


Stressors among undergraduate dental students at a public university

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Abstract The aim of the study was to identify stressors among students at the School of Dentistry according to gender and stage of course. Stress data was collected using the Dental Environment Stress (DES) questionnaire, answered by 78.1% of the students enrolled. Group comparisons were performed using the Mann-Whitney test with a significance level of 5%. Results were evaluated according to stage of course (pre-clinical and clinical) and gender. The mean value on the DES was 2.7, classified as moderately stressful. Students involved in clinical activities had higher values (2.9) than pre-clinical students (2.4) ($p < 0.0001$). Scores were also higher among females (2.8) than males (2.4) ($p < 0.0001$). All items of the domain "professional difficulties", related to learning difficulties and insecurity about professional future, exhibited statistically significant gender differences. Results showed that students perceived different stressors on the course.

Descriptors: Health. Occupational Stress. Students, Dental.

Factores de estrés en estudiantes de pregrado de odontología de una universidad pública estatal

Resumen El objetivo del estudio fue identificar factores estresantes entre los estudiantes de Odontología de una institución pública de São Paulo, Brasil, considerando el género del estudiante y la etapa en el curso. Para recolectar datos sobre estrés se utilizó la escala *Dental Environment Stress* (DES), respondida por el 78,1% de los estudiantes de matrícula regular. La comparación entre los grupos se realizó mediante la prueba de Mann-Whitney con un nivel de significancia del 5% y los resultados se evaluaron considerando la etapa del estudiante en el curso (preclínica y clínica) y el sexo de los participantes. El valor medio de DES fue de 2,7, lo que puede clasificarse como moderadamente estresante. Los estudiantes con actividades clínicas presentaron valores superiores (2,9) respecto a los estudiantes de la etapa preclínica (2,4) ($p < 0,0001$), así como las mujeres (2,8) respecto a los hombres (2,4) ($p < 0,0001$). Considerando los dominios del cuestionario, todos los ítems del dominio "dificultades profesionales", que están relacionados con dificultades de aprendizaje e inseguridad sobre el futuro profesional, tuvieron diferencia estadísticamente significativa entre los sexos. Se concluye que los estudiantes investigados percibieron diferentes estresores en el curso.

Descriptores: Salud. Estrés Laboral. Estudiantes de Odontología.

Fatores estressores entre estudantes de graduação em Odontologia de uma universidade pública estadual

Resumo O objetivo do estudo foi identificar fatores estressores entre os estudantes de Odontologia de uma instituição de ensino pública do estado de São Paulo, Brasil, considerando o sexo e a etapa do aluno no curso. Para a coleta dos dados sobre o estresse foi utilizada a escala *Dental Environment Stress* (DES), respondido por 78,1% dos estudantes regularmente matriculados. A comparação entre os grupos foi realizada por meio do teste de Mann-Whitney com nível de significância de 5% e os resultados foram avaliados considerando a etapa do aluno no curso (pré-clínica e clínica) e o sexo dos participantes. O valor médio do DES foi de 2,7 o que pode ser classificado como moderadamente estressante. Os estudantes com atividades clínicas apresentaram valores mais altos (2,9) em relação aos estudantes da etapa pré-clínica (2,4) ($p < 0,0001$), assim como as mulheres (2,8) em relação aos homens (2,4) ($p < 0,0001$). Considerando os domínios do questionário, todos os itens do domínio "dificuldades profissionais" que são relacionados às dificuldades de aprendizado e

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insegurança sobre o futuro profissional tiveram diferença estatisticamente significativa entre os sexos. Conclui-se que os estudantes investigados perceberam diferentes fatores estressores no curso.

Descritores: Saúde. Estresse Ocupacional. Estudantes de Odontologia.

INTRODUCTION

Stress can be defined as an organism's response to a real or perceived threat. This constitutes a mechanism which puts the individual into a state of alert, triggering psychic and emotional changes such as nausea, more rapid heartbeat, sweats, headache, dizziness, fatigue, low immunity, among a number of other symptoms¹. The intensity of responses to external stressors varies according to the individual influenced by different circumstances, but reflects the person's perceived ability to deal with the situation². Moreover, persistent stress can develop into psychological disorders in the form of depression, anxiety and burnout³.

