Sources of stress, psychological well-being and health among dental students: a comparison between preclinical and clinical phases and between sexes

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ABSTRACT

The aim of this study was to evaluate psychological well-being, overall health, and sources of stress among dental students from four Doctor of Dental Surgery (DDS) programs, comparing the preclinical and clinical phases and sexes. Three instruments were applied: Dental Environment Stress (DES), Psychological General Well-Being Index (PGWB) and Health Survey (SF-36), answered by 203 students, with 75 (37%) in the preclinical phase and 128 (63%) in the clinical one. Among them, 59 were male (29%) and 144 were female (71%). Comparisons were performed using the Mann-Whitney test, adopting a significance level of 5%. In the domains analyzed using DES (academic performance, difficulties and insecurities about their professional future, responsibilities with patients, personal and institutional factors, interpersonal relationships), preclinical students showed significantly lower scores than students enrolled in the clinical phases. For PGWB total score and in two domains (anxiety and general health), lower scores were also observed in preclinical students. Four domains of SF-36 (bodily pain, physical functioning, social functioning and role-physical) showed significantly better overall health for preclinical students. Among the sexes, two DES domains (academic performance and difficulties and insecurities about their professional future) showed lower stressors for males. PGWB showed a significant difference in four domains (depressed mood, self-control, general health and vitality), with better psychological well-being for males. Males showed better vitality in the SF-36 domain. Concluding, preclinical and male students showed lower sources of stress, better psychological well-being and better perception of their overall health.
Descriptors: Mental Health. Health. Occupational Stress. Dentistry students.

1 INTRODUCTION

University students are exposed to various stressors characteristic of higher education[1]. The great educational demand experienced in the academic environment, along with factors such as no time for resting, student competitiveness, distance from the family environment and concerns about the future labor market, have a major influence on the emotional and physical fatigue of college students[2,3].

Memory and concentration problems, decreased academic performance, and psychological and physical disorders are ordinary symptoms. Thus, the environment that should contribute to the building of knowledge can sometimes become a limiting factor for the development of academic, personal and professional skills of students, disabling, either physically or emotionally, the expansion of their learning potential[2,3].

In this context, dentistry has been pointed out by the scientific literature as being one of the most challenging, demanding and stressful academic fields[4]. Studies have agreed that dental students are subjected to significantly higher levels of stress than the general population[5] even when compared with students in other health areas, such as medicine[6,7]. This can be attributed to the complex and specific nature of dental education because in addition to adapting to the stressful stimuli, characteristic of the university environment, undergraduate dental students need to develop extremely accurate manual skills, provide clinical care to their patients while they are still in training[8], expand interpersonal skills for relationships with other health professionals[9], as well as needing time for management and treatment planning[10,11].

Researchers from different countries have investigated the stress factors specifically related to dental training and their psychological and physical consequences[5,6,10,12,13]. However, in Brazil, this issue has been little addressed. In addition, little is known, at both national and international levels, about possible differences reported in stress intensity between students from different phases of the Doctor of Dental Surgery (DDS) program (preclinical and clinical) and between sexes [5,6,10,12,13]. Considering that the different characteristics found among these groups of students may influence the perception of stress, as well as they impact on well-being and general health, understanding which groups are more vulnerable and discussing management and coping strategies for the stressors is essential to improve the overall quality of teaching and learning in the dental education system.

The aim of the present study was to compare the sources of stress, psychological well-being and overall health among preclinical and clinical dental students and between the sexes of four higher education institutions in the state of Ceará, Brazil.

2 METHODOLOGY

This study followed the criteria required by resolution 466/2002 of the National Health Council[14]. The identities of the participants were maintained in confidence, and the collected information was confidentially secured. The study protocol was approved by the Ethical Committee of the Federal University of Ceará under protocol #953.335/2015. All volunteers signed the informed consent form.

This is a cross-sectional study, in a quantitative manner. The study included students of the DDS program from four institutions of Ceará: Universidade de Fortaleza and Federal University of Ceará – Fortaleza campus, both of them headquartered in the state capital (Fortaleza); Centro Universitário Católica de Quixadá and Universidade Federal do Ceará – Sobral campus, both based in the countryside of the state.

To be included, the participants had to be at least 18 years old and be regularly enrolled during the year 2015. Furthermore, they needed to answer the following variables in a questionnaire: sex, academic year and institution in which they were enrolled. The students that answered all the questions, but did not answer the three instruments used in the questionnaire (Dental Environment Stress – DES –, Psychological General Well-Being – PGWB – and Health Survey – SF-36) were excluded in the data analysis.

