Anxiety and Sleep Quality in Dental Students at a Private Brazilian University

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Abstract

The aim of this cross-sectional study was to evaluate the impact of anxiety and quality of sleep on quality of life (QOL) in undergraduate dental students. A total of 141 students were enrolled. All were required to answer the following questionnaires: the State-Trait Anxiety Inventory (STAI) subscale state (S) (STAI-S); the Sleep Assessment Questionnaire (SAQ); and the simplified World Health Organization Quality of Life survey (WHO QOL-bref). The statistical analysis included univariate and bivariate analyses and Poisson regressions. The mean age of the participants was 22.9 (SD = 5.2) years; 81.6% were women, and 37.6% studied during the morning shift. The mean STAI-S score was 50.3 (SD = 9.4). Sleep problems, classified as “always” or “frequently”, were reported by 11.3% and 18.4% of the sample, respectively. Quality of life had a mean score of 13.2 (SD = 2.0). The STAI-S and SAQ scores showed a significant association with all WHOQOL-bref dimensions ($p < 0.05$). Analyses performed using multivariate regression and the highest STAI-S score (RR = 1.46, 95%CI = 1.03–2.06) and SAQ (RR = 1.39, 95%CI = 1.02–1.90) demonstrated significant sleep problems, even when other variables were controlled to prevent confounding biases. In conclusion, the dental students evaluated showed high levels of anxiety and sleep disorders impacting on QOL.

Key words: Anxiety — Cross-sectional study — Higher education — Sleep disorders

Introduction

One of the common problems faced by people throughout life is anxiety. The prevalence of anxiety is higher in students than in the general population²²⁾. Many students reported academic study to be stressful^{13,20)}.

Time demands, the pressure to learn, the volume of information to be assimilated, the expectation of a high income, the lack of time for social and physical activities, poor diet, and a lack of experience of dealing with sick people and death have been identified as potential factors in the onset of depressive

symptoms in the learning environment^{15,38,39}.

A number of academic scenarios have been demonstrated as being potentially contributory to the development of stress. These include academic assessments, deadlines, the performance and presentation of papers, criticism, difficulties in understanding professors' explanations, and extra-curricular activities³⁹. In addition, adaptation to new situations, such as the city environment, housing, and distance from the family, are also known stressors⁴¹.

The student population has been identified as being psychologically vulnerable, with women especially so^{11,15,21-23}. One cross-national study encompassing 19 universities in 8 countries revealed that 42.9% of the sample reported at least one mental disorder¹¹. The prevalence of undergraduates in Brazil with some type of psychological disorder is high, reaching 50%²⁷. One systematic review revealed that dental students also suffer from stress¹⁷.

According to the "Fórum Nacional de Pró-Reitores de Assuntos Comunitários e Estudantis" (National Forum of Pro-Rectors of Community and Student Affairs) in 2011, 47.7% of students reported various forms of psychiatric disorder³. In 2014, this value, evaluated as "emotional difficulties that may have interfered in their academic life in the last 12 months", reached 79.8%, which is extremely high⁴. This same study revealed that 32% had insomnia, and almost 60% had anxiety.

The State-Trait Anxiety Inventory (STAI) was developed to investigate anxiety, and was first introduced by Spielberg *et al.* in 1970⁴³. Indicated for the analysis of an individual's general and momentary states of anxiety, it has been used with university students¹¹.

Sleep alterations are also frequently found in university students, commonly presenting as irregular sleep. Moreover, evidence supports an association between such altered sleep patterns and anxiety levels in the life of the university student³⁶. In addition, overall sleep quality has been associated with mental health³². The Sleep Assessment Questionnaire (SAQ) is an instrument developed to

evaluate this particular correlation¹³.

A relationship has been suggested among sleep disturbances, anxiety, and quality of life (QOL) in young people^{34,45}, and particularly in university students⁴¹. Quality of life is a multidimensional and subjective concept, involving physical, psychological, and social perceptions⁴⁷. In order to develop an instrument that captured this subjectivity, the World Health Organization (WHO) proposed the WHOQOL questionnaire. The initial version consisted of 100 questions¹⁸. This was later simplified to 26 questions (WHOQOL-bref)⁴⁶. Quality of life measured by the WHOQOL-bref showed an association with sleep disturbances^{5,29,40}.

