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Factors related to occupational stress among private sector dentists in the first year of the COVID-19 pandemic

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Abstract *This cross-sectional study examined factors associated with occupational stress among 384 dentists working in the private sector in the first year of the COVID-19 pandemic in Brazil. Data were collected from August to October 2020 through an online form. Two outcomes – (1) anxiety and worry and (2) preparation and safety for work during the pandemic – constituted a proxy for occupational stress. The independent variables were grouped according to the explanatory theoretical model into individual, organisational and extra-organisational factors. Associations were tested by bivariate and multivariate logistic regression. Although prepared and confident, dentists felt anxious and worried about providing clinical care. Women, younger respondents and those who received no guidance on safety measures were more likely to report insecurity and unpreparedness. Younger professionals, those who did not participate in decision-making and who only sometimes had an assistant for four -hand work, were more likely to feel anxious and worried. In addition to individual factors, work organisation factors were associated with occupational stress among dentists in the first year of the pandemic.*

Key words *COVID-19, dentists, private sector, occupational stress*

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Introduction

COVID-19 caused irreparable damage to various sectors of society and is considered the greatest health challenge of the past 100 years[1]. Furthermore, the high capacity for adaptive mutations of the etiologic agent, the Sars-CoV-2 virus, and the emergence of new variants heighten the uncertainties regarding vaccine coverage and the end stage of the pandemic[2].

In 2020, the first year of the pandemic, guidelines issued by Brazil's national health surveillance agency (*Agência Nacional de Vigilância Sanitária*, ANVISA)[3] recommended that the main measures to be taken in dental services include suspending elective care, placing restrictions on emergency care, applying new biosecurity protocols and acquiring personal protective equipment (PPE), such as face shields and N95 or similar masks, as well as encouraging teleworking, distancing in waiting rooms and others[3].

In private dental practice, it is up to the dental employer or employee to make organisational decisions and changes, and to purchase the necessary PPE for safe care. These professionals were directly affected by the suspension of elective treatment: their earnings depend daily on their performance in carrying out procedures to maintain the profitability of their establishments[4]. The biosafety measures to be taken[5] entailed higher expenses and economic consequences of major concern to the profession[6-8].

COVID-19 brought diverse changes to the global scenario and had strong impact on dental practice, especially during the first year of the pandemic[9]. Also, private sector dentists[10] have shown greater emotional impairment than those in the public sector[9-11], possibly due to the numerous uncertainties and insecurity of employment in the private sector.

In view of the atypical problems experienced by these professionals and the concept of occupational stress (which can be defined as a physiological and psychological response to pressures and demands unrelated to workers' knowledge and skills[12]), it became important to identify possible factors causing job stress in the private sector during the pandemic period. Accordingly, this study examined for individual and organisational factors associated with occupational stress among dentists working in the private sector in the first year of the COVID-19 pandemic in Brazil.

Methods

This cross-sectional study used data from a multicentre, observational, cross-sectional study to evaluate the COVID-19 prevention and control measures adopted by dental surgeons, technicians and oral health assistants in Brazil's southern states (Paraná, Santa Catarina and Rio Grande do Sul) in response to the ANVISA recommendations for health services. Data for Paraná were obtained under the responsibility of the Universidade Estadual de Ponta Grossa and the Universidade Federal do Paraná. The study was approved by the research ethics committees of the Universidade Estadual de Ponta Grossa (CAAE certificate: 31720920.5.1001.0105, opinion 4,024,593) and the Universidade Federal do Paraná (CAAE certificate: 31720920.5.3001.0102, opinion 4,312,933).

The design followed a methodological framework for online studies (websurveys), within the limitations of a non-probabilistic, convenience sample. The research and reporting of results were guided by the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)[13].

A research form of open and closed questions was drawn up, subjected to face and content validation, assessment by eight experts in the field and a pilot study with oral health professionals from states not participating in the research. The construction and validation of the data collection instrument used for this research are described in detail in another publication[14].

The questionnaire was organised on the Google Forms platform and the link to participate was sent out by email by the regional boards of dentistry (*Conselhos Regionais de Odontologia*, CROs). The CROs resent the email 14 and 45 days after the first sending, totalling three attempts. In the same period, a wide-ranging dissemination strategy was pursued through social media. Responses to the form were monitored at all times and further dissemination strategies were implemented as needed[15].

The population of the multicentre study comprised 81,531 oral health professionals working in the three southern states in May 2020. With the study population size given by the number registered with the CROs, a non-probabilistic, convenience sample of 2,560 participants was obtained, representing a 3.1% response rate.

