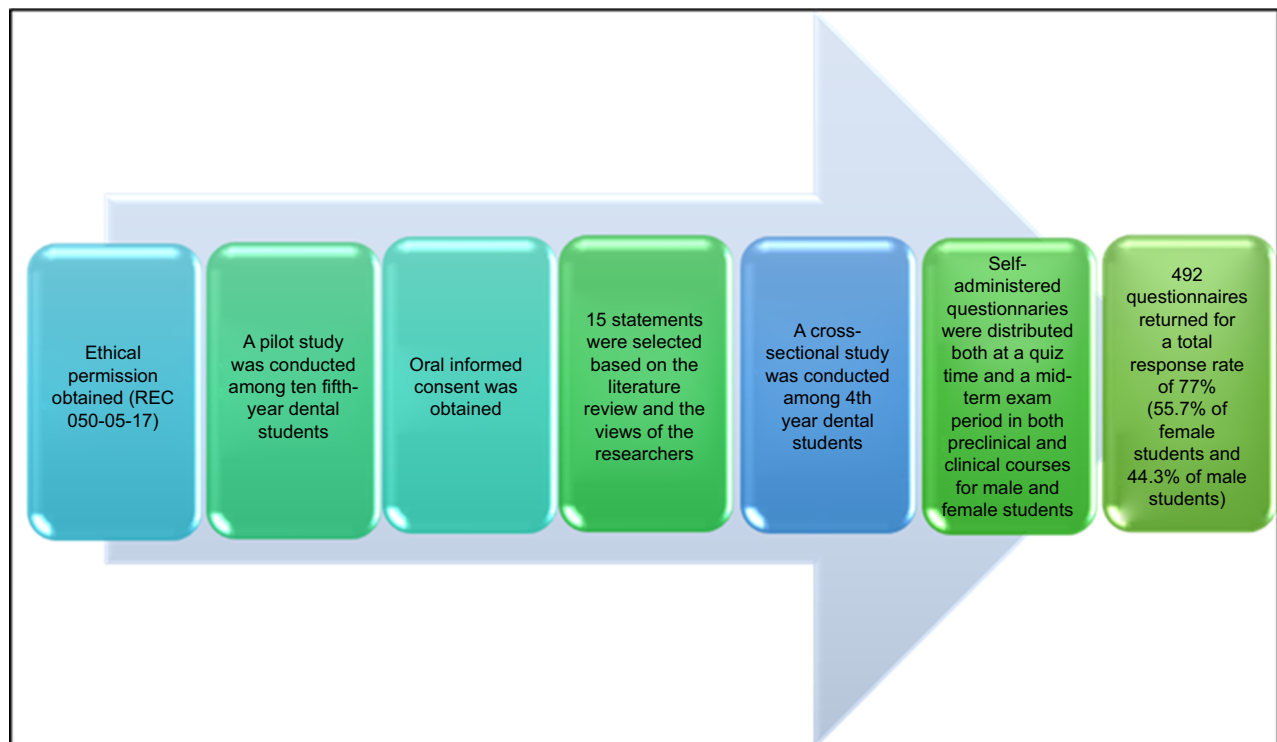


Figure 1 A workflow of the study.

Table 3 Relationship between different factors and gender

Variables		Total	Gender		P-value
			Male	Female	
Total		492	274 (55.7%)	218 (44.3%)	–
Lack of time to prepare before exam	Disagree	41	19 (46.3%)	22 (53.7%)	0.011 ^a
	Moderate	188	96 (51.1%)	92 (48.9%)	
	Usually	161	88 (54.7%)	73 (45.3%)	
	Agree	102	71 (69.6%)	31 (30.4%)	
Lack of English language proficiency (skills)	Disagree	206	133 (64.6%)	73 (35.4%)	<0.001 ^a
	Moderate	213	115 (54.0%)	98 (46.0%)	
	Usually	60	22 (36.7%)	38 (63.3%)	
	Agree	13	4 (30.8%)	9 (69.2%)	
Lack of knowledge about exam patterns (lack of guidance)	Disagree	173	115 (66.5%)	58 (33.5%)	<0.001 ^a
	Moderate	196	106 (54.1%)	90 (45.9%)	
	Usually	100	38 (38.0%)	62 (62.0%)	
	Agree	23	15 (65.2%)	8 (34.8%)	
Distractions in the form of mobiles, internet, etc.	Disagree	44	36 (81.8%)	8 (18.2%)	<0.001 ^a
	Moderate	191	117 (61.3%)	74 (38.7%)	
	Usually	183	94 (51.4%)	89 (48.6%)	
	Agree	74	27 (36.5%)	47 (63.5%)	
Memorizing the text without understanding	Disagree	68	48 (70.6%)	20 (29.4%)	0.002 ^a
	Moderate	267	156 (58.4%)	111 (41.6%)	
	Usually	124	57 (46.0%)	67 (54.0%)	
	Agree	33	13 (39.4%)	20 (60.6%)	

Notes: ^aSignificant using chi-squared test @<0.05 level.