Educational courses in the health area are a recognized source of stress among students⁴⁻⁶. In the case of dentistry^{1,4}, studies have reported high levels of depression, anxiety and stress among these students. Schmitter *et al.* (2008)⁷ assessed chronic stress in medical and dental students and found that some categories of chronic stress increased during both of these courses, but was more pronounced in dental education. Dentistry students, besides being exposed to pain and anguish, akin to other students in the health area, develop their clinical competencies and skills within a limited visual field involving high levels of concentration and exposure to physical (noises, lighting), chemical, biological and ergonomic (posture, repetitive movements) agents. These factors can negatively impact learning and academic performance, and may also affect the service delivered to patients⁸.

Another recent stress factor emerged in the form of the COVID-19 pandemic. Huang and Zhao (2021)⁹ found that stressors which threaten life and health amid a pandemic have greater impact on younger individuals and those with regular exposure to sick people. A study involving students from a dentistry school in Poland showed that suspension of classes, followed by their resumption amid heightened risk of infection in the clinical environment, led to an increase in perceived stress among students¹⁰.

A study of dental students across 14 developing countries, including Brazil, revealed high perceived stress in the dental environment for all countries surveyed and that the stressors appeared to be comparable among participating countries¹. Dental students from Egypt reported the highest level of stress, whereas students from Jordan had the lowest level. Brazilian students had highest mean scores on the analysis of the domain "academic performance", encompassing the items "difficulty of classwork", "examinations and grades", besides difficulty "reconciling personal life with dental school routines"¹.

In Brazil, there is scant literature on stress among dental students both in public and private institutions, with available studies predominantly focusing on students at the clinical stage of the course¹¹⁻¹³ and generally investigating the association of quality of life with stress^{14,15,16}. These studies all show the presence of several potentially stressful factors on courses that can potentially influence students' quality of life. However, there is a lack of studies exploring differences between students on pre-clinical versus clinical stages and between sexes. Gaining a clearer understanding on the role of stress factors in these groups is valuable in allowing measures to be applied that can reduce the issues found and minimize the impact on student well-being and health.

The objective of the present study was to identify stressors perceived by students of a public education institution in São Paulo state, Brazil. More specifically, the study investigated the perception of these factors by students at pre-clinical and clinical stages, and by female versus male students.

METHOD

This is a descriptive, cross-sectional study involving the application of an on-line questionnaire in a non-probabilistic convenience sample of undergraduate dental students at the Araraquara School of Dentistry- UNESP was conducted. The undergraduate course is a 5-year program, with the first 2 years classified as pre-clinical (laboratory-based and pre-clinical subjects), and the final 3 years defined as clinical (subjects centered on learning from clinical practice and treating patients at an increasing level of technical complexity). At data collection, 375 students were enrolled on the course, all of whom were invited to take part, thus, constituting the total study population. Of this overall population, 293 (78.1%) students answered the questionnaire and, hence, comprised the study sample.

Two questionnaires were applied for data collection: a 9-item questionnaire for collecting sociodemographic data; and a 36-item scale called the Dental Environmental Stress (DES) questionnaire, used to identify and quantify specific stressors perceived by dental students. The DES was originally devised by Garbee et al. (1980)¹⁷ and later translated and validated for use in Brazil by Sangiorgio *et al.* (2016)¹¹. The DES has been used for studies in a number of different countries, including Canada², India³, Turkey⁴ and Greece⁸. The resultant adapted Brazilian version of the DES demonstrated similar psychometric properties to the original scale¹¹.

The DES comprises 36 items rated on the following scale: 0 – Not applicable; 1- Not stressful; 2- Slightly stressful; 3- Moderately stressful; 4- Very stressful. The questions are categorized under 5 domains for further data analysis, namely: “Academic performance”; “Interpersonal relationships”; “Responsibilities with patients”, “Professional difficulties”; and “Individual and institutional factors”.

