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 (WHOQOL-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 population. Many students reported academic study to be stressful. 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\textsuperscript{15,38,39}.

A number of academic scenarios have been demonstrated as being potentially contribu-
tory to the development of stress. These include academic assessments, deadlines, the
performance and presentation of papers, criticism, difficulties in understanding profes-
sors’ explanations, and extra-curricular activities\textsuperscript{39}. In addition, adaptation to new
situations, such as the city environment, housing, and distance from the family, are also known
stressors\textsuperscript{4}.

The student population has been identified as being psychologically vulnerable, with
women especially so\textsuperscript{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 disor-
der\textsuperscript{1}. The prevalence of undergraduates in
Brazil with some type of psychological disor-
der is high, reaching 50%\textsuperscript{47}. One systematic
review revealed that dental students also suffer
from stress\textsuperscript{7}.

According to the “Fórum Nacional de Pró-
Reitores de Assuntos Comunitários e Estudantis”
(National Forum of Pro-Rectors of Commu-
nity and Student Affairs) in 2011, 47.7% of
students reported various forms of psychiatric
disorder\textsuperscript{3}. 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 high\textsuperscript{1}. 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 \textit{et al.} in 1970\textsuperscript{43}.
Indicated for the analysis of an individual’s
general and momentary states of anxiety, it
has been used with university students\textsuperscript{11}.

Sleep alterations are also frequently found
in university students, commonly presenting
as irregular sleep. Moreover, evidence sup-
ports an association between such altered
sleep patterns and anxiety levels in the life of
the university student\textsuperscript{80}. In addition, overall
sleep quality has been associated with mental
health\textsuperscript{32}. The Sleep Assessment Question-
naire (SAQ) is an instrument developed to
evaluate this particular correlation\textsuperscript{15}.

A relationship has been suggested among
sleep disturbances, anxiety, and quality of life
(QOL) in young people\textsuperscript{31,45}, and particularly
in university students\textsuperscript{46}. Quality of life is a
multidimensional and subjective concept,
involving physical, psychological, and social
perceptions\textsuperscript{47}. In order to develop an instru-
ment that captured this subjectivity, the World
Health Organization (WHO) proposed the
WHOQOL questionnaire. The initial version
consisted of 100 questions\textsuperscript{48}. This was later
simplified to 26 questions (WHOQOL-
bref)\textsuperscript{46}. Quality of life measured by the
WHOQOL-bref showed an association with
sleep disturbances\textsuperscript{45,46}.

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
\textsuperscript{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 undergradu-
ate students of dentistry at Universidade Posi-
tivo, Curitiba, Brazil.

\section*{Materials and Methods}

This study was approved by the Ethics Com-
nittee 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.

\subsection*{1. Sample selection}

This was an observational, cross-sectional
study employing quantitative analysis. A total
of 141 full-time students at the Faculty of Den-
tistry 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 Brazil[10]. 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 moment[19].
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[10,45]. 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 days[10]. 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 questions[40], was adapted and validated for the Portuguese language of Brazil[19], 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 explored[46]. The responses follow 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 perception[19]. The total score for each individual was accounted for and dichotomized by the median as better (WHO QOL>14) or worse (WHO QOL<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,
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
Anxiety (STAI-S) and sleep problems (SAQ) were significantly associated (p<0.05) with all dimensions analyzed.