Gender was identified as significantly causing factors in some of the tested exam-related features (Table 3). Details of the factors affecting students according to the assessment type are shown in Table 3.

Examination-related factors

When the examination period comes, 70% of the female students agreed that a lack of time to prepare before exams was an anxiety-provoking factor, while 53.7% of male students disagreed (P -value = 0.011) (Table 3). In addition, 74.0% of female students were unable to recall information before an exam, while 52.8% of male students disagreed that this was a concern for them (P =0.035). In terms of university learning aspects, 66.5% of female students disagreed that a lack of knowledge about exam patterns (lack of guidance) was an issue in exam anxiety. However, 62.0% of male students agreed that a lack of knowledge about exam patterns (lack of guidance) was usually an anxiety factor for exams (P <0.001) (Table 3). Regarding the studying aspect, 70.6% of female students disagreed that memorizing the text without understanding contributes to exam anxiety, whereas 60.6% of male students agreed (P =0.002) (Table 3).

Learning environment and technology

A total of 63.5% of the male students agreed that mobile phones, internet and other forms of social media were distractions,

while 81.8% of female students disagreed (P <0.001) (Table 3).

English proficiency

English is the language used to teach and test in the faculty of dentistry at KAUDH during the 6 years of study. However, 64.6% of female students disagreed that a lack of English language proficiency (skills) may be an examination anxiety factor, whereas 69.2% of male students indicated the opposite (P =0.001) (Table 3). In addition, 70.0% of the students responded that a lack of English language proficiency (skills) is usually a concern in the preclinical course. On the other hand, 52.9% of the students disagreed that it was an issue with the clinical course (P =0.018).

Regarding exam type, some factors were identified as affecting students in either quiz or mid-term exam. The results indicated that 68.6% of the students felt there was a lack of time to prepare before the quiz. By contrast, 53.7% of the students did not identify a lack of time to prepare before exam as an issue with the mid-term exam (P =0.030) (Table 4).

The timing of the exam, either early morning or late in the afternoon, was identified as an important factor in the case of the quiz (70.3%), while the opposite was found with the mid-term exam (57.6%) (P =0.001). Similarly, preparation for exams and time given to prepare before exams were found to

be related to the quiz (68.6%), while not a concern (53.7%) with the mid-term exam ($P=0.030$) (Table 4).

Psychological aspect

The students also identified fear of failure as a concern, with 65.2% of the students seeing fear of failure in quizzes as an anxiety-provoking factor. Interestingly, 54.2% of the students expressed a more moderate fear of failure regarding the mid-term ($P=0.004$) (Table 4).

When a comparison was conducted between course types (preclinical and clinical removable prosthodontics), six elements emerged as factors relevant to anxiety among undergraduate fourth-year dental students. Regarding the preclinical prosthodontic removable course, 58.5% of the students moderately agreed that a lack of time to prepare before exams was a relevant issue. Meanwhile, 61.0% disagreed that it was an issue with the clinical prosthodontic removable course ($P=0.044$) (Figure 2).

From the learning material perspective, students expressed both disagreement and moderate agreement (56.5% and 56.4%, respectively) that the course load was excessive in the preclinical prosthodontic removable course. By comparison, 67.3% of the students felt that the course load was excessive in the clinical prosthodontic removable course ($P=0.010$).

In terms of the study materials traditionally provided to the students, 59.0% of the students disagreed that there was a lack of knowledge about exam patterns or a lack of guidance in the preclinical course, while 73.9% of the students expressed the opposite view about the clinical course ($P=0.003$) (Figure 3).

Lifestyle issues, dietary habits

The students disorganized life style and unhealthy diets were found to be related to both the clinical course (59.3% agreement) and preclinical (58.7% moderate agreement) ($P=0.037$).

Table 4 Factors affecting students concerns in preclinical and clinical course examinations according to assessment type

Variables		Total	Type of exam		P-value
			Quiz	Mid-term	
Total		492	279 (56.7%)	213 (43.3%)	-
Lack of time to prepare before exam	Disagree	41	19 (46.3%)	22 (53.7%)	0.030 ^a
	Moderate	188	99 (52.7%)	89 (47.3%)	
	Usually	161	91 (56.5%)	70 (43.5%)	
	Agree	102	70 (68.6%)	32 (31.4%)	
Fear of failure	Disagree	109	66 (60.6%)	43 (39.4%)	0.004 ^a
	Moderate	168	77 (45.8%)	91 (54.2%)	
	Usually	138	90 (65.2%)	48 (34.8%)	
	Agree	77	46 (59.7%)	31 (40.3%)	
Time of the exam (early morning or late in afternoon)	Disagree	92	39 (42.4%)	53 (57.6%)	0.001 ^a
	Moderate	221	121 (54.8%)	100 (45.2%)	
	Usually	105	67 (63.8%)	38 (36.2%)	
	Agree	74	52 (70.3%)	22 (29.7%)	

Notes: ^asignificant using chi-squared test <0.05 level.