The questionnaires were made available and answered on-line using the Google Forms tool. The questionnaires were available for 4 weeks at the close of the academic year following exams so that this factor would not influence answers. Data collection took place following approval of the research project by the Research Ethics Committee of the Araraquara School of Dentistry - UNESP (CAAE permit: 16161419.0.0000.5416). Prior to completing questionnaires, all students read and agreed to the Free and Informed Consent Form.

The data collected were entered into spreadsheets and assessed using the software SPSS version 20.0 (IBM Corp NY, USA). Statistical analysis entailed rating the internal consistency of the DES scale using Cronbach’s Alpha and employing descriptive statistics for the study variables, expressed as percentages, mean and standard deviation, and the Mann-Whitney test to determine whether stressors were perceived differently according to student gender and stage of course. The level of significance was set at $p < 0.05$ for all tests.

RESULTS

The internal consistency of the DES scale answered by the participating undergraduate students was evaluated. Using Cronbach’s Alpha as a measure, the consistency proved adequate at 0.905.

A total of 293 undergraduate students who were enrolled on the dentistry course of Araraquara School of Dentistry took part in the study. Participants had a mean age of 21.5 (standard deviation 2.1) years and age range of 18 to 33 years. The sample was predominantly female (74.7%), most participants were single (99.6%) and 49.8% lived with others (non-family). Regarding academic-related aspects, 90.4% were in the same group as when commencing the course and 87.0% had passed all subjects studied up to the time of the investigation (Table 1).

Mean stressor score among participants was 2.7 (± 1.3), classified as slightly to moderately stressful, with a tendency toward moderate. For course stage, mean stressor score was higher among students engaged in clinical activity ($\bar{x} = 2.9$, ± 1.2), while pre-clinical stage students had a mean score of 2.4 (± 1.4) ($p < 0.0001$). With respect to gender, mean score was higher among females ($\bar{x} = 2.8 \pm 1.3$) than males ($\bar{x} = 2.4 \pm 1.4$) ($p < 0.0001$).

The results on the 5 domains of the questionnaire, according to pre-clinical and clinical course stage and by gender, are presented in Table 2.

Several stressors were reported by the participants. Of the 36 items comprising the questionnaire, 20 exhibited a statistically significant difference when comparing students at pre-clinical versus clinical stages. Regarding sex, 24 items showed a statistically significant gender difference between men and women. With regard to the questionnaire domains, all factors under the item "professional difficulties" showed statistically significant gender differences.

Table 1. Frequency distribution for sociodemographic data of sample, in absolute number and percentage.

Variables	n	%
Gender		
Female	219	74.7
Male	74	25.3
Marital status		
Single	291	99.6
Married	1	0.4
Living arrangements		
With parents or family	56	19.1
Alone	91	31.1
With others (non-family)	146	49.8
Did you need to move city?		
No	44	15.0
Yes, but within same State	214	73.0
Yes, from other State	35	12.0
Are you in the same group as upon admission?		
Yes	265	90.4
No	28	9.6
Were you failed on anything?		
Yes	38	13.0
No	255	87.0

Table 2. Frequency distribution on DES scale, expressed as mean and standard-deviation, according to students stratified by dentistry course stage and gender.

