

Original Article



# Evaluation of stress in the dental environment and its association with educational self-efficacy in dental students

Tayebeh Ghasemi<sup>1</sup>, Amir Hossein Khazaei<sup>2</sup>, Elnaz Irandegani<sup>3</sup>, Sadra Amirpour Haradasht<sup>1</sup>

<sup>1</sup>Department of Oral and Maxillofacial Surgery, School of Dentistry, Zahedan University of Medical Sciences, Zahedan, Iran

<sup>2</sup>Oral and Dental Disease Research Center, Faculty of Dentistry, Zahedan University of Medical Sciences, Zahedan, Iran

<sup>3</sup>School of Dentistry, Zahedan University of Medical Sciences, Zahedan, Iran

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## Abstract

**Background:** Dental students face significant stress due to the demands of their education, which may impact their academic performance. This study aims to examine the relationship between stress in the dental environment and academic self-efficacy among dental student.

**Methods:** The present research was a descriptive-analytical cross-sectional study that was performed on 225 third- to sixth-year dentistry students of Zahedan University of Medical Sciences who were studying during the academic year 2021-2022. The data collection method was three questionnaires: demographic questionnaire, modified dental environment stress questionnaire, and McElroy educational self-efficacy questionnaire. Pearson correlation coefficient, linear regression, Independent Samples T, least significant difference, analysis of variance (ANOVA), and Chi-square tests were used to analyze the collected data. Shapiro-Wilk test was used to evaluate the normality of the data.

**Results:** The overall average stress scores in the dimensions of clinical training, university factors, personal beliefs, patient care, and academic efficiency were  $3.03 \pm 1.09$ ,  $3.57 \pm 0.77$ ,  $3.52 \pm 0.82$ ,  $2.67 \pm 1.12$  and  $2.58 \pm 1.23$ , respectively. The stress of the dental setting showed a significant relationship with the variables of gender, academic semester, and academic self-efficacy ( $P < 0.05$ ). The stress score was higher in females than in males. With an increase in academic semester and educational self-efficacy, the stress level was significantly higher.

**Conclusion:** The present study shows that students with higher educational self-efficacy, experience more stress. Therefore, it seems that they endure a large amount of stress in the dental environment to achieve higher self-efficacy and are unable to deal with it properly.

## Introduction

Stress is defined as the body's response to any perceived demand, change, or threat.<sup>1</sup> Dental training is associated with high levels of stress.<sup>2</sup> During this period, students are exposed to various stress-inducing factors while learning theoretical knowledge, clinical skills, and interpersonal relationships.<sup>3</sup> Stress among dental students has different causes in various parts of the world.<sup>4,5</sup> In general, study results indicate that the most significant stress-inducing factors (all stressors that are transformed into transformative stressors) are associated with exams and grades, clinical procedures and patient management, performance of clinical tasks, student-faculty interactions, faculty-student interactions such as coldness, indifference, lack of encouragement, gender discrimination, excessive criticism and expectations from students, student interaction with staff and other students, dealing with the expectations of family and friends, responsibility for

patient care, managing difficult patients, concern about acquiring infectious diseases in clinical settings, workload, and lack of free time.<sup>6-10</sup>

Understanding the stress-inducing factors in educational environments will help us find effective ways to cope with stress and its consequences. Strengthening students' physical, mental, and social resources to deal with these stressors will improve their performance in clinical settings, patient communication, and learning new and current topics, thereby preventing waste of time and energy for both students and faculty. The most damaging effect of stress is the disruption and impairment of effective thinking and learning. In addition to the aforementioned consequences, students exposed to stress may exhibit maladaptive behaviors and reactions.<sup>11,12</sup>

A study by Sezer et al with dental students showed that the quality of life of these students decreases significantly due to the strain on the musculoskeletal system and the

\*Corresponding author: Sadra Amirpour Haradasht, Email: [sadrahadasht@gmail.com](mailto:sadrahadasht@gmail.com)

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workload.<sup>13</sup> Moreover, in a study by Gerreth et al students who were supposed to gain their first clinical experience with pediatric patients as part of the dental curriculum were asked to complete a questionnaire about their stress level. The results of this study showed that the stress level of these students is relatively high.<sup>14</sup> A study by Mocny-Pachońska et al in 2020 aimed to compare stress levels among dental students in different years of study. According to this study, stress levels drop as students advance through the year.<sup>15</sup>