Some studies have reported that this observed association between anxiety and sleep disorders directly affects a student's QOL, noting that it is therefore necessary to determine suitable support mechanisms for students aimed at helping them cope with the types of challenging situation that they will encounter during the course of their training^{5,17}. In light of the above, the aim of this study was to evaluate the impact of anxiety and quality of sleep on QOL in undergraduate students of dentistry at Universidade Positivo, Curitiba, Brazil.

Materials and Methods

This study was approved by the Ethics Committee in Research with Human Beings of Universidade Positivo (register no. 1,678,805), and the procedures used met the protocols stipulated in the ethical guidelines set out in the Declaration of Helsinki.

1. Sample selection

This was an observational, cross-sectional study employing quantitative analysis. A total of 141 full-time students at the Faculty of Dentistry at Universidade Positivo (from among a total of 152) were enrolled in the study. All were aged 18 years or over; both sexes and students working both shifts (day or night) were included. Recruitment was carried out

in March 2017.

All the study participants signed a Free and Informed Consent Form. Students who reported having an impediment at the time of completing questionnaires were excluded.

2. Data collection instruments

Two previously validated questionnaires were used to assess anxiety and quality of sleep. They were applied *via* Google®. The STAI was used to evaluate anxiety. This instrument has a version translated and adapted for Brazil¹⁰. This is a self-assessment questionnaire consisting of two subscales: Trait STAI and State STAI (STAI-S). The anxiety trait refers to how the individual usually feels, while the state of anxiety reflects a transient situation; that is, the behavior of the individual at a given moment¹².

The present study used the STAI, which comprises 20 items, with each question scored on a 4-point Likert scale, ranging from 1 (absolutely not) to 4 (very much). The response is based on how the participant feels “now, at this time”. The total score is obtained by the sum of the scores, which can range from 20 to 80^{10,43}. For the purpose of analysis, the total gross score was divided into quartiles.

The SAQ was used to evaluate quality of sleep. This consists of 17 items that evaluate sleep experience over the last 30 days¹³. Each item is rated on a 5-point scale, where 0 represents “never or never”; 1 represents “rarely”; 2 represents “sometimes”; 3 represents “often”; and 4 represents “always”. The total score was calculated as the sum of the values of all items; division into quartiles was also performed.

The original WHOQOL-bref, which comprised 26 questions⁴⁶, was adapted and validated for the Portuguese language of Brazil¹⁹, which was considered as a dependent variable. This version contains 2 general questions on QOL, while each of the remaining 24 is representative of a particular facet thereof. In this way, each domain (physical, psychological, personal relations, and the environment) may be explored⁴⁶. The responses fol-

low the Likert-type pattern: “very bad to very good” (rating scale); “very unsatisfied to very satisfied” (ratingscale); “nothing to extremely” (intensity scale); “nothing to completely” (scale of capacity); and “never to always” (frequency scale). Each domain consists of questions that correlate with answer scores ranging from 1 to 5. The higher the score, the better the perception¹⁸. The total score for each individual was accounted for and dichotomized by the median as better (WHOQOL>14) or worse (WHOQOL≤14). The dimensions and their gross scores were also considered in the analysis.

The independent variables collected were as follows: age (in years), which was dichotomized by the median (≤21 and >21); sex (male or female); years of study (1st, 2nd–3rd, and 4th–5th); and shift (morning or night).

3. Statistical analysis

The data were initially subjected to descriptive analysis. For the evaluation of STAI-S and SAQ, the variables were divided into 4 classes according to the quartiles. The Kruskal-Wallis and Mann-Whitney *U* tests were performed for comparisons between demographic and school variables, and for the WHOQOL (gross score) domains. The Poisson regression model was used in bivariate and multivariate analyses in order to determine associations between the outcome (better or worse QOL) and the independent variables. For inclusion in this model, *p*-values of <0.20 from the bivariate analyses were considered.

The statistical analysis was performed using the Statistical Package for the Social Sciences (IBM® SPSS®, Armonk, USA), version 21.0. Significance was set at *p*<0.05.

Results

The response rate was 92.8%. The mean age was 22.9 (SD=5.2) years, with women predominating (81.6%). Students working the morning shift occupied the highest percentage (62.4%).

When asked whether they felt anxiety,

Table 1 Association between demographic and school variables, anxiety, and sleep quality among students at a private Brazilian university.