	Course stage			Gender		
	Pre-clinical \bar{x} (SD)	Clinical \bar{x} (SD)	p	Female \bar{x} (SD)	Male \bar{x} (SD)	p
<i>Domain: Academic performance</i>						
Amount of assigned classwork	3.0 (0.9)	2.9 (0.9)	0.4196	3.0 (0.9)	2.7 (0.8)	0.0047*
Difficulty of classwork	2.8 (0.9)	2.9 (1.0)	0.0960	2.9 (0.9)	2.6 (1.0)	0.0349*
Examinations and grades	3.7 (0.6)	3.9 (0.5)	0.0314*	3.8 (0.4)	3.6 (0.7)	0.0696
Atmosphere created by faculty	2.7 (1.0)	3.6 (0.5)	<0.0001*	3.2 (0.9)	2.6 (1.0)	0.0001*
Receiving criticism about work	2.3 (1.2)	2.7 (1.0)	0.0056*	2.7 (1.0)	2.1 (1.0)	0.0004*
Lack of time for relaxation and recreation	3.3 (0.9)	3.6 (0.7)	0.0037*	3.6 (0.8)	3.4 (0.9)	0.1058
Completing graduation requirements (Grades/Clinical Output/Internship)	3.4 (0.9)	3.6 (0.8)	0.1092	3.6 (0.8)	3.3 (1.0)	0.0350*
Reconcile personal life with dental school routines	3.4 (0.7)	3.5 (0.8)	0.1072	3.6 (0.7)	3.2 (0.9)	<0.0001*
Fear of failing course or year	3.6 (0.9)	3.7 (0.7)	0.7596	3.7 (0.7)	3.4 (1.0)	0.1397
Lack of time to do assigned schoolwork	3.3 (0.8)	3.4 (0.8)	0.0628	3.5 (0.8)	3.1 (0.8)	0.0043*
Domain total	3.1 (0.9)	3.4 (0.7)	0.0045*	3.4 (0.8)	3.0 (0.9)	0.0038*
<i>Domain: Interpersonal relationships</i>						
Competition for grades	3.1 (1.2)	2.8 (1.3)	0.0283*	3.0 (1.2)	2.7 (1.4)	0.0697
Relations with members of opposite sex	1.5 (0.9)	1.5 (1.0)	0.8925	1.6 (1.0)	1.2 (0.9)	0.0069*
Cheating by dental students (copying on exams, forging signatures or medical records)	1.9 (1.3)	2.1 (1.3)	0.0984	2.0 (1.3)	2.0 (1.5)	0.9149

Continues

Continuation

Lack of family atmosphere in the dormitories during school	1.7 (1.4)	1.9 (1.5)	0.5047	1.9 (1.5)	1.4 (1.2)	0.0112*
Discriminatory attitudes toward women dental students	2.2 (1.4)	2.6 (1.4)	0.0511	2.7 (1.2)	1.7 (1.7)	<0.0001*
Conflict with family throughout career development	1.5 (1.1)	1.7 (1.3)	0.1829	1.6 (1.2)	1.5 (1.2)	0.3960
Discrimination due to race, class status or ethnic group	1.7 (1.5)	1.9 (1.5)	0.3070	1.7 (1.5)	1.9 (1.6)	0.5798
Discriminatory attitudes toward homosexual dental students	1.9 (1.6)	2.3 (1.7)	0.0640	2.3 (1.6)	1.7 (1.6)	0.0200*
Domain total	1.9 (1.3)	2.1 (1.4)	0.0560	2.1 (1.3)	1.8 (1.4)	0.0354*
<i>Domain: Responsibilities with patients</i>						
Lack of cooperation by patients in their home care	0.9 (1.2)	2.6 (0.8)	<0.0001*	2.0 (1.3)	1.7 (1.4)	0.1500
Responsibilities for comprehensive patient care	1.3 (1.4)	2.7 (1.0)	<0.0001*	2.3 (1.4)	1.7 (1.3)	0.0039*
Patients late or not showing for their appointments	0.9 (1.2)	2.5 (1.0)	<0.0001*	1.9 (1.3)	1.7 (1.3)	0.2463
Working on patients with dirty mouths	1.0 (1.3)	2.2 (1.0)	<0.0001*	1.8 (1.3)	1.5 (1.3)	0.0523
Domain total	1.0 (0.9)	2.5 (1.2)	<0.0001*	2.0 (1.3)	1.6 (1.3)	0.0367*
<i>Domain: Professional difficulties</i>						
Difficulty learning clinical procedures	1.9 (1.5)	3.0 (1.0)	<0.0001*	2.7 (1.4)	2.1 (1.2)	0.0003*
Difficulty learning precision manual skills required in pre-clinical and laboratory work	1.8 (1.5)	3.0 (1.0)	<0.0001*	2.7 (1.4)	1.9 (1.3)	<0.0001*
Lack of confidence in self to be a successful dental-student	3.2 (1.0)	3.4 (0.9)	0.0607	3.4 (0.9)	3.0 (1.0)	0.0006*
Lack of confidence in self to be a successful dentist	3.2 (1.0)	3.5 (0.8)	0.0045*	3.5 (0.9)	2.9 (1.0)	<0.0001*
Insecurity concerning professional future	3.4 (0.9)	3.7 (0.7)	0.0039*	3.7 (0.7)	3.2 (1.0)	0.0012*
Fear of being unable to catch up if falling behind	3.5 (0.9)	3.5 (0.9)	0.7979	3.6 (0.8)	3.2 (1.0)	0.0097*
Domain total	2.8 (1.0)	3.3 (0.8)	0.0387*	3.3 (1.0)	2.7 (1.1)	0.0069*
<i>Domain: Individual and institutional factors</i>						
Rules and regulations of dentistry course	2.0 (1.0)	2.4 (1.0)	0.0001*	2.3 (1.0)	1.9 (0.9)	0.0056*
Expectations of dental school and what in reality it's like	2.7 (1.1)	3.2 (0.9)	0.0001*	3.1 (0.9)	2.5 (1.1)	0.0002*
Lack of participation in the school's decision-making	2.3 (1.1)	2.8 (1.0)	0.0003*	2.7 (1.1)	2.3 (1.2)	0.0127*
Financial responsibilities	3.2 (1.0)	3.5 (0.8)	<0.0001*	3.5 (0.8)	2.9 (1.0)	<0.0001*
Considering entering some other field of work	1.7 (1.3)	2.1 (1.6)	0.0160*	2.0 (1.5)	1.6 (1.4)	0.0290*
Difficulty undertaking conjugal commitments (living together, getting engaged, married) due to dentistry course	1.4 (1.5)	1.4 (1.5)	0.9686	1.5 (1.5)	1.2 (1.4)	0.1821
Personal physical health	2.9 (1.0)	3.2 (1.0)	0.0044*	3.2 (1.0)	2.8 (1.0)	0.0030*
Inconsistency of feedback on work between different instructors	2.6 (1.3)	3.4 (0.9)	<0.0001*	3.1 (1.1)	2.8 (1.3)	0.0611
Domain total	2.3 (1.1)	2.7 (1.0)	<0.0001*	2.7 (1.1)	2.2 (1.1)	<0.0001*
Total	2.4 (1.4)	2.9 (1.2)	<0.0001*	2.8 (1.3)	2.4 (1.4)	<0.0001*