Participants from Paraná comprised 1,127 oral health professionals, of whom 435 worked in private dental clinics and surgeries. The sample selected for this study comprised the 384 dental

surgeons in Paraná who responded with regard to their work process in these establishments.

The survey form addressed: sociodemographic characteristics; academic background and work; biosafety and COVID-19-related work process; access to information; and perceptions regarding anxiety, worry and emotional aspects of work. Response options for questions on biosafety and work process were organised on a five-point Likert frequency scale: (1) never, (2) almost never, (3) sometimes, (4) almost always and (5) always. There was also an 'I don't know' option.

In this study, the two outcome items selected as proxy for occupational stress related to perceived anxiety and emotional aspects of work during the pandemic: (1) I feel informed and secure enough to practice dentistry properly during the COVID-19 pandemic and (2) I feel anxious and worried about working properly in my dental practice during the COVID-19 pandemic. Both offered response options on a five-point Likert scale of agreement: (1) strongly disagree, (2) partly disagree, (3) neither agree nor disagree, (4) partly agree and (5) strongly agree. They also offered the 'I don't know' response option.

For purposes of analysis, in addition to the ordinal measure, responses to the two items were dichotomised and categorised as: a) 'No' – negative and neutral responses (completely disagree, partly disagree, neither agree nor disagree); and b) 'Yes' – positive responses (partly agree and totally agree). 'I don't know' responses were considered missing (lost data). The outcomes of interest were the 'No' responses to feeling prepared and safe, and 'Yes' to feeling anxious and worried about working during the COVID-19 pandemic. These were considered proxy variables for stress symptoms.

This study is based on self-perceived stress assessment[16], and the choice of dependent and independent variables followed the explanatory theoretical model of occupational stress proposed by the World Health Organization (WHO)[17] and adapted to dental surgeons working during the pandemic (Figure 1). The proxy variables for stress symptoms include psychological and emotional factors (anxiety and worry) and cognitive and behavioural factors (secure and knowledge). The independent variables identified from the answers were listed as individual factors and extra-organisational and organisational sources of stress connected with the work process, biosafety and access to personal protective equipment (PPE).

The theoretical model described here rests on three explanatory pillars:

1) Individual characteristics: intrinsically individual possible sources of stress represented by the variables: age (dichotomised at the median into less than 39 years old and 39 years old or more), gender (male/female), time since professional qualification (10 years or less/11 to 20 years/more than 20 years), existence of a risk condition for severe COVID-19 (No/Yes) and whether COVID-19 tested (No/Yes);

2) Extra-organisational sources of stress indirectly related to the service as such and represented here by: withdrawal from practice in the pandemic (No/Yes) and access to information guidelines on dental care in health services (No/Yes); and

3) Organisational sources of stress, that is, directly work-related possible causes of stress, such as: type of work relationship (dichotomised into self-employed and other relationships), having received workplace guidance on measures to be taken during the COVID-19 pandemic (No/Yes) and a set of questions about work process organisation (suspension of elective care, participation in decision-making, reduction of workload, investigation for symptoms of respiratory infection when scheduling appointments, specification of urgency following prior clinical protocols, COVID-19 guidance from dentist to patients, use of digital tele-guidance and tele-monitoring tools), which were categorised into 'always/almost always', 'sometimes ' and 'almost never/never'. The same went for dental clinic biosafety factors (cleaning and disinfection of the environment and suction hoses at each appointment, use of sterile handpieces at each appointment, four-handed dentistry, use of the rubber dam in high-speed procedures, avoidance of aerosol-generating procedures, doffing in correct sequence at each appointment) and access to, and use of, PPE (N95/PFF2 masks and waterproof aprons in sufficient quantity, use of face shield during patient care and N95/PFF2 mask reuse in accordance with safety criteria) (Figure 1).

Lastly, the responses identified as proxy for occupational stress constituted the study outcome were the resultant of, on the one hand, sources of stress which can foster anxiety and concern and, on the other, information and conditions for safe clinical care during the pandemic (Figure 1).

The data were organised in a Microsoft Excel spreadsheet and analysed using the SPSS for Windows (version 16.0) Package for the Social Sciences statistics programme. The sample's sociodemographic, education, work and health