Variables	STAI-S				p-value*	SAQ				p-value
	31–42.5 n (%)	42.6–49 n (%)	49.1–56.5 n (%)	56.6–76 n (%)		27–38 n (%)	38.1–45 n (%)	45.1–52 n (%)	52.1–64 n (%)	
<i>Age</i>										
≤21	19 (54.3)	26 (66.7)	15 (46.9)	16 (45.7)	0.247	20 (55.6)	20 (55.6)	21 (58.3)	15 (45.5)	0.726
>21	16 (45.7)	13 (33.3)	17 (53.1)	19 (54.3)		16 (44.4)	16 (44.4)	15 (41.7)	18 (54.5)	
<i>Sex</i>										
Male	6 (17.1)	8 (20.5)	8 (25.0)	4 (11.4)	0.530	10 (27.8)	4 (11.1)	6 (16.7)	6 (18.2)	0.327
Female	29 (82.9)	31 (79.5)	24 (75.0)	31 (88.6)		26 (72.2)	32 (88.9)	30 (83.3)	27 (81.8)	
<i>Years of study</i>										
2nd–3rd	26 (74.3) ^a	25 (64.1) ^a	12 (37.5) ^a	15 (42.9) ^a		20 (55.6)	22 (61.1)	17 (47.2)	19 (57.6)	
1st	3 (8.6) ^{a, b}	4 (10.3) ^a	4 (12.5) ^{a, b}	5 (14.3) ^a	0.039	3 (8.3)	4 (11.1)	5 (13.9)	4 (12.1)	0.917
4th–5th	6 (17.1) ^b	10 (25.6) ^a	16 (50.0) ^b	15 (42.9) ^a		13 (36.1)	10 (27.8)	14 (38.9)	10 (30.3)	
<i>Shift</i>										
Morning	18 (51.4)	30 (76.9)	20 (62.5)	20 (57.1)	0.126	28 (77.8)	17 (47.2)	21 (58.3)	22 (66.7)	0.053
Night	17 (48.6)	9 (23.1)	12 (37.5)	15 (42.9)		8 (22.2)	19 (52.8)	15 (41.7)	11 (33.3)	

Note: Kruskal-Wallis and Mann-Whitney *U* tests. Bold values and different letters indicate statistically significant difference ($p < 0.05$).

37.6% of the students indicated “extremely”, 31.9% “rather”, and 24.8% “a little”. The mean STAI-S was 50.3 (SD = 9.4).

Concerning sleep disorders, 11.3% responded “always”, 18.4% “frequently”, and 34.0% “sometimes”. A total of 10.6% of the students reported “always” when asked if they used medication to achieve better sleep.

The mean crude score and standard deviation of WHOQOL-bref were 13.2 (SD = 2.0). The dimensions and their respective mean values were: physical D1 (12.6), psychological D2 (13.3), social relations D3 (14.1), and environment (13.2).

Table 1 shows the associations between the

demographic and school variables, as evaluated using the STAI-S and SAQ outcomes. Students in the first and last years showed more anxiety than those of the 2nd–3rd years ($p < 0.05$). Regarding quality of sleep, there was no significant difference between the morning and night shifts ($p = 0.053$). This result was considered borderline.

Table 2 shows the results of association tests between the WHOQOL-bref domains and other variables. Students in the first and last year showed a significant difference ($p = 0.038$) in the psychological dimension. The variable, “global quality of life and general health perception”, was also significantly associated with

Table 2 Association between WHOQOL-bref domains and demographic, school, anxiety, and sleep variables among students at a private Brazilian university.

