








Factors associated with psychological stress in oral health teams of the public health system during the COVID-19 pandemic: a cross-sectional study

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The COVID-19 pandemic has impacted the well-being of all healthcare professionals. However, there are still few studies evaluating this aspect in dental professionals. **Aim:** To identify the contextual and labor-related factors associated with psychological stress in dental professionals working in public healthcare services during the COVID-19 pandemic. **Methods:** This is an analytical, cross-sectional, and observational study including 96 dental professionals who worked in public services in the municipalities of Piracicaba-SP and Poços de Caldas-MG from October 2021 to January 2022. A self-administered questionnaire was used to collect data on the independent variables [sociodemographic characteristics, health and professional conditions, self-efficacy (Generalized Self-Efficacy Scale – GSE), subjective work overload (Job Demands scale), and thoughts/feelings related to COVID-19] and the outcome (psychological stress - Kessler Psychological Stress Scale-6 - K-6). Simple and multiple logistic regressions were performed using the Stepwise method to test the associations between independent and dependent variables. **Results:** In multiple regression, professionals who were not in a relationship (OR=4.61; 95% CI: 1.05–20.17) and those with greater subjective burden (OR: 47.18; 95% CI: 5.39–413.21) were more likely to experience psychological stress ($p<0.05$). **Conclusion:** Dental professionals working in public health system with greater subjective work overload were more likely to experience greater psychological stress during the COVID-19 pandemic.

Keywords: Stress, psychological. Psychological distress. Occupational stress. Oral health. Health services. COVID-19.



Introduction

In December 2019, Chinese government agencies reported the first cases of COVID-19 disease in the city of Wuhan, and these diagnoses were associated with infection by the SARS-CoV-2 virus¹. In early 2020, the disease spread worldwide, leading the World Health Organization (WHO) to classify it, in March 2020, as a global pandemic¹.

Due to the wide spread of the SARS-CoV-2 virus worldwide, more restrictive rules on territorial mobility were adopted, and social isolation was then encouraged¹.

The upper airways are the main reservoirs of the SARS-CoV-2 virus, as it causes a respiratory infection. As a result, transmission occurs mainly via direct contact with contaminated people or surfaces, via expelled respiratory droplets by reflexes such as coughs and sneezes, in addition to aerosols^{2,3}.

Thus, health professionals, especially those in Dentistry, are among the most exposed to contact with the SARS-CoV-2 virus, as dental procedures generate contaminated aerosols⁴. Within this context of elevated stress due to a higher risk of death, the mental health of the population and healthcare professionals was greatly affected⁵⁻⁷. Studies that investigated the mental health status of these professionals, including oral health professionals, during the COVID-19 pandemic and post-pandemic, indicated associations with psychosocial conditions of stress, depression, anxiety, and episodes of insomnia^{5,8-10}. Despite this, there are still few published studies exploring this phenomenon to date in Dentistry, especially in professionals who work in the Brazilian Unified Health System (SUS)⁸⁻¹⁰.

The SUS is a complex and unique healthcare system with 33 years of existence that aims to guarantee comprehensive, universal, and free access to healthcare services for the entire Brazilian population^{11,12}. Formed by a broad healthcare network, the SUS provides individual and collective actions to promote, prevent, and recover health, covering basic, medium, and highly complex care. Among the services offered by SUS, dental care stands out with the implementation of an oral health team in primary care, in addition to the implementation of dental specialty centers and dental emergency centers^{11,12}.

Therefore, this study aimed to identify the contextual and labor-related factors associated with psychological stress in dental professionals working in public health system during the COVID-19 pandemic. We hypothesized that public dental service professionals have a high prevalence of psychological stress which is associated with social determinants, self-efficacy, subjective work overload and thoughts/feelings related to COVID-19.

Material and methods

Study design and ethical aspects

This is an analytical, cross-sectional, and observational study. The research was approved by the Research Ethics Committee of the Piracicaba Dental School – UNI-

CAMP (CAAE: 52048021.2.0000.5418). This study was conducted in accordance with the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) checklist¹³.

The study included dental professionals [dentists, oral health technicians (OHT), and oral health assistants (OHA)] who worked in public oral health services in the municipalities of Piracicaba-SP and Poços de Caldas-MG from October 2021 to January 2022.