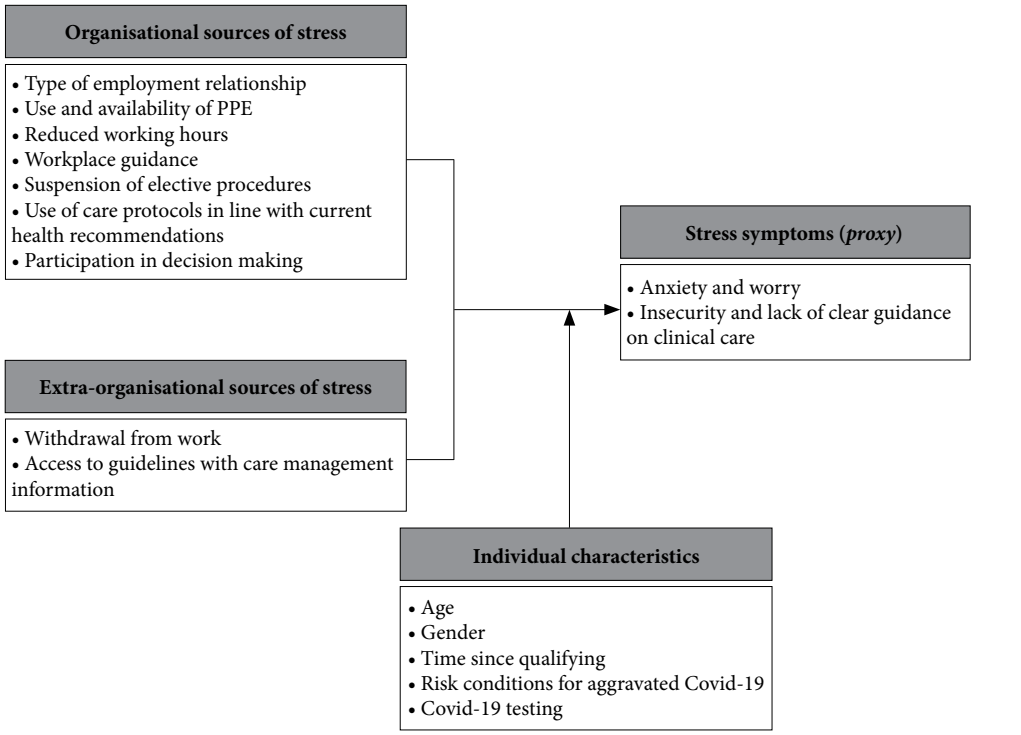

Figure 1. Proposed theoretical model for occupational stress among dentists during the COVID-19 pandemic.

Source: Adapted from Leka, Jain[17] (World Health Organization).

characteristics were analysed using descriptive statistics. Absolute and percentage frequencies were measured for categorical variables, and medians (± interquartile intervals), for numeric variables.

Associations between outcome variables were quantified using Spearman's correlation test. Bivariate associations between outcomes (proxy for occupational stress) and explanatory variables (individual, extra-organisational and organisational factors) were measured using Pearson's chi-square test, to a 5% level of statistical significance. Variables associated with each outcome with p-value ≤ 0.20 were eligible for multivariate analysis, which was performed by binary logistic regression. Results for the variables included in the multivariate explanatory model are displayed by crude and adjusted odds ratio with respective 95% confidence intervals. Years since completion of undergraduate course showed multicollinearity with age and was excluded from the analysis. Variables were included in the regression analysis by the enter method. Goodness of fit of the final model was assessed using the Hosmer and Lemershow test, with $p \geq 0.05$ indicating fit.

Results

The sample characterisation (Table 1) revealed that participants were predominantly female (74.7%) and 39 years old or less (51.0%). Most reported no risk factors for the development of severe forms of COVID-19 (90.9%) and had not yet been tested for COVID-19 (71.6%). On the other hand, most participants declared having left off working in a dental clinic during the pandemic (84.4%), having had access to official COVID-19 prevention and control guidelines (84.4%) and having received workplace guidance on measures to be taken during the COVID-19 pandemic (77.5%). Table 1 also shows that, despite the high frequency of reports of feeling prepared and safe to work properly in dentistry during the COVID-19 pandemic (78.1%), most participants reported feeling anxious and worried (64.8%).

Table 1. Absolute and percentage distribution of sociodemographic characteristics, education, work, health and reported preparedness/security of the sample of dentists working in the private sector in Paraná, August-October, 2020.

Variable (total responses)	n (%)	CI95%
Gender (n = 384)		
Female	287 (74.7)	69.8-78.9
Male	97 (25.3)	21.1-30.2
Age* (n = 384)		
Up to 39 years	196 (51.0)	45.6-56.0
40 years or older	188 (49.0)	44.0-54.4
Risk factors for severe forms of COVID-19 (n = 384)		
No	349 (90.9)	88.0-93.8
Yes	35 (9.1)	6.3-12.2
Tested for COVID-19 (n = 384)		
No	275 (71.6)	66.9-76.0
Yes	109 (28.4)	23.7-32.8
Withdrew from working at a dental clinic during the pandemic (n = 384)		
No	60 (15.6)	12.5-19.0
Yes	324 (84.4)	80.5-88.0
Had access to official COVID-19 prevention and control guidelines (from government agencies or boards of dentistry) (n = 384)		
Yes	324 (84.4)	80.5-87.8
No	27 (7.0)	4.4-9.6
Received workplace guidance on measures to be taken during the COVID-19 pandemic**		
Yes	292 (77.5)	73.2-82.0
No	85 (22.5)	18.0-26.8
Felt prepared and secure to work properly in the dental practice during the COVID-19 pandemic*** (n = 382)		
Yes	298 (78.0)	73.8-81.9
No	84 (22.0)	18.1-26.2
Felt anxious and worried about working properly in the dental practice during the COVID-19 pandemic*** (n = 381)		
Yes	247 (64.8)	60.1-69.6
No	134 (35.2)	30.4-39.9