One of the methods for assessing students' confidence in performing clinical skills is Bandura's self-efficacy theory, which defines self-efficacy as an individual's belief in their ability to perform desired tasks.<sup>16,17</sup> Self-efficacy in educational settings is of particular importance as it contributes to appropriate performance improvement and relates to students' beliefs about their ability to perform tasks in educational environments. Students who believe they can achieve their goals demonstrate more motivation and perseverance in fulfilling tasks and responsibilities.<sup>18</sup> Understanding how stressors in dental education affect students' self-efficacy is essential. Self-efficacy, or confidence in academic success, influences how students handle stress and perform. Stress can impair self-efficacy, leading to reduced academic and clinical performance. Improving self-efficacy in stressful contexts can enhance coping and outcomes. Exploring this relationship is important for developing targeted interventions to boost students' resilience and performance by managing stress more effectively.

The purpose of this study was to determine the level of stress in the dental environment and examine its association with academic self-efficacy among dental students at Zahedan University of Medical Sciences in the 2021-2022 academic year.

## Materials and Methods

### Design and setting

The present study was cross-sectional descriptive-analytical research that was carried out in the 2021-2022 academic year, adhering to ethical considerations (IR.ZAUMS.REC.1401.162). Inclusion criteria for the study were completion of basic science courses (entry into clinical courses), no history of guest or transfer student status, no history of academic leave for at least one academic semester, not being in the 12th semester (as these individuals might experience stress from specialization exam and other issues such as employment and marriage that could distort the study results), filling out a consent form, not being under the care of a psychiatrist or counselor, and not be a drug addict. The exclusion criteria were an incomplete questionnaire.

### Participants and sampling

This study involved 225 dental students from Zahedan University of Medical Sciences enrolled in the 2021-2022

academic year. Given the limited study population, all dental students from the fifth to eleventh semesters of Zahedan Dental School who met the inclusion criteria for the study were included.

### Data collection methods

Three questionnaires were utilized to collect data. The first questionnaire contained demographic information, including gender (male-female), marital status (married-single), accommodation (dormitory-with parents-independent house), academic semester (5-6-7-8-9-10-11), and average score ( $\leq 16$  -  $> 16$ ). The second questionnaire pertained to dental environment stress, while the third questionnaire focused on students' academic self-efficacy. The Modified Dental Environment Stress Questionnaire (MDESQ) is a tool specifically designed to assess stressors in dental training. It covers various stress dimensions, including academic workload, clinical responsibilities, and interpersonal relationships. The MDESQ, consisting of 32 items rated on a five-point Likert scale (never, low, moderate, high, severe), with each item rated 1 to 4, has been adapted to address the unique challenges of dental students and has shown reliability and validity in capturing stress experiences in dental education. This questionnaire has been used in other similar studies.<sup>5,19</sup> It includes clinical education, university factors, personal beliefs, patient care, and academic efficiency dimensions. In the MDESQ, "personal beliefs" refers to an individual's attitudes, values, or perceptions about dental care. This can include their personal views on the importance of oral health, their feelings about dental procedures, or their general attitude toward visiting the dentist. These beliefs can influence how they experience stress in a dental environment. The reliability and validity of this questionnaire were confirmed by Ramazani and Nazari,<sup>20</sup> who reported content validity scores of over 0.62 and Cronbach's alpha reliability coefficients of 84% for academic efficiency, 78% for patient care, 82% for personal beliefs, 79% for university factors, 81% for clinical education, and 77% for other aspects. Nevertheless, in this study, the reliability of this questionnaire was re-examined with the participation of 30 students who did not participate in the study but had almost similar conditions to the study participants, and a Cronbach's alpha coefficient of 72% was confirmed. The standardized academic self-efficacy questionnaire constructed by McElroy was used to measure students' academic self-efficacy.<sup>21</sup> The McElroy Educational Self-Efficacy Questionnaire (MEESQ) evaluates students' confidence in their academic abilities. It assesses various aspects of self-efficacy, including the capacity to manage academic tasks and overcome challenges. Validated across different educational contexts, the MEESQ reliably predicts academic performance and stress responses. The questionnaire comprises ten items, each rated on a seven-point scale, with total scores ranging from 10 to 70. Higher