All the institutions involved in the present study had a closed group in the social media Facebook, they also had an e-mail accessible only by the students of each class. From February to May 2015, invitations were sent to both social media and e-mails, explaining the main objectives and inclusion criteria of the study. The participants were invited to answer their personal e-mail to one of the researchers involved in the present study. The study could also make a face-to-face meeting to answer the questionnaire in a printed format. Confirmations of the students' enrollment, in the year 2015, were made by contact with the dean of each institution.

Because all Dentistry students (1,500 students regularly enrolled in the year 2015) were invited to participate, a sample size calculation was not made prior to the study.

A power of 99.96% and 78.97% was determined, *a posteriori*, for the comparisons between academic year and sex, respectively. In this sense, in each analysis, the mean and standard deviation obtained with DES instrument using a 95% confidence interval. To achieve a power of 80% in the analysis between sexes, it would be necessary to have 207 Dentistry students, which is very close to the final sample of 203 included in the present study.

The DES instrument has been widely used and it is considered the best instrument to evaluate and quantify specific stressors in the dental field[14]. The translated and validated version for the Brazilian population was applied in the present study[15]. This instrument consists of 36 items, divided into five domains, with answers based on the four-point Likert scale, which range from 1 (not stressful) to 4 (very stressful). The five domains were: "academic performance," "difficulties and insecurities about their professional future," "responsibilities with patients," "personal and institutional factors" and "interpersonal relationships."

The PGWB, in its translated and validated format for a Portuguese population[16,17], was applied in the study to measure the psychological well-being and distress in the dental students. It is composed of 22 questions included in six domains. The original scores ranged from 0 to 5, zero being the most negative experience and five points the most positive one, and the maximum score is 110 points. The PGWB is composed of the following six domains: "anxiety," "depressed mood," "positive well-being," "self-control," "general health" and "vitality."

The translated and validated, for a Brazilian sample, of the SF-36 instrument was used to evaluate the general health of the participants[18]. This tool is composed of 36 items grouped into eight domains. Each item presents a final score of 0 to 100, in which zero means the worst general health and 100 is the best general health status. The SF-36 of composed by the following domains: "physical functioning," "role-physical," "bodily pain," "general health," "vitality," "social functioning," "role-emotional" and "mental health."

The present study compared the domains of the three instruments between preclinical and clinical phases and between sexes. The normality of the data distribution was tested using the Shapiro-Wilk test. Because a nonnormal distribution was detected, the Mann-Whitney test

was applied to all comparisons. For the categorical variables, the chi-square test was used. The reliability of the three instruments was previously evaluated using the Cronbach alpha coefficient[19].

The statistical analysis was performed with the software SPSS, version 21, for Windows (IBM Corp., Armonk, NY, USA), adopting a level of significance of 5% for all analyses.

3 RESULTS

Overall, 237 e-mails were received, and the questionnaires were sent to only 231 students because six of them were not regularly enrolled in the year 2015.

Two-hundred and three students returned the questionnaire (response rate 87.88%). From these, 98 (48.28%) and 105 (51.72%) questionnaires were answered in printed and electronic formats, respectively. From the 203 students that answered the questionnaire, 75 (37%) were in the preclinical phase and 128 (63%) in the clinical phase. In total, 59 (29%) were male and 144 (71%) were female. Tables 1 and 2 describe the demographic characteristics of the sample according to the academic phase and the sex, respectively.

For the comparison between sexes, statistically significant differences were noticed for the following variables: age, institution and academic phase. No statistically significant difference was noted between the academic phases.

Table 1. Demographic characteristics of the sample according to the academic phase.

		Students in the preclinical phase (n=75)	**Students in the clinical phase (n=128)**	**p-value**
Age (in years)	Mean ± SD (median–min.;max.)	22.00 ± 3.16 (22–18;32)	22.23 ± 5.44 (21–18;50)	0.739#
Sex	Male – n (%) Female – n (%)	22 (29.3) 53 (70.7)	37 (28.9) 91 (71.1)	0.948*
School type	Public – n (%) Private – n (%)	36 (48.0) 39 (52.0)	56 (43.8) 72 (56.3)	0.557*

*Chi-square test; #t test for independent samples.

Table 2. Demographic characteristics of the sample according to the sexes.