DISCUSSION

Previous studies conducted in a number of different countries^{2,3,18}, including Brazil^{5,11}, have reported that dentistry courses are renowned for being highly demanding and stressful, negatively impacting the physical, mental and social wellbeing of students. The present study, with the objective of identifying stressors among dental students of a public state education institution, found that students on the clinical stage, and those who were female, perceived greater impact of stressors compared with students at the pre-clinical stage and who were male, respectively.

Mean stressor score among participants was 2.7, indicating a slightly to moderately stressful rating. Compared against studies performed in other countries, this mean was slightly higher than scores found in both Turkey⁴ (2.5) and Jordan (2.4)¹⁹. In Brazil, Sangiorgio *et al.* (2016)¹¹ used the same scale (DES), but values were reported in percentages, precluding direct comparison of results.

Dental students are exposed to many different stressors, such as knowledge overload, personal pressures and demands of teachers, exams, difficulties reconciling personal and academic life, long working hours, combining theory with clinical practice, insecurities treating patients and fear of causing them injury¹. These factors have a direct impact on the health

of students from the first to final years of their academic course. This situation highlights the importance of investigating academic life, together with its associated stress factors, to help raise awareness concerning the mental health of students. According to Fiorotti *et al.* (2010)²⁰, roughly 12-18% of university students have some kind of diagnosable mental disorder, where the first psychiatric episode can often manifest during the degree course.

Based on the academic stages analyzed, mean perceived stressors were higher (2.9) among students engaged in clinical activity (3rd, 4th and 5th year). Similarly, students at this stage in Jordan reported the same score¹⁹, while the slightly higher mean score of 2.4 was found in India (3rd and 4th-year students). By comparison, the mean score of pre-clinical (1st and 2nd-year) students was 2.4.