According to the Brazilian Institute of Geography and Statistics (IBGE), the municipality of Piracicaba had an estimated population of 410,275 inhabitants in 2021, while the municipality of Poços de Caldas had 169,838 inhabitants¹⁴. During the research period, Piracicaba's public dental service had 30 Family Health Strategy teams (FHS) units and 17 Basic Health Units (BHU), in addition to two Dental Specialty Centers¹⁵. In the municipality of Poços de Caldas, the health structure had 36 FHS teams, two BHU, one prison health unit, and one Street Outreach team (Equipe de Consultório na Rua). Regarding FHS, the municipality had 12 family oral health teams and seven primary care oral health teams in the conventional model. In specialized care, the municipality of Poços de Caldas had three medical specialty centers, two Psychosocial Care Centers (CAPS), two Emergency Care Units and one Dental Specialty Center.

Data collection was carried out online, using a questionnaire prepared on the Google Forms platform, based on previous studies^{16,17}. To this purpose, an invitation was sent via email to all oral health team members (dentists, oral health technician and an oral health assistant) who worked in the SUS of the two aforementioned municipalities. As an inclusion criterion, the professional should work in the SUS and belong to one of the aforementioned professional categories, regardless of the length of time they have worked in public services. In total, 150 dental professionals from Piracicaba, SP, and 59 professionals from Poços de Caldas, MG, all working in primary care and at the Dental Specialties Center, were invited.

Psychological Stress

The outcome variable "Psychological Stress" was measured using the Kessler Psychological Stress Scale-6 (K-6)^{18,19}. This instrument consists of six items addressing anxiety and depression symptoms that a respondent may have experienced over the last month, namely: feeling "Nervous"; "Hopeless"; "Agitated or restless"; "So depressed that nothing could cheer them up"; "That everything was difficult and required a lot of effort"; "Useless or worthless." Each item is scored on a 5-point Likert scale (Always; Almost always; Sometimes; Almost never; Never), with higher values considered greater stress^{18,19}.

The K6^{18,19} can be scored in two ways (both employing the 5-point Likert scale). Using the 0–4 range for each statement (total score range 0–24), results equal to 13 or above classifies the individual as suffering from psychological stress. Using the 1–5 range for each statement (total score range 6–30), results equal to 19 or above classifies the individual as suffering from psychological stress^{18,19}. In this study the cutoff of 13 points was used.

Independent Variables

Furthermore, other questions were applied to evaluate the participants' independent sociodemographic variables, health, professional conditions, self-efficacy, subjective work overload, and thoughts/feelings related to COVID-19, based on the study by Shacham et al.¹⁷ (2020).

Contextual variables

The variables linked to sociodemographic characteristics, health and professional conditions were: sex (male/female); age (dichotomized by the median, up to 42 years old/older than 42 years); relationship status (in a serious relationship/not in a relationship); systemic diseases ("Do you suffer from chronic lung disease, moderate to severe asthma, chronic kidney disease, and are you undergoing dialysis or suffering from liver disease/serious heart conditions/conditions that can immunocompromise an individual, including cancer treatment/diabetes? – Yes/No") and dental group (dentist/OHT, OHA).

Perceived general self-efficacy

Perceived general self-efficacy was assessed using the generalized self-efficacy scale (GSE), which was translated and validated for Brazilian population by Souza and Souza¹⁶ (2004). This is a self-administered scale containing 10 statements organized according to people's self-perception. Each item is rated from 1 to 4 points—1 corresponds to "not at all true" and 4 corresponds to "exactly true"¹⁶. The total score ranges from 4 to 44 and, for our study, the sample median value (25 points) was considered to categorize individuals as having low and high levels of perceived generalized self-efficacy.

Subjective work overload

Subjective work overload was assessed using the scores from the Demands scale (short version), which includes six items assess some aspects of personal stress, namely: "I cannot deal with the contradictory demands placed on me during work"; "During work, the amount of time available for myself is insufficient"; "My work is imposing demands which I do not have the right equipment and resources to meet"; "I leave my job feeling like I have not finished all my tasks"; "I cannot perform my work satisfactorily due to the time available to do it"; "I need to perform simple tasks that prevent me from performing more sophisticated tasks." Each item is attributed a score ranging from 1 to 5 points—1 means "completely disagree" and 5 corresponds to "completely agree." The final score ranges 6–30 points¹⁷. The higher the value, the greater the subjective work overload. In this study, the professionals' scores were dichotomized, based on the sample median, into lowest (≤ 10) and highest (> 10).