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

<table>
<thead>
<tr>
<th>Variables</th>
<th>D1 median (min.–max.)</th>
<th>D2 median (min.–max.)</th>
<th>D3 median (min.–max.)</th>
<th>D4 median (min.–max.)</th>
<th>Global quality of life and general health perception</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>≤21</td>
<td>13 (7–18)</td>
<td>13 (7–18)</td>
<td>15 (5–20)</td>
<td>14 (8–18)</td>
<td>16 (8–20)</td>
</tr>
<tr>
<td>&gt;21</td>
<td>12 (5–18)</td>
<td>14 (7–19)</td>
<td>15 (4–20)</td>
<td>13 (6–18)</td>
<td>16 (6–20)</td>
</tr>
<tr>
<td>p-value*</td>
<td>0.859</td>
<td>0.917</td>
<td>0.855</td>
<td>0.056</td>
<td>0.221</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>14 (8–17)</td>
<td>15 (9–19)</td>
<td>15 (8–20)</td>
<td>14 (8–18)</td>
<td>16 (6–20)</td>
</tr>
<tr>
<td>Female</td>
<td>13 (5–18)</td>
<td>13 (7–18)</td>
<td>15 (4–20)</td>
<td>13 (6–18)</td>
<td>16 (6–20)</td>
</tr>
<tr>
<td>p-value*</td>
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<td>0.093</td>
<td>0.441</td>
<td>0.515</td>
<td>0.510</td>
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<td></td>
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</tr>
<tr>
<td>2nd–3rd</td>
<td>13 (5–18)</td>
<td>14 (7–18)</td>
<td>15 (4–20)</td>
<td>14 (6–18)</td>
<td>16 (6–20)</td>
</tr>
<tr>
<td>1st</td>
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<td>12.5 (9–19)</td>
<td>15.5 (5–20)</td>
<td>13.5 (9–18)</td>
<td>15 (8–18)</td>
</tr>
<tr>
<td>4th–5th</td>
<td>13 (6–17)</td>
<td>13 (7–17)</td>
<td>15 (7–20)</td>
<td>13 (6–18)</td>
<td>16 (6–20)</td>
</tr>
<tr>
<td>p-value*</td>
<td>0.468</td>
<td><strong>0.038</strong></td>
<td>0.962</td>
<td>0.689</td>
<td>0.516</td>
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<tr>
<td>Shift</td>
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<td>Morning</td>
<td>13 (6–17)</td>
<td>14 (7–17)</td>
<td>15 (5–20)</td>
<td>14 (6–18)</td>
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<tr>
<td>p-value*</td>
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<td>0.231</td>
<td>0.753</td>
<td>&lt;0.001</td>
<td>0.007</td>
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<td>STAI-S (quartiles)</td>
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<td></td>
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</tr>
<tr>
<td>31–42.5</td>
<td>15 (10–18)a</td>
<td>15 (12–19)a</td>
<td>16 (9–20)a</td>
<td>14 (9–18)a</td>
<td>16 (12–20)a</td>
</tr>
<tr>
<td>42.6–49</td>
<td>13 (9–18)ab</td>
<td>14 (10–17)ab</td>
<td>15 (5–20)a</td>
<td>14 (9–18)ab</td>
<td>16 (10–20)a</td>
</tr>
<tr>
<td>49.1–56.5</td>
<td>13.5 (9–17)b</td>
<td>13 (8–16)b</td>
<td>15 (7–20)a</td>
<td>13 (8–18)ab</td>
<td>16 (6–20)a</td>
</tr>
<tr>
<td>56.6–76</td>
<td>10 (5–14)c</td>
<td>11 (7–15)c</td>
<td>12 (4–16)ab</td>
<td>12 (6–17)c</td>
<td>14 (6–18)b</td>
</tr>
<tr>
<td>p-value*</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
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<tr>
<td>SAQ (quartiles)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27–38</td>
<td>14 (11–18)a</td>
<td>15 (10–18)a</td>
<td>15 (5–20)a</td>
<td>14 (9–18)a</td>
<td>16 (12–20)a</td>
</tr>
<tr>
<td>38.1–45</td>
<td>14 (10–18)a</td>
<td>14.5 (8–19)b</td>
<td>15 (8–20)a</td>
<td>14 (9–17)a</td>
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<td>45.1–52</td>
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<td>13 (8–16)b</td>
<td>15 (7–19)b</td>
<td>13 (8–18)a</td>
<td>16 (6–18)a</td>
</tr>
<tr>
<td>52.6–64</td>
<td>10 (5–15)c</td>
<td>11 (7–17)c</td>
<td>13 (4–20)b</td>
<td>11 (6–17)b</td>
<td>12 (6–16)b</td>
</tr>
<tr>
<td>p-value*</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.011</td>
<td>0.002</td>
<td>&lt;0.001</td>
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</tbody>
</table>

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.
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. 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 courses.