		Male	**Female**	**p-value**
Age (in year)	Mean ± SD (median–min.;max.)	22.19 ± 5.06 (21.5–18;50)	22.13 ± 4.58 (21–18;50)	0.933#
Academic phase	Preclinical phase – n (%) Clinical phase – n (%)	22 (37.3) 37 (62.7)	53 (36.8) 91 (63.2)	0.948*
School type	Public – n (%) Private – n (%)	30 (50.8) 29 (49.2)	62 (43.1) 82 (56.9)	0.311*

**Chi-square test; #t test for independent samples.

DES Instrument

Table 3 presents the scores on the DES instrument according to its domains in the comparison between academic phase and sex. All the domains presented statistically significant differences between groups. The overall mean scores also showed statistically significant differences because the students in the preclinical phase demonstrated lower scores (76.20 ± 15.65) than students in the clinical phase (89.48 ± 19.52).

Regarding the comparison between sex, only the domains "academic performance" and "difficulties and insecurities about their professional future" demonstrated significant differences because the female sex presented higher scores in both domains. The total score, for the comparison between sex, was 79.15 (± 17.07) for males and 86.79 (± 19.70) for females, and this difference presented statistical significance (p = 0.006)

Table 3. Scores obtained in the different academic phases and sexes in the DES instrument.

DES – domains	Preclinical phase	Clinical phase	Male	Female
Academic performance	26.79 (5.79)*	28.95 (6.21)*	26.75 (5.30)*	28.72 (6.37)*
Difficulties and insecurities about their professional future	13.53 (4.12)*	15.40 (5.26)*	12.86 (4.64)*	15.47 (4.87)*
Responsibilities with patients	5.36 (2.16)*	9.81 (2.73)*	7.86 (3.17)	8.28 (3.38)
Personal and institutional factors	16.87 (4.28)*	20.30 (5.61)*	17.85 (4.67)	19.52 (5.69)
Interpersonal relationships	13.65 (4.58)*	15.02 (4.67)*	13.83 (5.00)	14.80 (4.51)
Total scores	76.20 (15.65)*	89.48 (19.52)*	79.15 (17.07)*	86.79 (19.70)*

* $p < 0.05$ for the comparisons between academic phases or sex. The values are expressed as mean (standard deviation).

PGWB Instrument

Regarding the comparison between academic phases, only two domains ("anxiety" and "general health") presented significant differences between groups, and higher scores were found in the groups of the preclinical phases than with the students in the clinical phase in the PGWB instrument. The differences in the total mean scores between students in the preclinical (63.24 ± 12.85) and clinical (59.09 ± 14.65) phases were statistically different (p = 0.015) (table 4).

The comparison between sexes in the PGWB instrument showed significant differences in four domains (depressed mood; self-control; general health; vitality). In all domains, the female sex presented significantly lower scores, demonstrating a higher impact on the psychological well-being. The total mean scores for male (65.36 ± 15.45) and female (58.68 ± 13.10) also significantly different (p = 0.002) (table 4).

SF-36 Instrument

In relation to the SF-36, significant differences in four domains related to the academic phases were detected. Again, students in the

preclinical phase presented significantly lower scores than those in the clinical phase. The domains were "physical functioning," "role-physical," "bodily pain" and "social functioning" (table 5).

Table 4. Scores obtained according to academic phases and sexes by the PGWB instrument.

PGWB – domains	Preclinical phase	Clinical phase	Male	Female
Anxiety	13.01 (3.79)*	11.63 (4.91)*	13.08 (5.10)	11.76 (4.29)
Depressed mood	10.15 (2.94)	9.49 (3.12)	10.70 (3.16)*	9.34 (2.95)*
Positive well-being	10.63 (2.72)	10.87 (3.39)	11.25 (3.14)	10.58 (3.14)
Self-control	9.33 (2.46)	9.55 (2.77)	10.12 (2.63)*	9.21 (2.64)*
General health	9.72 (1.97)*	8.04 (2.78)*	9.38 (2.50)*	8.37 (2.65)*
Vitality	10.40 (2.63)	9.50 (3.11)	10.83 (3.35)*	9.42 (2.70)*
Total scores	63.24 (12.85)*	59.09 (14.65)*	65.36 (15.45)*	58.68 (13.10)*

* $p < 0.05$ for the comparisons between academic phases or sex. The values are expressed as mean (standard deviation).

Table 5. Scores obtained according to academic phases and sexes by the SF-36 instrument.