scores reflect greater academic self-efficacy. The reliability and validity of this questionnaire in Iran were confirmed in the study by Mirzaei-Alavijeh et al, with a Cronbach's alpha reliability coefficient of 75%.<sup>22</sup> Before completing the questionnaires, the students were informed about the goals and significance of the study and took part in the study with informed consent. Students were assured that their information would be treated confidentially and would only be used for study reporting. If a student had any questions about filling out the questionnaire or answering any ambiguities, they were provided with explanations. The questionnaires were distributed to students by researchers.

### Statistical analysis

The data were coded and analyzed using SPSS 19 software at a significance level of 5%. Data analysis employed statistical tests including Pearson correlation coefficient, linear regression, independent t-test, minimum significant difference, analysis of variance, and chi-square. Data normality was confirmed using the Shapiro-Wilk test. (The study employed several statistical methods: 1. Pearson correlation coefficient: Measures the strength and direction of linear relationships between two continuous variables. 2. Linear regression: Models the relationship between a dependent variable and multiple independent variables for prediction. 3. Independent t-test: Compares means between two independent groups to detect significant differences. 4. Minimum significant difference: Identifies the smallest meaningful difference between group means. 5. Analysis of variance (ANOVA): Evaluates differences in means across multiple groups to determine significant variations. 6. Chi-square test: Assesses associations between categorical variables by comparing observed versus expected frequencies. 7. Shapiro-wilk test: Checks data normality to validate the use of parametric tests.)

### Results

The mean age of the students was  $22.96 \pm 9.1$  years. In terms of gender distribution, 110 students (48.9%) were male and 115 students (51.1%) were female. Regarding accommodation, 64 students (28.4%) lived in dormitories, 47 students (20.9%) lived in independent houses and 114 students (50.7%) lived with their parents. In terms of marital status, 198 students (88%) were single and 27 students (12%) were married. In terms of average score, 156 students (69.3%) had an average of 16 or lower, while the remaining students had an average of over 16. The reason for considering 16 was that if a student retakes a course in which they previously failed, and subsequently scores 16 or more, their failing score will be removed, and it will not be factored into their semester or overall average calculation (as per the educational regulations of the general dentistry doctoral program, 2017, p. 17, note 3).

A total of 38 participants were from semester 5, 51

from semester 6, 25 from semester 7, 42 from semester 8, 22 from semester 9, 32 from semester 10, and 13 from semester 11.

Concerning stress in the dental environment, the present study examined stress levels in the dimensions of clinical education, university factors, personal beliefs, patient care, and academic efficiency by the academic semester. The overall mean stress scores in the dimensions of clinical education, university factors, personal beliefs, patient care, and academic efficiency were estimated to be  $2.67 \pm 1.23$ ,  $0.82 \pm 3.52$ ,  $0.77 \pm 3.57$ ,  $1.09 \pm 3.03$ , and 2.58, respectively. Based on the results of the Shapiro-Wilk test, all scores were normally distributed. The analysis of variance in this study demonstrated that in the dimensions of patient care and clinical education, the mean stress scores in the dental environment varied significantly among academic semesters ( $P < 0.05$ ). The LSD post hoc test indicated that in both dimensions, the difference between students in the 10th and 11th academic semesters and other academic semesters was significant ( $P < 0.05$ ). In other words, with an increase in academic semesters, the level of stress in the dimensions of patient care and clinical education significantly increased. In this study, considering the total scores obtained from the questionnaire, the level of stress in students was categorized as follows: a score between 32 and 42 was considered low stress, a score between 42 and 84 was considered moderate stress, and a score above 84 was considered high stress. The study demonstrated that 70 students (31.1%) experienced low stress, 100 students (44.4%) experienced moderate stress, and 55 students (24.4%) experienced high levels of stress in the dental school environment at Zahedan University of Medical Sciences. After examining the level of stress and its association with gender, the chi-square test indicated that the frequency distribution of the level of dental environment stress differed based on the gender of the students, with female students experiencing higher levels of stress ( $P < 0.05$ ).