* Categorized at the median; **Yes = I totally agree, I partly agree; No = neither agree nor disagree, partly disagree, totally disagree; Spearman's correlation coefficient between the two variables (p-value) = - 0.361 (< 0.001).
Source: Authors.

The measure most often adopted to prevent and control the spread of COVID-19, as reflected in the response 'always/almost always', was to investigate for symptoms of respiratory infection when scheduling appointments (83.4%) and the measure least applied was to suspend elective procedures and restrict care to emergencies (29.7%) (Table 2).

The biosafety measure most often taken in dental clinics, as given by 'always/almost always' responses, was for a trained professional, with appropriate PPE, to clean and disinfect the environment (80.5%), while the least applied was to avoid aerosol-generating procedures (26.6%), to use a rubber dam in high-speed treatments (32.0%), four-hand dentistry (40.1%) and to use sterile handpieces at each appointment (42.7%) (Table 2).

The PPE most commonly available and used was the face shield (85.4%) and N95/PFF2 masks were available in sufficient quantity for most participants (76.6%) (Table 2).

Table 3 shows the bivariate associations between explanatory factors of the theoretical model and the dichotomised outcome variables. As regards the individual factors, participants who felt prepared and confident were mostly male (p = 0.018), over 39 years old (p < 0.001), trained

Table 2. Sample distribution as regards taking Covid-19 prevention and control measures in the dental clinic. Private sector dentists in Paraná, August-October, 2020 (n = 384).

During the pandemic, in the workplace:	Always/Often (score 5 and 4)	Sometimes (score 3)	Almost never/ never (score 1 and 2)	Median scores*	Interquartile range*
	n (%)	n (%)	n (%)		
Organisation of the work process					
Elective procedures have been suspended and appointments are restricted to urgency/emergency.	114 (29.7)	132 (34.4)	136 (35.4)	3	2
Participated in decision-making about changes at work during the pandemic.	290 (75.5)	36 (9.4)	57 (14.9)	5	1
Respiratory infection symptoms are investigated for when scheduling appointments.	320 (83.4)	31 (8.1)	31 (8)	5	1
Emergency is defined on the basis of pre-established clinical protocols.	264 (69.2)	11 (2.9)	70 (18.2)	4	2
Digital tele-guidance or tele-monitoring tools are used.	201 (52.3)	52 (13.5)	121 (31.5)	4	3
Biosafety in the dental clinic	309 (80.5)	24 (6.3)	47 (12.2)	5	1
Environment is cleaned and disinfected by a trained professional, who has and uses appropriate PPE.	242 (63.0)	39 (10.2)	86 (22.4)	4	2
Suction hoses are cleaned and disinfected at each appointment.	164 (42.7)	65 (16.9)	150 (39.0)	3	3
Sterile handpieces are used at every dental appointment.	154 (40.1)	49 (12.8)	181 (47.1)	3	3
Four-hand dental procedures are performed.	123 (32.0)	91 (23.7)	148 (38.5)	3	2
Rubber dam is used in high-speed procedures.	102 (26.6)	92 (24.0)	189 (49.2)	3	2
Aerosol-generating procedures are avoided.	281 (73.2)	32 (8.3)	69 (18.0)	5	2
Doffing after each appointment is performed in the recommended sequence.					
Personal Protective Equipment (PPE)	294 (76.6)	26 (6.8)	62 (16.1)	5	1
Enough N95/PFF2 masks are available.	262 (68.2)	35 (9.1)	83 (21.6)	5	2
Enough waterproof aprons are available.	328 (85.4)	29 (7.6)	23 (6.3)	5	1
Face shield is used during patient care.					

* Excludes 'Don't know' answers.

Source: Authors.

more than 20 years ago ($p < 0.001$) and had some risk factor for severe forms of COVID-19 ($p = 0.044$). Women ($p = 0.015$), younger participants (up to 39 years old) ($p < 0.001$) and more recent graduates (qualified up to 10 years previously) ($p = 0.055$) reported greater anxiety and concern (Table 3).