SF-36 – domains	Preclinical phase	Clinical phase	Male	Female
Physical functioning	78.80 (17.47)*	72.22 (21.52)*	75.85 (20.37)	74.17 (20.36)
Role-physical	49.00 (29.48)*	39.96 (35.53)*	44.83 (34.34)	42.71 (33.43)
Bodily pain	70.65 (19.67)*	63.09 (22.18)*	67.59 (21.27)	65.22 (21.70)
General health	62.99 (17.56)	60.28 (18.47)	64.66 (17.62)	59.93 (18.23)
Vitality	47.67 (16.99)	45.98 (18.43)	51.81 (18.89)*	44.51 (17.09)*
Social functioning	64.83 (20.42)*	58.76 (21.78)*	63.36 (20.53)	60.07 (21.79)
Role-emotional	52.89 (33.82)	50.92 (40.02)	53.45 (38.46)	50.93 (37.59)
Mental health	60.64 (14.89)	58.90 (18.53)	62.48 (18.06)	58.36 (16.84)
Total score	487.47 (92.46)	449.91 (120.28)	483.60 (121.90)	455.90 (107.20)

* $p < 0.05$ for the comparisons between academic phases or sex. The values are expressed as mean (standard deviation).

Regarding the sex, only the domain "vitality" presented significant differences between groups. Male students demonstrated higher scores, with a mean score of 51.81 (± 18.89), meanwhile female students presented a mean score of 44.51 (± 17.09). There was no significant difference for the total mean score in this instrument, for both comparisons between academic phase ($p = 0.055$) or between sex ($p = 0.065$) (table 5).

4 DISCUSSION

This study aimed to verify sources of stress, psychological well-being and general health aspects in dental students from four universities in the state of Ceará. Female students and those in clinical phases of the DDS program were found to have a significant influence on their stress sources, psychological well-being and some aspects of general health when compared with male students and those in preclinical phases.

Dental students undergo considerable levels of stress during their training, which can have implications for their professional future,

emotional, physical and social well-being[20].

However, the scientific literature should have more information for identifying which phase of the course and which sex are more critically exposed to these stressors, presenting a greater impact on student psychological well-being and overall health. This research is one of the first studies that compared stressors between academic phases and sexes in Brazilian students.

With regard to comparisons between the academic phases, not only the mean value of total DES score but also the five DES domains showed statistically significant differences, with higher scores for students in the clinical phase, confirming the perception of more intense stressful sources for this group of students. The present research corroborates others that reported the longer the students are in the dental program, the more pronounced the stressors are. In addition, the increased stress levels of these students may reflect a cumulative effect or, alternatively, suggest that each progressive year of training becomes more difficult and stressful.[21] Other research carried out in five European dental programs showed that the first-year students experienced significantly lower stress intensity than those from the last year.[22] Studies conducted in other countries, such as the United States, Japan, Argentina and Turkey, have shown higher stress levels in students in clinical phases[23-26]. This study is in agreement with the latter results because it demonstrated higher intensity of perceived stress in students of the clinical phase.

However, previous research showed that students who are transitioning from preclinical to clinical phases presented higher scores related to specific stressors[4,21,27,28]. The increased demands on patient management may be another explanation for the major sources of stress perceived by students. This group of students needs to be able to present the theoretical knowledge acquired in the preclinical phase, put it into practice in patients for the first time and also needs to be responsible for patient care as well as performing more complex dental treatments[3]. The domain "responsibility to patients" in the present study showed a significant difference between the students of the different phases of the course, indicating that the student's burden related to patient care is one of the causes of the highest level of perceived stress among the group of students in the clinical phase.

The data obtained in this study, using PGWB and SF-36 questionnaires, respectively used for psychological well-being and general health analyses, respectively, indicated an unfavorable situation for students in the clinical phase. The PGWB instrument indicated significantly higher values for "anxiety" and "general health" domains, and the SF-36 instrument for "physical functioning," "role-physical," "bodily pain" and "social functioning" domains. In both tools, higher scores were found for preclinical students, which means a better perception of psychological well-being and general health.

The increased complexity of the dental program after the clinical phase begins demands physical efforts[26].

In dental clinics, many procedures require twisting and static body movements for long periods of time[27]. Students in clinical phases are more exposed to physical difficulties caused by clinical activities.

In the comparison between sexes, the "academic performance" and "difficulties and insecurity about the professional future" domains of the DES instrument showed significantly higher scores for females, indicating a higher perception of stressors than with male students. This result is in line with previous studies that indicated the sex influence on the perception of stressors, women being more vulnerable.[11,29-31].