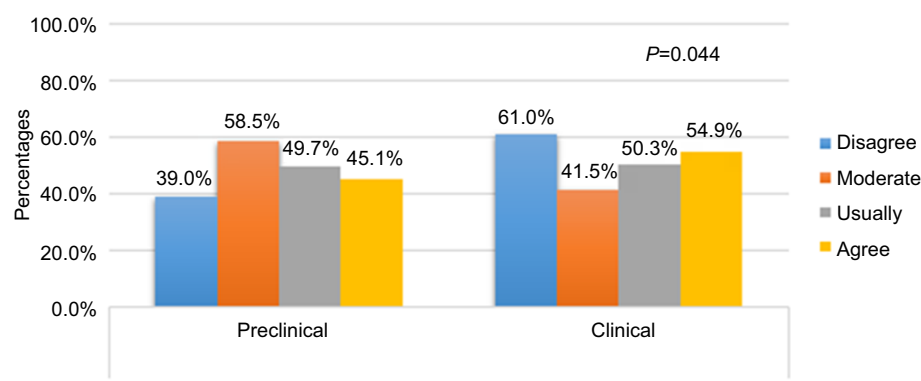


Figure 2 Graph showing the percentages of students' responses to lack of time to revise before the exam in both the clinical and preclinical courses, $P=0.044$.

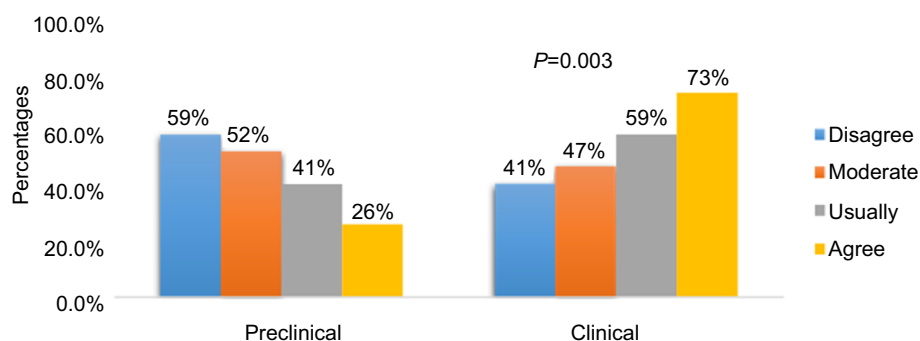


Figure 3 Graph showing the percentages of students' responses to lack of knowledge about exam pattern (lack of guidance) in both the clinical and preclinical courses, $P=0.003$.

Discussion

This study is, to the best of the authors' knowledge, the first to explore aspects related specifically to prosthodontic examination apprehension, particularly regarding study style, examination time, material load, psychological problems, parental factors, and social media distractions.

The fourth-year dental students in this study are between 21 and 23 years old, which is a critical period in the life of a dental student.¹⁶ Test anxiety is negatively associated with academic performance.^{17–19}

A study by Al-Samadani and Al-Dharab reported that fourth-year dental students expressed a fear of failure and examination grading.¹ In this study, there was a more specific focus on exploring anxiety factors that students face in regard to prosthodontics examinations, in particular among fourth-year undergraduate dental students, including both male and female students. Variables like gender, course type (preclinical, clinical), and exam type (quiz and mid-term) contributed to the list of major anxiety issues among the students.

A major contribution was found to derive from quiz-related anxiety factors. Lifestyle (inadequate rest and time management), student psychology, and timing of the quiz were found to be causative factors for students' anxiety. These results disagree with other studies that have found that psychological factors are the only major cause of exam anxiety.²⁰

Moreover, it was found that the quiz-related anxiety response, reaching up to 70.0%, was considered dependent on the timing of the examination. The anxiety was related to a psychological fear of failure, time management, inadequate rest and exam timing. Psychological health enables students to recognize their capacities, and a certain degree of fear is required to achieve academic success,¹⁵ described as an optimal level of anxiety,¹⁷ without leading to physical and mental health problems.²¹

A major contributor to anxiety-related issues among dental students can similarly be a lack of proper guidance from their professors and fellow students on preparing for a particular topic. It was found that the majority of the male students, approximately 62%, experienced a lack of guidance in preparing for examinations, which could also be a major trigger for their anxiety during examinations or other interviews.