In the block of extra-organisational work-related factors, professionals who stopped working during the pandemic were more anxious and concerned ($p = 0.020$), while those who had access to official COVID-19 prevention and control guidelines were more prepared and confident ($p = 0.050$) (Table 3).

With regard to organisational factors, participants who declared they were more prepared and confident reported receiving workplace guidance on measures to be taken during the pandemic ($p < 0.001$), always or almost always suspending elective care ($p = 0.035$) and participating in decision-making ($p < 0.001$), as well as those who reported 'always/almost always' investigating for respiratory infection symptoms when scheduling appointments ($p < 0.001$), specifying emergencies on the basis of established protocols ($p < 0.001$) and using digital tele-guidance and tele-monitoring tools ($p < 0.001$). As regards workplace biosafety measures, participants who reported feeling better prepared and safer responded that 'always/almost always': a) the environment was cleaned and disinfected by a trained professional with appropriate PPE ($p < 0.001$); b) suction hos-

Table 3. Bivariate analysis between individual and work factors and self-reported knowledge/security or anxiety/concern about working in a dental clinic during the COVID-19 pandemic. Private sector dentists working in Paraná, August-October, 2020.

Explanatory variable	Feel prepared and safe* n (%)	p-value	Feel anxious and worried* n (%)	p-value
Individual factors				
Gender		0.018		0.015
Male	84 (86.6)		53 (54.6)	
Female	214 (75.1)		194 (68.3)	
Age**		< 0.001		< 0.001
Up to 39 years	135 (69.2)		143 (73.7)	
40 years or older	163 (87.2)		104 (55.6)	
Years since qualifying (in 2020)		< 0.001		0.055
Up to 10 years	103 (68.2)		106 (70.7)	
11 to 20 years	74 (75.5)		65 (66.3)	
More than 20 years	121 (91.0)		76 (57.1)	
Risk factors for severe forms of COVID-19		0.044		0.627
No	266 (76.7)		223 (64.5)	
Yes	32 (91.4)		24 (68.6)	
Tested for COVID-19		0.150		0.530
No	219 (79.9)		175 (63.9)	
Yes	79 (73.1)		72 (67.3)	
Extra-organisational factors				
Withdrew from work at a dental clinic during the pandemic		0.685		0.020
No	44 (80.0)		31 (51.7)	
Yes	250 (77.6)		216 (67.3)	
Had access to official COVID-19 prevention and control guidelines (from government or boards of dentistry)		0.050		0.529
Yes	281 (79.2)		231 (65.3)	
No	17 (63.0)		16 (59.3)	
Organisational factors				
Type of work relationship		0.188		0.171
Self-employed	246 (79.4)		196 (63.2)	
Others	52 (72.2)		51 (71.8)	
Received workplace guidance on measures to be taken during the pandemic ***		< 0.001		0.796
Yes	244 (84.1)		186 (64.4)	
No	49 (57.8)		56 (65.9)	

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es were cleaned at each appointment ($p < 0.001$); c) sterile pens and handpieces were used at each appointment ($p < 0.001$); d) four-hand dentistry was performed ($p = 0.002$); e) aerosol-generating procedures were avoided ($p = 0.005$); f) doffing followed the recommended sequence ($p < 0.001$); g) enough N95/PFF2 masks were available ($p = 0.018$); and h) enough waterproof aprons were available ($p = 0.046$) (Table 3).

The most anxious and concerned were women ($p = 0.015$), young people (up to 39 years old) ($p < 0.001$), participants who had completed their professional training within 10 years earlier ($p = 0.055$), who withdrew from clinical work during the pandemic ($p = 0.020$) and who "always/almost always" suspended elective care ($p = 0.037$) and used a face shield ($p = 0.001$). The most anxious and concerned declared that they "never/

Table 3. Bivariate analysis between individual and work factors and self-reported knowledge/security or anxiety/concern about working in a dental clinic during the COVID-19 pandemic. Private sector dentists working in Paraná, August-October, 2020.