Considering Table 1, the independent t-test in this study revealed that overall, dental environment stress is associated with gender and average score, and the mean stress score was higher in female students and those with higher average scores ( $P < 0.05$ ). Although students living with their parents and single students had slightly higher stress, an independent t-test indicated that dental environment stress was not significantly associated with marital status, and analysis of variance demonstrated no significant relationship between students' accommodation and dental environment stress ( $P > 0.05$ ).

Although stress scores increased slightly over the semester in this study, the Pearson correlation coefficient showed no significant relationship between students' semester and stress scores ( $P = 0.072$ ,  $P = 0.1$ , respectively). Another variable examined in this study was the academic self-efficacy of dental students in Zahedan. The study

**Table 1.** Mean and standard deviation of dental environment stress scores in five dimensions among dental school students in Zahedan city based on gender, marital status, accommodation, and average score

Variables	Dimensions of dental environment stress					Total	P value	
	University factors	Personal beliefs	Patient care	Clinical education	Academic self-efficacy			
Gender	Male	Mean	3.25	3.53	2.45	3.15	2.57	0.045
		SD	0.842	0.854	1.089	1.094	1.207	
	Female	Mean	3.59	3.59	2.88	3.91	2.89	
		SD	0.712	0.799	1.11	0.97	1.25	
Marital status	Single	Mean	3.64	3.60	2.61	3.06	2.61	0.12
		SD	0.675	0.732	1.142	1.100	1.216	
	Married	Mean	3.07	2.96	3.11	2.85	2.37	
		SD	1.207	1.192	0.847	1.099	1.334	
Average score	≤16	Mean	3.05	3.12	2.69	3.01	2.62	0.05
		SD	0.718	0.821	1.130	1.108	1.255	
	>16	Mean	3.29	3.53	2.59	3.12	3.43	
		SD	0.913	0.844	1.098	1.073	1.137	
Accommodation	Dormitory	Mean	3.45	3.64	2.38	3.14	2.25	0.22
		SD	0.834	0.743	1.228	1.096	1.208	
	Independent house	Mean	3.32	3.26	2.68	2.83	2.51	
		SD	1.002	1.052	1.105	1.028	1.317	
	With parents	Mean	3.74	3.57	2.83	3.05	2.79	
		SD	0.581	0.740	1.038	1.128	1.171	

revealed that the overall mean academic self-efficacy score among dental students in Zahedan was  $129.5 \pm 23.2$  (range 32 to 160). Considering that higher scores indicate better self-efficacy, students were categorized into three groups of high, moderate, and low academic self-efficacy based on standard deviation from the mean. The study showed that 76 students (33.7%) had low academic self-efficacy, 112 students (49.9%) had moderate academic self-efficacy, and 37 students (16.4%) had high academic self-efficacy in the dental school environment at Zahedan University of Medical Sciences. To determine the relationship between academic self-efficacy and dental environment stress, the Pearson correlation coefficient was used. The test revealed a significant relationship between students' academic self-efficacy and dental environment stress, indicating that students with higher academic self-efficacy also experienced more stress ( $r=0.231$ ,  $P=0.02$ ). Students' academic self-efficacy also demonstrated a significant association with gender, academic semester, and average score ( $P<0.05$ ), but no significant relationship was found between marital status and accommodation ( $P>0.05$ ).

One of the main objectives of this study was to determine the relationship between dental environment stress in the dimensions of clinical education, university factors, personal beliefs, academic efficiency, and patient care with academic self-efficacy among dental students while controlling for potential confounding factors (age, gender, marital status, accommodation, and academic semester). It should be noted that due to the linear relationship and

the high correlation between age and academic semester, only the academic semester variable was included in the model. Linearity in regression modeling refers to the effect of one variable on an outcome being contingent on the effects of other variables on the same outcome. Therefore, the variance of the regression coefficients increased, and the predictive power of the regression model was associated with high errors. There was significant overlap in participants' ages and academic semesters. Hence, one of these variables needs to be examined in the regression model analysis.