Variables	D1 median (min.–max.)	D2 median (min.–max.)	D3 median (min.–max.)	D4 median (min.–max.)	Global quality of life and general health perception
<i>Age</i>					
≤21	13 (7–18)	13 (7–18)	15 (5–20)	14 (8–18)	16 (8–20)
>21	12 (5–18)	14 (7–19)	15 (4–20)	13 (6–18)	16 (6–20)
p-value*	0.859	0.917	0.855	0.056	0.221
<i>Sex</i>					
Male	14 (8–17)	15 (9–19)	15 (8–20)	14 (8–18)	16 (6–20)
Female	13 (5–18)	13 (7–18)	15 (4–20)	13 (6–18)	16 (6–20)
p-value*	0.118	0.093	0.441	0.515	0.510
<i>Years of study</i>					
2nd–3rd	13 (5–18)	14 (7–18) ^b	15 (4–20)	14 (6–18)	16 (6–20)
1st	13 (9–15)	12.5 (9–19) ^a	15.5 (5–20)	13.5 (9–18)	15 (8–18)
4th–5th	13 (6–17)	13 (7–17) ^a	15 (7–20)	13 (6–18)	16 (6–20)
p-value*	0.468	0.038	0.962	0.689	0.516
<i>Shift</i>					
Morning	13 (6–17)	14 (7–17)	15 (5–20)	14 (6–18)	16 (6–20)
Night	13 (5–18)	13 (7–19)	15 (4–20)	13 (6–18)	14 (6–20)
p-value*	0.405	0.231	0.753	<0.001	0.007
<i>STAI-S (quartiles)</i>					
31–42.5	15 (10–18) ^a	15 (12–19) ^a	16 (9–20) ^a	14 (9–18) ^a	16 (12–20) ^a
42.6–49	13 (9–18) ^{ab}	14 (10–17) ^{ab}	15 (5–20) ^a	14 (9–18) ^{ab}	16 (10–20) ^a
49.1–56.5	13.5 (9–17) ^b	13 (8–16) ^b	15 (7–20) ^a	13 (8–18) ^b	16 (6–20) ^a
56.6–76	10 (5–14) ^c	11 (7–15) ^c	12 (4–16) ^b	12 (6–17) ^c	14 (6–18) ^b
p-value*	<0.001	<0.001	<0.001	<0.001	<0.001
<i>SAQ (quartiles)</i>					
27–38	14 (11–18) ^a	15 (10–18) ^a	15 (5–20) ^a	14 (9–18) ^a	16 (12–20) ^a
38.1–45	14 (10–18) ^a	14.5 (8–19) ^{ab}	15 (8–20) ^a	14 (9–17) ^a	16 (10–20) ^a
45.1–52	12 (7–15) ^b	13 (8–16) ^b	15 (7–19) ^{ab}	13 (8–18) ^a	16 (6–18) ^a
52.1–64	10 (5–15) ^c	11 (7–17) ^c	13 (4–20) ^b	11 (6–17) ^b	12 (6–16) ^b
p-value*	<0.001	<0.001	0.011	0.002	<0.001

Note: Kruskal-Wallis and Mann-Whitney *U* tests. Bold values and different letters indicate statistically significant difference ($p < 0.05$).

D1: physical domain; D2: psychological domain; D3: personal relations; D4: environment.

shift ($p = 0.007$).

Anxiety (STAI-S) and sleep problems

(SAQ) were significantly associated ($p < 0.05$)

with all dimensions analyzed.

Table 3 shows the results of the bivariate and multivariate analyses, and indicates means of better and worse QOL outcomes in association with the independent variables surveyed.

The independent variables in STAI-S and SAQ showed a significant correlation with the dependent variables, even after adjustment, which indicates that higher values in either are associated with worse QOL.

Discussion

The aim of this study was to evaluate the impact of demographic, school, anxiety, and quality of sleep quality on self-perception of QOL in students undertaking a graduate dentistry course at a private Brazilian university. The analyses showed that students who were more anxious and had worse quality of sleep scores reported poorer QOL.

Earlier studies identified a number of factors as being contributory to an increase in depressive symptoms among students, and these included excessive pressure to study and assimilate large volumes of information, a lack of time, and poor nutrition^{4,15,38,39}. One systematic review revealed that stress in dental students was mainly due to the demanding nature of the training involved, something that differentiated them from students undertaking other courses¹⁷.

The vulnerability of university students is a reality^{3,4}, and this has been reported to be especially the case in women^{11,15,21–23}. The results of the present study support this earlier finding, with women, who comprised the majority of the study participants, showing higher levels of anxiety.

Dentistry students showed higher levels of anxiety than students undertaking other health-related courses⁴². One study showed that dental academics showed high levels of anxiety and depression, as well as more difficulties in interpersonal relationships⁷. The present study also found a marked prevalence of students reporting high levels of anxiety.

Poor sleep quality among university stu-

dents is a relevant problem²⁴. In the present study, almost 30% of the sample reported some form of sleep disorder, ranging from “always” to “frequently”. Earlier studies on medical students reported a prevalence of sleep disorders of 42.3%²⁶ and 38.9%³¹.