Explanatory variable	Feel prepared and safe* n (%)	p-value	Feel anxious and worried* n (%)	p-value
Work process organisation				
Elective procedures have been suspended and appointments are restricted to emergencies.		0.035		0.037
Always/Almost always	96 (84.2)		84 (74.3)	
Sometimes	105 (80.2)		82 (62.6)	
Almost never/Never	96 (71.1)		80 (59.3)	
Participated in decision-making about changes at work during the pandemic		< 0.001		0.010
Always/Almost always	241 (83.4)		177 (61.2)	
Sometimes	25 (71.4)		24 (68.6)	
Almost never/Never	31 (54.4)		46 (82.1)	
Respiratory infection symptoms are investigated for when scheduling appointments.		< 0.001		0.147
Always/Almost always	263 (82.7)		201 (63.4)	
Sometimes	17 (54.8)		19 (61.3)	
Almost never/Never	17 (54.8)		25 (80.6)	
Emergency is defined on the basis of pre-established clinical protocols.		< 0.001		0.562
Always/Almost always	196 (85.2)		148 (64.3)	
Sometimes	37 (82.2)		30 (66.7)	
Almost never/Never	46 (60.5)		54 (71.1)	
Digital tele-guidance or tele-monitoring tools are used		< 0.001		0.434
Always/Almost always	173 (86.5)		127 (63.5)	
Sometimes	40 (78.4)		35 (68.6)	
Almost never/Never	78 (64.5)		85 (70.2)	
Biosafety in the dental clinic				
Environment cleaned and disinfected by a trained professional using appropriate PPE.		< 0.001		0.009
Always/Almost always	256 (83.4)		188 (61.2)	
Sometimes	14 (58.3)		20 (83.3)	
Almost never/Never	25 (53.2)		37 (78.7)	

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almost never" took part in decision making (p = 0.010). Also more anxious and worried were those who answered "sometimes" with regard to a trained professional's cleaning and disinfecting the environment (p = 0.009) and four-hand dental care (p < 0.001) (Table 3).

Table 4 shows the results of multivariate analysis for feeling individually prepared and safe with regard to, and anxious and concerned about, working in a clinic during the pandemic. The final model revealed that the preparedness and safety outcome was associated with individual and organisational biosafety-related factors. Participants were less likely to feel prepared and safe regarding clinical care because of individual factors (being female and younger) and organisational factors (not receiving workplace guidance on measures to be taken during the pandemic and "almost never/never" doffing in the recommended sequence). COVID-19-related factors, such as risk factors for severe forms of the disease and laboratory testing to detect COVID-19, were of borderline statistical significance and adjusted the explanatory model.

Table 3. Bivariate analysis between individual and work factors and self-reported knowledge/security or anxiety/concern about working in a dental clinic during the COVID-19 pandemic. Private sector dentists working in Paraná, August-October, 2020.

Explanatory variable	Feel prepared and safe* n (%)	p-value	Feel anxious and worried* n (%)	p-value
Suction hoses cleaned and disinfected at each appointment		< 0.001		0.282
Always/Almost always	207 (86.2)		149 (62.1)	
Sometimes	30 (76.9)		27 (69.2)	
Almost never/Never	50 (58.1)		61 (70.9)	
Sterile handpieces used at every appointment.		< 0.001		0.306
Always/Almost always	147 (90.2)		99 (60.7)	
Sometimes	51 (78.5)		46 (70.8)	
Almost never/Never	96 (64.4)		99 (66.4)	
Four-hand dental procedures performed.		0.002		< 0.001
Always/Almost always	133 (86.9)		81 (53.3)	
Sometimes	37 (77.1)		37 (77.1)	
Almost never/Never	128 (70.7)		129 (71.3)	
Aerosol-generating procedures are avoided.		0.005		0.331
Always/Almost always	65 (90.3)		65 (63.7)	
Sometimes	70 (81.4)		65 (71.4)	
Almost never/Never	162 (72.6)		117 (62.6)	
Doffing after each service follows the recommended sequence		< 0.001		0.445
Always/Almost always	238 (85.3)		177 (63.7)	
Sometimes	25 (78.1)		24 (75.0)	
Almost never/Never	34 (49.3)		45 (65.2)	
Reuse of N95/PFF2 masks follows safety criteria		0.383		0.333
Always/Almost always	201 (78.2)		168 (65.6)	
Sometimes	38 (86.4)		31 (70.5)	
Almost never/Never	50 (75.8)		38 (57.6)	
Personal Protective Equipment (PPE)				
Enough N95/PFF2 masks available.		0.018		0.741
Always/Almost always	237 (80.9)		192 (65.5)	
Sometimes	20 (80.0)		14 (58.3)	
Almost never/Never	40 (64.5)		39 (62.9)	
Enough waterproof aprons available.		0.046		0.753
Always/Almost always	212 (81.5)		167 (64.2)	
Sometimes	27 (77.1)		24 (70.6)	
Almost never/Never	57 (68.7)		53 (63.9)	
Face shield used in patient care		0.955		0.001
Always/Almost always	254 (77.9)		222 (68.3)	
Sometimes	22 (75.9)		11 (37.9)	
Almost never/Never	19 (79.2)		12 (50.0)	
Overall prevalence	298 (78.1)		247 (64.8)	

* Answers I totally agree and partly agree; ** Categorised by median; ***Yes = I totally agree, I partly agree; No = neither agree nor disagree, partly disagree.