COVID-19 related variables

One of the variables related to COVID-19 was: "Are you afraid of being infected with COVID-19 because of your profession?", with responses coded as 1) "Not at all"; 2) "Slightly afraid"; 3) "Quite afraid"; and 4) "Very afraid." Additionally, participants were

asked: "Do you feel you have acquired sufficient knowledge (via lectures, seminars, information leaflets, etc.) on how to maintain a safe work environment since the onset of the COVID-19 pandemic?". The response options were dichotomized into insufficient ("not at all" or "slightly" answers) and sufficient ("quite" or "very" answers). Finally, for the following question: "Do you feel that the safety measures adopted today in your workplace are useful for preventing one of your patients transmitting COVID-19 to you?" The answers were dichotomized into less useful ("no" or "somewhat useful" responses) and more useful ("are useful" or "very useful" responses). These questions were based on Shacham et al.¹⁷ (2020).

Statistical analysis

Descriptive analyses of the data were carried out using absolute and relative frequencies. Simple and multiple logistic regression models were then adjusted using the Stepwise method, for the outcome "psychological stress." Based on these models, the crude and adjusted odds ratios were estimated, with the respective 95% confidence intervals (95% CI). Model fit was assessed using the Akaike Information Criterion (AIC) and the Hosmer–Lemeshow test. The analyses were carried out using the R program²⁰, with a 5% significance level.

Results

The questionnaires were answered by 96 dental professionals, 64 (66.7%) from Piracicaba and 32 (33.3%) from Poços de Caldas.

Table 1 shows that 77.1% (n=74) of participants were females, 66.7% (n=64) were dentists, 33.3% (n=32) were assistants (OHT or OHA) and 11.5% (n=11) had some chronic disease. The mean age of the sample was 42 years (standard deviation=10.7). Notably, although 81.2% (n=78) of respondents stated that they felt they had acquired sufficient knowledge (via lectures, seminars, information leaflets, etc.) on how to maintain a safe work environment since the onset of the COVID-19 pandemic, 62.5% (n=60) were still afraid or very afraid of infecting their family with COVID-19 because of their profession. The average score for this question was 2.11.

Furthermore, 40.6% (n=39) of participants reported feeling that the safety measures adopted in their public workplace were not useful or of little use for preventing one of their patients transmitting COVID-19 to them. Regarding the outcome variable, 21 participants (22.7%) were found to suffer from psychological stress (cutoff above 13 points).

Table 1 shows that the variables "feels that the safety measures adopted are useful to prevent transmission," "subjective work overload", and "general self-efficacy" showed a significant association (OR = 3.06 95% CI: 1.13–8.33; OR= 33.57 95% CI: 4.27–263.94; OR=3.65 95% CI: 1.22–11.01, respectively; p<0.05) with psychological stress when they were studied individually (crude analyses), that is, without considering other conditions. The variables "age," "current relationship status," "fear of contracting COVID-19 from patients," and "feels that have acquired sufficient knowledge on how to maintain a safe work environment is sufficient" presented p<0.20 in individual analyses and were then evaluated in a multiple model associated with the significant variables

Table 1. Crude and adjusted analyses of independent variables with psychological stress (n=96).