Previous studies have shown that clinical practice is a stress factor that intensifies as students progress on the course^{1,18,19}. During this phase, students start coming into direct contact with patients who may be in pain or fearful of treatment and tests. Also, the complexity of procedures increases, adding to the responsibility, and increasing doubts over the ability to perform procedures correctly^{19,21}.

With respect to the domains assessed in the study, "Academic Performance" had the highest means for both pre-clinical and clinical stages. The stressors with the highest means in this domain were: "Examinations and grades", "Fear of failing course or year", "Completing graduation requirements", and "Lack of time for relaxation and recreation". These categories were rated at between "Moderately stressful" and "Very stressful", receiving mean scores of up to 3.9 on a scale of 1 to 4. These results indicate that the Dentistry course requires intense study and dedication, irrespective of stage of course. However, excessive demands can lead to physical and mental fatigue which may subsequently develop into burnout and stress, hampering studies, as well as academic and social life²². Moreover, these conditions can progress to anxiety, mild or moderate depression and low levels of satisfaction with life. The negative associations between sources of stress in the dental environment and wellbeing are widely acknowledged in the literature²³.

Also within the "Academic performance" domain, the stressors "Atmosphere created by faculty" and "Receiving criticism about work", had higher mean scores amongst students at the clinical stage. This period when students begin providing clinical treatment is marked by an increase in perceived stress, because it involves greater responsibility on the part of the student, who is also subject to greater scrutiny and judgment by teachers about their work^{1,8,18}. Studies performed in Sweden and Saudi Arabia showed that the two stressors most consistently identified by dental students are examinations and student-teacher conflicts^{18,23}.

Other stressful factors associated with high mean scores are found under the domain "Professional difficulties". This domain relates to issues concerning expectations held by students as undergraduates and future professionals which may be associated with feelings of lack of preparedness for clinical procedures and/or the job market. These feelings often lead to a sense of impotence and professional insecurity, commonly seen in students of courses involving practical activities and the health area, such as dentistry, nursing and medicine²⁴.

On the analysis of stressors according to sex, overall mean score was 2.8 among females versus 2.4 for males ($p < 0.001$). Of the 36 items on the DES scale, women had statistically higher scores on 24 items, most notably for "Reconcile personal life with dental school routines", "Financial responsibilities", "Atmosphere created by faculty" and all items under the domain "Professional difficulties". Some studies have shown that women score higher on the DES compared to men, a disparity that may be explained by several factors^{1,8,18,19}. These reasons include biological factors and, in this case, women are more sensitive than men to the release of corticotropin-releasing hormone, a stress-related hormone, and produce greater amounts of estrogen and progesterone, rendering them more susceptible to the anxiogenic effects of stress²⁵. Gender differences may also be explained by sociocultural factors, where women are more burdened with tasks than men, and may feel more pressured to take them all on^{8,19}. Men are less prone to reporting stress, whereas women tend to express their feelings more¹¹.

The current study has some limitations, such as the fact that only students on one Dentistry degree course of a single public teaching institution comprising a convenience sample were assessed. Consequently, the study results are only

valid for the students who answered the questionnaire, where results cannot be extrapolated to all students or to other courses, public or private. In addition, the study had a cross-sectional design, making it impossible to ascertain whether these factors exerted a continued effect or otherwise. However, the results of the present study offer insights for higher education institutions and course managers on redesigning their structures and processes to provide students with a healthier environment.

CONCLUSION

The results revealed that students perceived a number of stressors during their academic training, predominantly associated with professional difficulties and academic performance. The stressors perceived by students within the training environment showed a tendency towards a moderate level of stress, although mean stress values proved higher than those reported by other studies. These findings allowed perceived stressors to be stratified according to course stage (pre-clinical and clinical) and gender (female and male), helping to fill a knowledge gap in the national literature. Moreover, this constitutes the first study conducted at the Dentistry School to assess student perceptions of stressors, with results proving consistent with previous investigations on the subject. The study data were collected prior to the COVID-19 pandemic and further studies should therefore be conducted to better understand the challenges of remote education, physical distance among peers and teachers, and the long period without face-to-face practical classes in the context of academic stress.

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