Source: Authors.

Table 4. Multivariate logistic regression analysis. Crude and adjusted odds ratios (OR) with 95% confidence intervals (95%CI). Explanatory model for self-report of feeling prepared and safe or anxious and worried about working in a dental clinic during the COVID-19 pandemic. Private sector dentists working in Paraná, August-October, 2020.

Explanatory variables	ORcr (95% CI)	p-value	ORadj (95% CI)	p-value
Outcome 1: feeling prepared and safe [a]				
Individual factors				
Gender				
Male	1.0		1.0	
Female	0.5 (0.2 - 0.9)	0.020	0.4 (0.2 - 0.9)	0.036
Age*				
40 years or older	1.0		1.0	
Up to 39 years	0.3 (0.2 - 0.6)	< 0.001	0.5 (0.3 - 0.9)	0.024
Risk factors for severe forms of COVID-19				
No	1.0		1.0	
Yes	3.2 (1.0 - 10.9)	0.056	3.5 (0.9 - 13.6)	0.076
Tested for COVID-19				
No	1.0		1.0	
Yes	0.7 (0.4 - 1.1)	0.151	0.6 (0.3 - 1.1)	0.108
Organisational factors				
Received workplace guidance on measures to be taken during the COVID-19 pandemic **				
No	1.0		1.0	
Yes	3.9 (2.3 - 6.6)	< 0.001	3.5 (1.9 - 6.3)	< 0.001
Biosafety in the dental clinic				
Doffing after each service follows the recommended sequence				
Always/Almost always	1.0		1.0	
Sometimes	0.6 (0.2 - 1.5)	0.291	0.8 (0.3 - 2.1)	0.632
Almost never/Never	0.2 (0.1 - 0.3)	< 0.001	0.2 (0.1 - 0.4)	< 0.001
Outcome 2: feeling anxious and worried [b]				
Individual factors				
Age*				
40 years or older	1.0		1.0	
Up to 39 years	2.2 (1.4 - 3.4)	< 0.001	2.0 (1.2 - 3.2)	0.007
Organisational factors				
Work process organisation				
Elective procedures have been suspended and appointments are restricted to emergencies.				
Always/Almost always	1.0		1.0	
Sometimes	0.6 (0.3 - 1.0)	0.051	0.5 (0.3 - 0.9)	0.025
Almost never/Never	0.5 (0.3 - 0.9)	0.013	0.3 (0.2 - 0.6)	0.001

it continues

In the multivariate model, feelings of anxiety and concern about working were found to be associated with only one individual factor – age – and with factors relating to work process organisation and biosafety in the clinic. Younger dentists, those who "almost never/never" participated in decision-making and who "sometimes" performed four-handed dental procedures were more likely to feel anxious and worried. Less likely to be anxious and worried were those who "almost never/never" suspended elective care and who "sometimes" used a face shield (Table 4).

Table 4. Multivariate logistic regression analysis. Crude and adjusted odds ratios (OR) with 95% confidence intervals (95%CI). Explanatory model for self-report of feeling prepared and safe or anxious and worried about working in a dental clinic during the COVID-19 pandemic. Private sector dentists working in Paraná, August-October, 2020.

Explanatory variables	ORcr (95% CI)	p-value	ORadj (95% CI)	p-value
Participated in decision making about changes at work during the pandemic				
Always/Almost always	1.0		1.0	
Sometimes	1.4 (0.6 - 2.9)	0.401	1.1 (0.5 - 2.5)	0.798
Almost never/Never	2.9 (1.4 - 6.0)	0.004	3.0 (1.4 - 6.7)	0.006
Biosafety in the dental clinic				
Four-hand dental procedures performed				
Always/Almost always	1.0		1.0	
Sometimes	3.0 (1.4 - 6.2)	0.004	2.6 (1.2 - 5.6)	0.020
Almost never/Never	2.2 (1.4 - 3.4)	0.001	1.6 (1.0 - 2.7)	0.054
Personal Protective Equipment (PPE)				
Face shield used in patient care				
Always/Almost always	1.0		1.0	
Sometimes	0.3 (0.1 - 0.6)	0.002	0.3 (0.1 - 0.7)	0.005
Almost never/Never	0.5 (0.2 - 1.1)	0.071	0.4 (0.2 - 1.1)	0.086

* Categorised at the median; ** Yes = I totally agree, I partly agree; No = neither agree nor disagree, partly disagree, totally disagree. [a] Measure of model fit: Hosmer and Lemeshow test (Chi square = 3.981; p = 0.782). [b] Measure of model fit: Hosmer and Lemeshow test (Chi square = 5.685; p = 0.682).