Characteristic	Category	n (%)	Psychological stress		Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
			Without n (%)	*With n (%)				
Sex	Male	22 (22.9)	19 (19.8)	3 (13.6)	Ref	-	-	-
	Female	74 (77.1)	56 (75.7)	18 (23.4)	2.04 (0.54-7.68)	0.2943	-	-
Age (years)	≤42	50 (52.1)	36 (72.0)	14 (28.0)	2.17 (0.79-5.97)	0.1351	-	-
	>42	46 (47.9)	39 (84.8)	7 (15.2)	Ref	-	-	-
Chronic diseases	No	85 (88.5)	67 (78.8)	18 (21.2)	Ref	-	-	-
	Yes	11 (11.5)	8 (72.7)	3 (27.3)	1.40 (0.34-5.81)	0.6464	-	-
Current relationship status	In a serious relationship	75 (78.1)	61 (81.3)	14 (18.7)	Ref	-	Ref	-
	Not in a relationship	21 (21.9)	14 (66.7)	7 (33.3)	2.18 (0.74-6.40)	0.1566	4.61 (1.05-20.17)	0.0425
Profession	Dentist	64 (66.7)	51 (79.7)	13 (20.3)	Ref	-	-	-
	OHT or OHA	32 (33.3)	24 (75.0)	8 (25.0)	1.31 (0.48-3.57)	0.16010	-	-
Afraid of contracting COVID-19 from patients	Not at all/slight afraid	36 (37.5)	32 (88.9)	4 (11.1)	Ref	-	-	-
	Quite afraid/very afraid	60 (62.5)	43 (71.7)	17 (28.3)	3.16 (0.97-10.31)	0.0561	-	-
Feels that have gained sufficient knowledge on how to maintain a safe work environment is sufficient	Not at all/slightly	18 (18.8)	12 (66.7)	6 (33.3)	2.10 (0.68-6.50)	0.1982	-	-
	Quite/very much	78 (81.2)	63 (80.8)	15 (19.2)	Ref	-	-	-
Feels that the safety measures in the workplace are useful for preventing COVID-19	Not at all/slightly	39 (40.6)	26 (66.7)	13 (33.3)	3.06 (1.13-8.33)	0.0284	-	-
	Quite/very much	57 (59.4)	49 (86.0)	8 (14.0)	Ref	-	-	-
Subjective overload	Lower values	48 (50.0)	47 (97.9)	1 (2.1)	Ref	-	Ref	-
	Higher values	48 (50.0)	28 (58.3)	20 (41.7)	33.57 (4.27-263.94)	0.0008	47.18 (5.39-413.21)	0.0005
General self-efficacy	Lower values	51 (53.1)	35 (68.6)	16 (31.4)	3.65 (1.22-11.01)	0.0211	-	-
	Higher values	45 (46.9)	40 (88.9)	5 (11.1)	Ref	-	-	-

* Outcome event (person with psychological stress – score ≥ 13). Ref: Reference category for independent variables. OR: Odds ratio. CI: Confidence interval. AIC (empty model)=102.86; AIC (final model=96.59); Hosmer-Lemeshow test p = 0.4645.

in the individual analyses. In the multiple model, the variables “current relationship status” and “subjective overload” remained statistically significant with the outcome. Professionals who were not in a relationship (OR=4.61; 95% CI: 1.05–20.17) and had greater subjective burden (OR: 47.18; 95% CI: 5.39–413.21) were found to be more likely to present psychological stress ($p<0.05$).

Discussion

This study demonstrated that the perception of greater subjective work overload and not being in a serious relationship were statistically associated with a greater risk of dental professionals experiencing psychological stress. These results were also found by Shacham et al.¹⁷ (2020), who investigated the association between factors related to COVID-19 and high levels of psychological stress in a sample of 338 dentists and hygienists working in dental services in Israel during the COVID-19 pandemic. Furthermore, a cross-sectional study carried out by Mijiritsky et al.²¹ (2020) with 11,302 dentists in five countries during the pandemic found high levels of subjective burden and psychological distress among dentists. This result differed among countries, with Italy showing the greatest association.

Thus, the association between subjective work overload and psychological stress during the COVID-19 pandemic may be related to the difficulty of healthcare professionals in dealing with the uncertainty of the disease, fear of being infected, changes in the work process related to the pandemic, and social, cultural and environmental factors^{17,21}. García-Batista et al.²² (2021) highlight that strong stressors such as demands for urgency and speed in patient care, as well as the high demand for health-care, hinders the implementation and the use of coping strategies necessary for the health professional’s emotional control.

Regarding relationship status, the results were similar to those of other studies^{23,24} that demonstrated an association between being in a serious relationship and a lower level of psychological stress. These results suggest that people who are in a serious relationship have greater social and psychological support from their partner and/or family, which helps them cope with stressful situations.

In this study, 22.7% (n=21) of participants reported suffering from psychological stress, a higher percentage than that found by Shacham et al.¹⁷ (2020) (11.5%), which included 338 Israeli dentists and hygienists and was conducted from March to April 2020 (the initial period of the pandemic). These differences may have occurred due to several reasons. Firstly, the sample of our study was exclusively composed of professionals who worked in the public sector, while Shacham’s sample was composed of dental professionals from both public and private sectors. Differences in working conditions and control over occupational risk factors can impact workers’ psychological stress levels²⁵. An interesting finding of our study is that 40.6% of professionals reported feeling that the safety measures adopted in their workplace were not useful or of little use for preventing of one of their patients transmitting COVID-19 to them, which demonstrates that in the respondents’ opinion the public workplace is not safe enough to prevent the disease. Another possible reason may be associated to the differences between patients

treated in private and public services^{26,27}: the latter may present socio-psychological profiles that affect stress and the professional's quality of life. Notably, the fact that the percentage of dentists in our sample was greater than that in the aforementioned study (66.7% vs. 58.6%) may also explain the outcome. Considering that dentists are those in dental teams who work directly with the patients' mouth during all care sessions, they are more exposed to biological risks and, therefore, experience greater professional stress.