One study noted that excessive use of technology has an impact on quality of sleep due to the marked changes in lifestyle it encourages, with this being especially evident in the academic environment⁴⁴. Harmful behaviors such as irregular bedtimes, prolonged naps during the day, alcohol use, and studying in bed can also have a negative impact on sleep²⁴.

Pascotto *et al.* reported that 10.3% of students used medication to regulate sleep³⁵. This finding was supported by that of the present study, with 10.6% of the study participants answering “always” to use of sleep medication. This value was higher than that observed in medical students in an earlier study, where only 8.6% reported using sleep medication¹⁶. This highlights the seriousness of this problem, as many dental students appear to self-medicate without seeking proper medical advice.

The STAI was used in the present study as it has already been used in investigations targeting university students¹¹. The subscale STAI-S evaluates the behavior of an individual at a given moment⁴³. The psychometric properties of the STAI were considered adequate in a recent study³³. The minimum value for the sum of the scores with this particular instrument is 20. In the present study, however, the minimum score was 31. One earlier study considered that values of 31 to 49 indicated moderate anxiety³⁷. This suggests that there were no cases of only mild anxiety in the present study. This justifies the methodological choice of dividing this variable into quartiles, in addition to the fact that its distribution allowed this consideration.

The SAQ variable was dichotomized in the present study, a procedure adopted by other investigators⁴⁸. The analysis of sub-scores was not considered in this study¹⁴.

Differences were found in level of anxiety depending on years of study. Halboulb *et al.*²¹

Table 3 Results of Poisson regression model, adjusted and not adjusted for WHOQOL-bref outcome, and demographic, school, anxiety and sleep variables among students at a private Brazilian university.

Variables	WHOQOL		Bivariate		Multivariate	
	>14 n (%)	≤14 n (%)	Unadjusted p-value	PR (95%CI)	Adjusted p-value	PR (95%CI)
<i>Age</i>						
≤21	18 (50.0)	58 (55.2)		1.00	—	—
>21	18 (50.0)	47 (44.8)	0.589	0.95 (0.78–1.15)	—	—
<i>Sex</i>						
Male	11 (30.6)	15 (14.3)		1.00		1.00
Female	25 (69.4)	90 (85.7)	0.045	1.35 (0.78–2.34)	0.063	0.74 (0.54–1.02)
<i>Years of study</i>						
2nd–3rd	25 (69.4)	53 (50.5)		1.00		1.00
1st	2 (5.6)	14 (13.3)	0.039	1.29 (1.01–1.64)	0.131	1.17 (0.95–1.44)
4th–5th	9 (25.0)	38 (36.2)	0.099	1.19 (0.97–1.46)	0.503	1.07 (0.88–1.30)
<i>Shift</i>						
Morning	24 (66.7)	64 (61.0)		1.00	—	—
Night	12 (33.3)	41 (39.0)	0.533	1.06 (0.88–1.29)	—	—
<i>STAI-S (quartiles)</i>						
31–42.5	17 (47.2)	18 (17.1)		1.00		1.00
42.6–49	11 (30.6)	28 (26.7)	0.083	1.40 (0.96–2.04)	0.107	1.34 (0.94–1.91)
49.1–56.5	7 (19.4)	25 (23.8)	0.027	1.52 (1.05–2.20)	0.068	1.41 (0.97–2.04)
56.6–76	1 (2.8)	34 (32.4)	<0.001	1.89 (1.36–2.62)	0.034	1.46 (1.03–2.06)
<i>SAQ (quartiles)</i>						
27–38	15 (41.7)	21 (20.0)		1.00		1.00
38.1–45	15 (41.7)	21 (20.0)	1.000	1.00 (0.68–1.49)	0.701	0.93 (0.63–1.36)
45.1–52	5 (13.9)	31 (29.5)	0.013	1.48 (1.09–2.00)	0.070	1.32 (0.98–1.78)
52.1–64	1 (2.7)	32 (30.5)	<0.001	1.66 (1.25–2.20)	0.040	1.39 (1.02–1.90)

Note: p-values estimated by Poisson regression with robust and adjusted variance.
PR: prevalence ratio.

indicated that stress increased significantly as the educational level increased, corroborating the findings of Igbal *et al.*²³⁾ with medical undergraduate students. In contrast, Alonso *et al.*¹⁾ revealed that university entrance was stressful.