The social construction of masculinity is reported to influence men to be less likely to report stress[31]. However, other historical, cultural and biological variables must be considered.

The reflection that Brazilian dental students are inserted into this social reality should be considered when analyzing the present results. The buildup of tasks for females can influence perceived stress related to academic performance and job market insecurities, as shown in DES data. Other studies should further investigate this social interference with perceived stress in women undergoing dental training.

The domains "depressed mood," "self-control," "general health" and "vitality", as well as the mean of total PGWB score and the "vitality" domain of the SF-36 instrument showed significant differences when comparing the sexes, with higher male scores, which indicates a better overview of psychological well-being and overall health perception for men. Sex differences may be related to cyclic fluctuations in estrogen and progesterone, which favor stress responses, making women more susceptible to anxiety and depression[32]. The significant scores of the domains cited in this study may be related to this female particularity.

The hormonal influence for women is a natural feature of the female body's own physiology, which can impact on the way she copes with stress and should not be ignored. The historical construction of dentistry in Brazil was predominantly male[33], which may make a denial of the understanding of female peculiarities as normal. Discussions within higher education institutions on this subject can promote understanding, thus changing this reality.

In addition to these discussions, several other strategies can be adopted to reduce the stressors of these students, such as physical exercise[34], mindfulness-based cognitive therapy[35] or the use of music therapy[36]. The literature also points out that spirituality can play an important role in better welfare states among dental students[37]. These results can be used in strategy implementations aiming to contribute to facing the stressors of dental students. However, it should be put into perspective that some of these factors are not related to academic sources, consequently eliminating all stressors is a complex task.

Despite the relevant findings, the present study has some limitations. Its cross-sectional design, which does not allow temporality, should be considered when interpreting the data. In addition, a high external validity may not be identified because the recruitment strategy for this research relied only on sending e-mails and contacts on social networks. Nevertheless, the two power calculations for both comparisons showed an estimated power of approximately 80% or greater. Therefore, the number of included students was considered adequate.

5 CONCLUSIONS

Preclinical and male students had lower stress perception, better psychological well-being and better perception of their overall health than the clinical and female students, respectively. However, more studies are needed to evaluate and understand better the consequences of stressors in dental students, contributing to improvements in the dental education system.

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RESUMO

Fontes de estresse, bem-estar psicológico e saúde entre estudantes de Odontologia: uma comparação entre fases pré-clínica e clínica e entre os sexos

O objetivo do estudo foi avaliar bem-estar psicológico, saúde geral e fontes de estresse de estudantes de Odontologia de quatro cursos, comparando as fases pré-clínica e clínica e os sexos. Três instrumentos foram aplicados: Dental Environment Stress (DES), Psychological General Well-Being Index (PGWB) e Health Survey (SF-36), respondidos por 203 estudantes, sendo 75 (37%) em fase pré-clínica e 128 (63%) em clínica. Desses, 59 (29%) eram homens e 144 (71%) mulheres. As comparações foram realizadas pelo teste de Mann-Whitney, adotando um nível de significância de 5%. Nos domínios analisados pelo DES (performance acadêmica; dificuldades e inseguranças sobre o futuro profissional; responsabilidade com pacientes; fatores pessoais e institucionais; relações interpessoais), estudantes em fase pré-clínica demonstraram escores significativamente menores quando comparados a estudantes em fase clínica. No escore total de PGWB e em dois domínios (ansiedade e saúde geral), observou-se também escores menores em estudantes em fase pré-clínica. Quatro domínios do SF-36 (dor corporal, funcionamento físico, funcionamento social e papel físico), apresentaram significativa melhor saúde geral dos estudantes em fase pré-clínica. Entre os sexos, dois domínios do DES (performance acadêmica, dificuldade e insegurança sobre o futuro profissional) mostraram menores fatores estressores para o sexo masculino. O PGWB demonstrou diferença significativa em quatro domínios (estado deprimido; autocontrole; saúde geral; vitalidade), com melhor bem-estar psicológico para homens. O sexo masculino apresentou melhor vitalidade no domínio do SF-36. Concluiu-se que estudantes em fase pré-clínica e do sexo masculino demonstraram menores fontes de estresse, melhor bem-estar psicológico e percepção de saúde geral.

Descritores: Saúde Mental. Saúde. Estresse Ocupacional. Estudantes de Odontologia.

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