Although psychological stress levels were greater in our sample than in that of Shacham et al.¹⁷ (2020), the average score for the question "Are you afraid of being infected by COVID-19 because of your profession?" was lower in the former study than in the latter (2.11 vs 2.88). One of the hypotheses for this fact is that variables other than the COVID-19 pandemic were interfering with the well-being of the professionals, as observed in other studies. On the other hand, this lower score corroborates the epidemiological moment of data collection: in Shacham's¹⁷ study, the collection was carried out from March 30 to April 10, 2020, i.e., at the peak of the pandemic, whereas data collection in our study was carried out at a time when the lowest monthly number of deaths from COVID-19 was observed in 2020².

According to the study by Uhlen et al.⁷ (2021), carried out with more than 1,000 dentists in Norway during the COVID-19 pandemic, the prevention and early treatment of psychological disorders in dental professionals are essential for promoting personal satisfaction and emotional stability among workers. Furthermore, a systematic review²⁸ that investigated the performance of health professionals and their psychological conditions during the COVID-19 pandemic demonstrated that nine factors were associated with a low performance: depression, anxiety, inadequate social support, occupational stress, decreased productivity, adjustments in the workplace, financial concerns associated with changes in income and daily life, fear of transmission, and burnout/fatigue. Taken together, these findings demonstrate the importance of implementing strategies aimed at promoting mental health and emotional control in health professionals, which could improve professional performance.

In our study, although most professionals responded that they acquired sufficient knowledge for safe dental practice, most participants (62.5%) also reported being more afraid to be infected with COVID-19 because of their profession. These results demonstrate that even with a high level of knowledge and practice, the pandemic negatively impacted the mental health of dental professionals worldwide, causing them to develop feelings of fear, anxiety and chronic stress²⁹.

This study has some limitations, such as its cross-sectional design, that prevents causality verification, and the application of remote questionnaires, which can generate self-report bias since it is not possible to verify the accuracy of responses³⁰. However, this form of data collection was chosen due to the pandemic scenario, reducing selection bias and allowing the participation of professionals who were most afraid of COVID-19-infection. Moreover, the small sample size may have interfered with the strength of association and statistical significance of the analyses. In addition, the absence of more precisely defined criteria for participant selection (for example, exclusion of individuals with pre-existing psychological disorders

before the pandemic or other unassessed comorbidities) may have introduced bias into the research regarding its impact on psychological stress, potentially influencing the main outcome. Finally, the small sample size is a limitation of this, and we suggest that further studies should be carried out with larger samples.

The findings of this study can contribute to the investigation and discussion on the results of future studies about the impact of the COVID-19 pandemic on the psychological stress levels of professionals in the public dentalcare service and its consequences on mental and psychological health over time. It is expected that future studies cover larger samples and be conducted in different geographic regions, so that the results of this study can be compared or strengthened and, consequently, generalized.

In conclusion, dental professionals from public services who had greater subjective work overload and were not in a serious relationship were more likely to experience high levels of psychological stress.

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Conflict of Interest

The authors have no conflict of interest to disclose

Data availability

Datasets related to this article will be available upon request to the corresponding author.

Author Contribution

Fábio Luiz Mialhe: Conceptualization Resources, Funding acquisition, Supervision, Writing - review & editing. **Fernanda Maria Rovai Bado:** Methodology, Investigation, Data Curation. **Cristiane Maria da Costa Silva:** Investigation, Data Curation; Writing - original draft, Writing - review & editing. **Lais Renata Almeida Cezário:** Writing - original draft, Writing - review & editing. **Menachem Ben-Ezra:** Methodology, Writing - review & editing. **Eitan Mijiritsky:** Methodology, Writing - review & editing. **Maayan Shacham:** Methodology, Writing - review & editing. All authors actively participated in the manuscript's findings, revised and approved the final version of the manuscript.

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