Benavente *et al.*⁹⁾ analyzed 151 undergraduate nursing students and identified loss of quality of sleep in the sample. The onset of the university pathway was associated with sleep problems arising from changes in routine due to an increase in the amount of time required to assimilate large volumes of information. Academics from other courses also had worse QOL scores during the early years of their studies²³⁾.

In the present study, the shift worked showed a significant association with global QOL. It should be borne in mind that those who study during the morning shift have to start early, which may have affected sleep. In addition, those who study at night usually work concomitantly. An extended awake time, together with the demands of academic activities, may also affect sleep duration²⁸⁾.

Amadeu and Justi²⁾, in 2017, evaluated QOL and the socioeconomic circumstances in 150 undergraduate and graduate students of dentistry at a public university in the State of São Paulo. They found that the domain with the best evaluation was social relations (D3), followed by psychological (D2), with the worse values for physical (D1). This ordering follows the same pattern as the findings in the current research.

The Poisson regression model, which estimates rate ratios, was selected as it is recognized as robust for cross-sectional studies⁶⁾.

This study had a number of limitations related to its cross-sectional design. This meant that the identification of causal relationships was impaired, as data collection on both exposures and outcomes was performed at a single moment in time⁸⁾.

The majority of the students analyzed showed some degree of anxiety and sleep disorders, with this negatively impacting their QOL. Actions aimed at promoting health in the academic environment are desirable, as is

identifying factors that might adversely affect it⁵⁰⁾. Some earlier studies reported that training in stress prevention was associated with a reduction in stress among undergraduate students^{25,30,51)}. Such strategies should be incorporated into health profession training programs, and include mindfulness-based intervention, relaxation, and meditation^{30,49)}.

The present results indicate that identification of potential factors in decreased QOL can help prevent this occurring by providing guidance to dental students in their decision making. Such guidance would increase awareness of the importance of regulated and rehabilitated sleep; incentivize engagement in physical activities and social interactions; reduce consumption of alcohol and sleeping medication; and decrease anxiety levels during classes; all of this acting to increase well-being during the academic period.

Conflict of Interest

The authors declare no conflict of interest related to this manuscript.

References

- 1) Alonso J, Mortier P, Auerbach RP, Bruffaerts R, Vilagut G, Cuijpers P, Demyttenaere K, Ebert DD, Ennis E, Gutiérrez-García RA, Green JG, Hasking P, Lochner C, Nock MK, Pinder-Amaker S, Sampson NA, Zaslavsky AM, Kessler RC; WHO WMH-ICS Collaborators (2018) Severe role impairment associated with mental disorders: Results of the WHO World Mental Health Surveys International College Student Project. *Depress Anxiety* 35:802–814.
- 2) Amadeu JR, Justi MM (2017) Qualidade de vida de estudantes de graduação e pós-graduação em Odontologia. *Arch Health Invest* 6: 540–544.
- 3) Associação Nacional dos Dirigentes das Instituições Federais de Ensino Superior (ANDIFES). Fórum Nacional de Pró-Reitores de Assuntos Comunitários e Estudantis (2011) Perfil socioeconômico e cultural dos estudantes de graduação das universidades federais brasileiras, FONAPRACE, Brasília.