Linear regression analysis showed that academic self-efficacy was associated with stress in the clinical education dimension in the presence of gender, marital status, accommodation, and academic semester variables. Students with higher academic self-efficacy experienced higher levels of stress in the clinical education dimension. Gender and academic semester variables could also influence stress in the clinical education dimension in the presence of self-efficacy, as female students and those in higher academic semesters experienced more stress. However, multiple linear regression analysis showed that marital status and accommodation did not have a significant relationship with stress in the clinical education dimension and were not included in the model (Table 2).

Linear regression analysis revealed that academic self-efficacy was not associated with stress in the university factors dimension in the presence of gender, marital

**Table 2.** Coefficients for the relationship between dental environment stress in clinical education, university factors, personal beliefs, academic efficiency, and patient care with academic self-efficacy among dental students in Zahedan, considering potential confounding variables

Variables		Regression coefficient ( $\beta$ )	Standard error (SE)	Confidence interval for B	P value
Clinical education	Gender				0.021
	Female	0.111	0.48	0.17 – 0.205	
	Male	1	0	0	
	Semester	0.196	0.43	0.11 – 0.28	0.001
	Academic self-efficacy	0.178	0.083	0.15 – 0.34	0.033
University factors	Gender				0.001
	Female	0.28	0.038	0.21 – 0.36	
	Male	1	-	-	
	Semester	0.117	0.037	0.045 – 0.19	0.002
	Academic self-efficacy	0.049	0.036	0.02 – 0.119	0.17
Personal beliefs	Gender				0.001
	Female	0.187	0.033	0.12 – 0.25	
	Male	1	-	-	
	Semester	0.139	0.042	0.05 – 0.185	0.001
	Academic self-efficacy	0.117	0.034	0.15 – 0.34	0.033
Patient care	Gender				0.002
	Female	0.24	0.077	0.094 – 0.397	
	Male	1	-	-	
	Academic self-efficacy	0.087	0.034	0.019 – 0.154	0.012
Academic efficiency	Semester	0.087	0.034	0.019 – 0.154	0.012
	Academic self-efficacy	0.041	0.073	0.1 – 0.185	0.57

status, accommodation, and academic semester variables. However, gender and academic semester variables, in the presence of self-efficacy, could influence stress in the university factors dimension, with female students and those in higher academic semesters suffering more from stress. Nevertheless, multiple linear regression analysis showed that marital status and accommodation did not have a significant relationship with stress in the university factors dimension and were not included in the model (Table 2).

Linear regression analysis revealed that, in the presence of gender, marital status, accommodation, and academic semester variables, academic self-efficacy was associated with stress in the personal beliefs dimension. Students with higher academic self-efficacy experienced higher stress in the personal beliefs dimension. Additionally, gender and academic semester variables, in the presence of self-efficacy, could influence stress in the personal beliefs dimension, with female students and those in higher academic semesters experiencing more stress. However, multiple linear regression analysis showed that marital status, academic semester, and accommodation did not have a significant relationship with stress in the personal beliefs dimension and were not included in the model (Table 2).

Linear regression analysis demonstrated that, in the presence of gender, marital status, accommodation, and academic semester variables, academic self-efficacy was

associated with stress in the patient care dimension. Students with higher academic self-efficacy experienced higher levels of stress in the patient care dimension. The gender variable could also influence stress in the patient care dimension in the presence of self-efficacy, with female students experiencing more stress. However, multiple linear regression analysis showed that marital status, academic semester, and accommodation did not have a significant relationship with stress in the patient care dimension and were not included in the model (Table 2). Based on the findings, the highest level of stress was in the dimension of university factors, and the lowest was in the dimension of academic efficiency.

## Discussion

In the present study, the level of dental environment stress was examined based on dimensions of clinical education, university factors, personal beliefs, patient care, and academic efficiency. Additionally, a similar study at Zahedan Dental School allowed us to compare students' stress levels in two different periods, which was a strength of this study. This study revealed that the highest level of stress was in the university factors dimension, and the lowest was in the academic efficiency dimension. Overall, compared to a study conducted a decade ago,<sup>20</sup> the stress in the dimensions of clinical education, university factors, and personal beliefs has increased significantly among students. However, while

stress levels increased in the patient care and academic efficiency dimensions, the difference was not substantial. The findings of this study illustrate that dental students are exposed to various stress-inducing factors, and the impact of these factors depends on other variables such as gender and academic semester. Although different studies have identified various factors as triggers of stress,<sup>21-25</sup> the results of all these studies are consistent with the present study and highlight the stressful nature of the dental school environment. Nevertheless, among various stress-inducing factors, understanding clinical education and university factors is of paramount importance, and efforts should focus on controlling students' stress.