Strategic studying and time management issues revealed significant gender differences. Female dental students reported significantly more than male students that they were unable to get adequate rest or to recall and prepare the study materials effectively prior to the exam. Similar results have recently been reported in relation to fifth-year female medical students.²²

On the other hand, male students were more concerned about other issues, such as a lack of guidance from the faculty, distraction from mobile phones, English skill proficiency, and having to memorize text without understanding it. These were reported to be significant factors in connection to academic performance.^{20–23}

Additionally, certain factors were identified by the students as hindrances while preparing for their exams. Distractions including mobile phones and browsing the internet were found to be major hindrances. Among the male students, 63.5% reported being distracted from their studies by their use of electronic devices.

Regarding the removable prosthodontic course type, in terms of the clinical course, anxiety among students was mostly considered to be due to excessive course load, as cited by 67.3% of the dental students. Analysis of the data found that a lack of proficiency in the English language was the main contributor (70%) to the development of preclinical anxiety issues, whereas in the case of clinical anxiety factors,

73.9% of respondents attributed these to a lack of guidance for students during exams.

Excessive course load may affect students' academic learning process and is a factor that should be considered in the design and evaluation of curricula.²⁴ This finding agrees with previous studies in which course load was identified as an anxiety-provoking factor.²⁰

It is recommended that in order to help students manage stress and thereby improve the dental learning process, the teaching of appropriate skills and individual alertness should be included in the undergraduate dental curriculum.^{9,18}

Understanding students' needs and worries is essential for the development and improvement of curriculum design and evaluation of the removable prosthodontic course.²⁴

This study highlighted that test competency, rather than the test itself, might be an underlying factor in increasing students' anxiety. Wise and DeMars²⁵ reported that there was no significant discriminator among low and high academic achievers in relation to test anxiety. Instead, test competency was the major determinant.

Test competence, defined as "a student's ability to manage and cope with the amount of study material for examinations and/or tests," was found to be potentially the single most important factor in distinguishing students with high and low academic performance.²⁶

Test anxiety, meanwhile, is defined as "responses like worry, depression, nervousness, task irrelevant cognitions, etc. to a class of stimuli arising from an individual's experience of assessment or testing."^{25,27}

It was reported recently by a group of researchers²⁸ that test competency is associated with young students specifically in the didactic years of their study, like the junior fourth-year dental undergraduate students explored in this study. Therefore, it is important for students to develop study strategies that will enable them to learn more effectively and better understand knowledge. In addition, students should be enabled to refresh their mind and to enhance their overall performance.²⁹

Furthermore, dietary factors contribute to anxiety among students. In this study, the consumption of an unhealthy diet is cited by 59.3% of students as contributing to a rise in pre-clinical anxiety. Unhealthy food habits among students may cause them to become obese, which in turn will make them lethargic, with higher associated risk of high blood sugar, high blood pressure, etc. Previous studies have reported that female students in particular are more affected by this issue.^{20,27}

A fear of failure is another major factor contributing to increased anxiety among the students, as it may not only

hamper their mental growth as a student but also lead to the serious consequence of suicide, which is not only a loss for the family but also for the future development of society. This was found to be a major factor in relation to quizzes, but the finding of a correlation with female students disagrees with other reported studies.^{20,27,30}

Not all of these factors represent stress-producing circumstances in the environment of dental students. However, it is very important to understand them and to recognize their potential implications.

Regarding the limitations of this study, although the authors attempted to cover all the important aspects and conditions that provoke anxiety during studying prosthodontics, it is possible that some aspects may have been overlooked. As a Middle Eastern country, the cultural thoughts nowadays have changed towards adding more positive attitude to the capacity of females' academic achievement opposed to their male peers. And this was reflected in this study. However, this is a research area that needs further investigation and also to compare the academic performance of the students to their final grades. Moreover, due to the use of self-reporting as a study tool, the authors cannot rule out the unfairness in the students responses to the questionnaire's questions.

Conclusion

This study highlighted the presence of prosthodontics exam anxiety aspects among fourth-year undergraduate dental students studying at KAUFU. To maximize success in dental undergraduate education, several areas could be improved as follows:

1. Courses should focus on test competency, curricula and examination patterns to overcome students' anxiety.
2. Make counseling services available at dental schools in order to enable students to deal with the issues causing their anxiety and thereby to improve their academic performance.
3. Train dental undergraduate students on strategies to improve their study, life and time-management skills to better deal with and overcome exam anxiety.
4. Additional studies are required to monitor and correlate the effects of exam anxiety on students' grades and academic performance through different undergraduate educational levels.

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Author contributions

MRA and DMB researched literature and conceived the study. MRA was involved in protocol development, gaining ethical approval, literature review writing and data analysis. DMB developed the first draft of statements and wrote the first draft of the manuscript. Both authors contributed toward data analysis, drafting and revising the paper, gave final approval of the version to be published and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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