- 4) Associação Nacional dos Dirigentes das Instituições Federais de Ensino Superior (ANDIFES). Fórum Nacional de Pró-Reitores de Assuntos Comunitários e Estudantis (2014) IV Pesquisa do perfil socioeconômico e cultural dos estudantes de graduação das instituições federais de ensino superior brasileiras, FONAPRACE, Brasília.
- 5) Bampi LNS, Baraldi S, Guilhem D, Araújo MP, Campos ACO (2013) The quality of life of medical students at the University of Brasília, Brazil. *Rev Bras Educ Med* 37:217–225.
- 6) Barros AJ, Hirakata VN (2003) Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol* 3:21.
- 7) Basudan S, Binanzan N, Alhassan A (2017) Depression, anxiety and stress in dental students. *Int J Med Educ* 8:179–186.
- 8) Belbasis L, Bellou V (2018) Introduction to epidemiological studies. *Methods Mol Biol* 1793:1–6.
- 9) Benavente SBT, da Silva RM, Higash AB, Guido LA, Costa ALS (2014) Influence of stress factors and sociodemographic characteristics on the sleep quality of nursing students. *Rev Esc Enferm USP* 48:512–518.
- 10) Biaggio AMB, Natalicio L, Spielberger CD (1977) Desenvolvimento da forma experimental em português do Inventário de Ansiedade Traço-Estado (IDATE) de Spielberger. *Arq Bras Psicol* 19:31–44.
- 11) Brenneisen Mayer F, Souza Santos I, Silveira PS, Itaquí Lopes MH, de Souza AR, Campos EP, de Abreu BA, Hoffman II I, Magalhães CR, Lima MC, Almeida R, Spinardi M, Tempiski P (2016) Factors associated to depression and anxiety in medical students: a multicenter study. *BMC Med Educ* 16:282.
- 12) Cattell RB, Scheier IH (1961) The meaning and measurement of neuroticism and anxiety, Ronald Oxford, England.
- 13) Cesta A, Moldofsky H, Sammut C (1996) The University of Toronto Sleep Assessment Questionnaire (SAQ). *Sleep Res* 25:486.
- 14) Cesta A, Moldofsky H, Sammut C (1999) The sensitivity and specificity of the Sleep Assessment Questionnaire (SAQ) as a measure of non-restorative sleep. *Sleep Med Rev* 99:1–4.
- 15) Chernomas WM, Shapiro C (2013) Stress, depression, and anxiety among undergraduate nursing students. *Int J Nurs Educ Scholars* 10:255–266.
- 16) Corrêa CC, Oliveira FK, Pizzamiglio DS, Ortolan EVP, Weber SAT (2017) Qualidade de sono em estudantes de medicina: comparação das diferentes fases do curso. *J Bras Pneumol* 43:285–289.
- 17) Elani HW, Allison PJ, Kumar RA, Mancini L, Lambrou A, Bedos C (2014) A systematic review of stress in dental students. *J Dent Educ* 78:226–242.
- 18) Fleck MPA, Leal OF, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, Pinzon V (1999) Desenvolvimento da versão em português do instrumento de avaliação de qualidade de vida da organização mundial da saúde (WHOQOL-100). *Rev Bras Psiquiatr* 21: 19–28.
- 19) Fleck MPA, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, Pinzon V (2000) Aplicação da versão em português do instrumento abreviado de avaliação da qualidade de vida WHOQOL-bref. *Rev Saude Publica* 34: 178–183.
- 20) Ghodasara SL, Davidson MA, Reich MS, Savoie CV, Rodgers SM (2011) Assessing student mental health at the Vanderbilt University School of Medicine. *Acad Med* 86:116–121.
- 21) Halboub E, Alhajj MN, AlKhairat AM, Sahaqi AM, Quadri MFA (2018) Perceived stress among undergraduate dental students in relation to gender, clinical training and academic performance. *Acta Stomatol Croat* 52:37–45.
- 22) Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C (2013) A systematic review of studies of depression prevalence in university students. *J Psychiatr Res* 47:391–400.
- 23) Iqbal S, Gupta S, Venkatarao E (2015) Stress, anxiety and depression among medical undergraduate students and their socio-demographic correlates. *Indian J Med Res* 141: 354–357.
- 24) Kang JH, Chen SC (2009) Effects of an irregular bedtime schedule on sleep quality, daytime sleepiness, and fatigue among university students in Taiwan. *BMC Public Health* 9:248.
- 25) Kuhlmann SM, Huss M, Bürger A, Hammerle F (2016) Coping with stress in medical students: results of a randomized controlled trial using a mindfulness-based stress prevention training (MediMind) in Germany. *BMC Med Educ* 16:316.
- 26) Lima PF, Medeiros ALD, Araújo JF (2002) Sleep-wake pattern of medical students: early versus late class starting time. *Braz J Med Biol Res* 35:1373–1377.
- 27) Lucchetti G, Damiano RF, DiLalla LF, Lucchetti ALG, Moutinho ILD, da Silva Ezequiel O, Kevin Dorsey J (2018) Cross-cultural differences in mental health, quality of life, empathy, and burnout between US and Brazilian medical students. *Acad Psychiatry* 42:62–67.