This study demonstrated a significant increase in stress in the patient care and clinical education dimensions as academic semesters progressed. This finding is consistent with the study by Morse and Dravo<sup>26</sup> and with studies conducted by Akbari et al<sup>27</sup> and Kumar et al.<sup>5</sup> Although the amount of theoretical courses decreases in later years, it appears that as students approach graduation, their concerns increase, leading to greater fatigue, workload, and subsequently, increased stress in the clinical environment. This issue should receive greater attention. In a study conducted by Ramazani and Nazari in Zahedan,<sup>20</sup> third and fourth-year students reported the highest levels of stress in comparison to fifth and sixth-year students, which is somewhat different from the present study. This difference could be attributed to the smaller number of faculty members at that time compared to the time of this study, leading to more attention given by faculty to senior students. Consequently, these students perceived more support from faculty members in the early stages of clinical courses compared to participants in the present study.

In this study, female students experienced higher levels of stress. This finding aligns with a previous study conducted in Zahedan<sup>20</sup> but differs from the results of the study by Akbari et al in Mashhad<sup>27</sup> and Kumar et al in India.<sup>5</sup> Higher levels of stress in females can be attributed to factors such as increased pressure to succeed and less support from friends. Although students living with their parents and single students had slightly higher stress, marital status, and accommodation did not have a significant relationship with dental environment stress. This finding partially aligns with a study conducted by Sugiura et al in Japan.<sup>28</sup>

While stress levels increased somewhat with age, there was no significant relationship between the students' age and dental environment stress. This result corresponds with a previous study conducted among medical students at Golestan University of Medical Sciences.<sup>29</sup> Another variable examined in this study was academic self-efficacy among dental students in Zahedan. This study demonstrated a significant relationship between academic self-efficacy and dental environment stress, indicating that students with higher academic self-

efficacy also experienced more stress. This result is somewhat contradictory to the findings of another study<sup>30</sup> and suggests that dental students endure increased stress in the dental environment at the expense of higher academic efficiency. Therefore, stress management interventions supported by educational professionals can lead to increased student performance and reduced stress. One of the limitations of this study is that it does not examine the students' previous educational level. Future studies should include larger sample sizes and different geographic locations. Additionally, evaluating the success rates of activities that reduce student stress should be a priority.

## Conclusion

Dental students face considerable stress in their educational environment, often striving to enhance academic performance while struggling with effective stress management. Educating students about stress management techniques and promoting healthy lifestyles, alongside fostering a stress-reduced learning environment, is crucial. Effective stress reduction strategies include regular exercise and engagement in group activities. The study suggests that elevated stress levels can adversely affect academic efficiency. Therefore, implementing stress management interventions by educational professionals could improve both student performance and stress levels. Limitations include not considering students' prior educational backgrounds. Future research should involve larger samples, and diverse locations, and assess the effectiveness of stress-reducing activities.

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## Authors' Contribution

**Conceptualization:** Sadra Amirpour Haradasht.

**Data curation:** Sadra Amirpour Haradasht.

**Investigation:** Amir Hossein Khazaei, Elnaz Irandegani.

**Methodology:** Amir Hossein Khazaei, Elnaz Irandegani.

**Project administration:** Sadra Amirpour Haradasht.

**Resources:** Amir Hossein Khazaei, Elnaz Irandegani.

**Software:** Amir Hossein Khazaei, Elnaz Irandegani.

**Supervision:** Tayebeh Ghasemi.

**Writing—original draft:** Tayebeh Ghasemi.

**Writing—review & editing:** Tayebeh Ghasemi.

## Competing Interests

The authors declare no conflict of interest.

## Ethical Approval

Before completing the questionnaire, students were informed about the goals of the research and its significance and participated in the study with informed consent. In addition, the students were assured that the information would be treated confidentially and used exclusively for the study report. The present study was approved by the Ethics Committee of Zahedan University of Medical Sciences

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