The vulnerability of university students is a reality, and this has been reported to be especially the case in women. 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 courses. One study showed that dental academics showed high levels of anxiety and depression, as well as more difficulties in interpersonal relationships. The present study also found a marked prevalence of students reporting high levels of anxiety.

Poor sleep quality among university students is a relevant problem. 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% and 38.9%.

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 environment. Harmful behaviors such as irregular bedtimes, prolonged naps during the day, alcohol use, and studying in bed can also have a negative impact on sleep.

Pascotto et al. reported that 10.3% of students used medication to regulate sleep. 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 medication. 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 students. The subscale STAI-S evaluates the behavior of an individual at a given moment. The psychometric properties of the STAI were considered adequate in a recent study. 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 anxiety. 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 investigators. One earlier study considered that values of 31 to 49 indicated moderate anxiety. 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 investigators. The analysis of sub-scores was not considered in this study. Differences were found in level of anxiety depending on years of study. Halboulb et al.
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.

<table>
<thead>
<tr>
<th>Variables</th>
<th>WHOQOL</th>
<th>Bivariate</th>
<th>Multivariate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>&gt;14 n (%)</td>
<td>≤14 n (%)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>≤21</td>
<td>18 (50.0)</td>
<td>58 (55.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>&gt;21</td>
<td>18 (50.0)</td>
<td>47 (44.8)</td>
<td>0.589</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11 (30.6)</td>
<td>15 (14.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Female</td>
<td>25 (69.4)</td>
<td>90 (85.7)</td>
<td><strong>0.045</strong></td>
</tr>
<tr>
<td>Years of study</td>
<td></td>
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<tr>
<td>2nd–3rd</td>
<td>25 (69.4)</td>
<td>53 (50.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>1st</td>
<td>2 (5.6)</td>
<td>14 (13.3)</td>
<td><strong>0.039</strong></td>
</tr>
<tr>
<td>4th–5th</td>
<td>9 (25.0)</td>
<td>38 (36.2)</td>
<td>0.099</td>
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<td>Shift</td>
<td></td>
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<tr>
<td>Morning</td>
<td>24 (66.7)</td>
<td>64 (61.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Night</td>
<td>12 (33.3)</td>
<td>41 (39.0)</td>
<td>0.533</td>
</tr>
<tr>
<td>STAI-S (quartiles)</td>
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<tr>
<td>31–42.5</td>
<td>17 (47.2)</td>
<td>18 (17.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>42.6–49</td>
<td>11 (30.6)</td>
<td>28 (26.7)</td>
<td>0.083</td>
</tr>
<tr>
<td>49.1–56.5</td>
<td>7 (19.4)</td>
<td>25 (23.8)</td>
<td><strong>0.027</strong></td>
</tr>
<tr>
<td>56.6–76</td>
<td>1 (2.8)</td>
<td>34 (32.4)</td>
<td><strong>0.001</strong></td>
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<td>SAQ (quartiles)</td>
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<td>27–38</td>
<td>15 (41.7)</td>
<td>21 (20.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>38.1–45</td>
<td>15 (41.7)</td>
<td>21 (20.0)</td>
<td>1.000</td>
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<tr>
<td>45.1–52</td>
<td>5 (13.9)</td>
<td>31 (29.5)</td>
<td><strong>0.013</strong></td>
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<td>52.1–64</td>
<td>1 (2.7)</td>
<td>32 (30.5)</td>
<td><strong>0.001</strong></td>
</tr>
</tbody>
</table>

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.\textsuperscript{23} with medical undergraduate students. In contrast, Alonso et al.\textsuperscript{21} revealed that university entrance was stressful.

Benavente et al.\textsuperscript{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 studies\textsuperscript{23}.

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 duration\textsuperscript{28}.

Amadeu and Justi\textsuperscript{2}, 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 studies\textsuperscript{6}.

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 time\textsuperscript{8}.

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 it\textsuperscript{50}. Some earlier studies reported that training in stress prevention was associated with a reduction in stress among undergraduate students\textsuperscript{25,30,51}. Such strategies should be incorporated into health profession training programs, and include mindfulness-based intervention, relaxation, and meditation\textsuperscript{28,49}.

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**


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