- 28) Maier SRO, Mattos M (2016) O trabalhar e o estudar no contexto universitário: uma abordagem com trabalhadores-estudantes. *Saúde (Santa Maria)* 42:179–185.
- 29) Marques DR, Meia-Via AMS, da Silva CF, Gomes AA (2017) Associations between sleep quality and domains of quality of life in a non-clinical sample: results from higher education students. *Sleep Health* 3:348–356.
- 30) McConville J, McAleer R, Hahne A (2017) Mindfulness training for health profession students-the effect of mindfulness training on psychological well-being, learning and clinical performance of health professional students: a systematic review of randomized and non-randomized controlled trials. *Explore (NY)* 13:26–45.
- 31) Medeiros ALD, Mendes DBF, Lima PF, Araújo JF (2001) The relationships between sleep-wake cycle and academic performance in medical students. *Biol Rhythm Res* 32: 263–270.
- 32) Milojevich HM, Lukowski AF (2016) Sleep and mental health in undergraduate students with generally healthy sleep habits. *PLoS One* 11: e0156372.
- 33) Ortuño-Sierra J, García-Velasco L, Inchausti F, Debbané M, Fonseca-Pedrero E (2016) New approaches on the study of the psychometric properties of the STAI. *Actas Esp Psiquiatr* 44: 83–92.
- 34) Paiva T, Gaspar T, Matos MG (2015) Sleep deprivation in adolescents: correlations with health complaints and health-related quality of life. *Sleep Med* 16:521–527.
- 35) Pascotto AC, Santos BRM (2013) Assessing sleep quality in health occupations students. *J Health Sci Inst* 31:306–310.
- 36) Peltzer K, Pengpid S (2015) Nocturnal sleep problems among university students from 26 countries. *Sleep Breath* 19:499–508.
- 37) Pesqueira AA, Zuim PR, Monteiro DR, Ribeiro PP, Garcia AR (2010) Relationship between psychological factors and symptoms of TDM in university undergraduate students. *Acta Odontol Latinoam* 23:182–187.
- 38) Pöhlmann K, Jonas I, Ruf S, Haerzer W (2005) Stress, burnout and health in the clinical period of dental education. *Eur J Dent Educ* 9: 78–84.
- 39) Qamar K, Khan NS, Bashir Kiani MR (2015) Factors associated with stress among medical students. *J Pak Med Assoc* 65:753–755.
- 40) Ratnani IJ, Vala AU, Panchal BN, Tiwari DS, Karambelkar SS, Sojitra MG, Nagori NN (2017) Association of social anxiety disorder with depression and quality of life among medical undergraduate students. *J Family Med Prim Care* 6:243–248.
- 41) Samaranayake CB, Arroll B, Fernando AT 3rd (2014) Sleep disorders, depression, anxiety and satisfaction with life among young adults: a survey of university students in Auckland, New Zealand. *N Z Med J* 127:13–22.
- 42) Sanders AE, Lushington K (2002) Effect of perceived stress on student performance in dental school. *J Dent Educ* 66:75–81.
- 43) Spielberger CD, Gorsuch RL, Lushene RE (1970) *Manual for the State-Trait Anxiety Inventory*, Palo Alto, Consulting Psychologist Press.
- 44) Tavernier R, Willoughby T (2014) Sleep problems: predictor or outcome of media use among emerging adults at university? *J Sleep Res* 23:389–396.
- 45) Taylor DJ, Bramoweth AD, Grieser EA, Tatum JI, Roane BM (2013) Epidemiology of insomnia in college students: relationship with mental health, quality of life, and substance use difficulties. *Behav Ther* 44:339–348.
- 46) The WHOQOL Group 1998 (1998) Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychol Med* 28:551–558.
- 47) The WHOQOL Group 1998 (1998) The World Health Organization quality of life assessment (WHOQOL): development and general psychometric properties. *Soc Sci Med* 46:1569–1585.
- 48) Unger ER, Nisenbaum R, Moldofsky H, Cesta A, Sammut C, Reyes M, Reeves WC (2004) Sleep assessment in a population-based study of chronic fatigue syndrome. *BMC Neurol* 4:6.
- 49) Van der Riet P, Levett-Jones T, Aquino-Russell C (2018) The effectiveness of mindfulness meditation for nurses and nursing students: an integrated literature review. *Nurse Educ Today* 65:201–211.
- 50) Winwood PC, Winefield AH, Lushington K (2008) The role of occupational stress in the maladaptive use of alcohol by dentists: A study of South Australian general dental practitioners. *Aust Dent J* 48:102–109.
- 51) Yusoff M (2014) Interventions on medical students' psychological health: a meta-analysis. *J Taibah Univ Med Sci* 9:1–13.

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