Source: Authors.

Discussion

This study showed that most dentists reported feeling anxiety and concern about working during the COVID-19 pandemic, and that individual and organisational factors were associated with occupational stress among dentists in the private sector in the state of Paraná during the COVID-19 pandemic. Studies have shown that the pandemic affected mental health adversely in the population at large[18], and especially among health personnel[19] , including private-sector dentists[10], who were more affected as compared with the emotional state of public-sector dentists[10,11], possibly because of the unpredictability inherent to economic and work conditions in the former sector.

Women are a majority among dental professionals in southern Brazil and the mostly-female sample was similar to those of most studies of dentists there, corroborating the feminisation of the profession[20,21]. Although studies have shown women to be more perceptive of mental health, the only outcomes with which gender was found to associate in this study were preparedness for, and safety at, work: more women reported feeling less prepared and safe. Although, in this study, gender was not retained in the multivariate analysis as a factor associated with anxiety, in the literature, women have been found at greater risk of anxiety during the COVID-19 pandemic[19,22]. That age showed greater impact than gender may be explained by the professional experience gained with age's fostering feelings of being informed and safe in clinical practice and, consequently, resulting in less anxiety and concern at work and mitigating the influence of gender.

In this study, most participants were in the younger age groups (median age, 39; 75% percentile, 47 years). Younger people tend to use social networks more and are more likely to respond to online surveys. With social isolation, however, the population as a whole began to make more use of these tools[23], which may justify the similar participation by different age groups. Age was the only individual factor retained in the theoretical

model in both outcomes, in which younger professionals felt less prepared and safe, and more anxious and concerned about working during the pandemic. In Turkey, recent dentistry graduates seemed to be the most affected during the pandemic[24] and a study in Paraíba State in Brazil showed greater confidence in working during the pandemic among older dentists, which can be explained by their being longer in practice and more stably established in the profession[25].

As regards the organisational factors, participants who received workplace guidance on COVID-19 reported greater confidence and preparedness for work, highlighting the importance of continuing health education for practitioners. A study in São Paulo state showed that more than 80% of dentists received no specific training to control COVID-19 transmission in the healthcare environment, although several courses were available and widely publicised[11].

Participants who did not follow the recommended sequence for doffing PPE felt unprepared and more insecure in providing care during the pandemic. Given that doffing is one of the main routes for contamination of health personnel, this procedure is as important as donning[3]. Adequate access to, and proper use of, PPE have been associated with not only physical health protection, but greater job satisfaction and lesser emotional distress[26].

Organisational factors relating to adherence to COVID-19 protocols were associated with anxiety and concern about working. Lack of participation in decision-making was associated with a greater likelihood of participants' being anxious and worried, suggesting that those employed in clinics, with fragile employment relationships, were adversely affected. This underlines the importance of team dialogue, as well as managers' role in guiding targeted measures.

Professionals who understood the importance of the adjustments were more affected emotionally, as they were more aware of the risk of infection and possibly more concerned about the consequences of contamination, as evidenced in the association between use of face shield and anxiety and concern. Lax adherence to protective measures, reflected in the "sometimes" responses with regard to four-hand care, showed that uncertainty regarding the workplace support structure can generate anxiety and concern among health personnel. Private sector care teams do not always include oral health assistants and technicians, although this can optimise the work, possibly because they represent an additional financial burden for the clinics. Nonetheless, four-hand dentistry is highly recommended and stressed during pandemics because it helps reduce the generation of aerosols, speeds up care and, consequently, reduces the risk of contamination[27].

On the other hand, participants who did not suspend elective care were less anxious and worried. With time, they had possibly grown used to the inappropriate conditions or this may even suggest carelessness and denial of the severity of the pandemic, both of which are associated with a lesser likelihood of occupational stress. A study in Poland showed that dentists who suspended their clinical work reported greater anxiety than those who continued their practice without interruption[22]. In general, however, dentists seem to have a good command of knowledge of COVID-19 and the adjustments necessary in services to minimise the risk of contamination[28].

Patient flow, in both urgent and elective care[29], has been seen to decrease in private dental services worldwide, entailing financial losses for practitioners. Also, the impact of COVID-19 on dentists' financial situation is determined by factors beyond those inherent to suspending care during a critical period of the pandemic, because the economic situation of patients who attend private dental clinics is intrinsically bound up with the country's economic situation. Accordingly, the current economic crisis in Brazil, which involves reduced purchasing power, high rates of unemployment and food insecurity, has heightened the impacts of the pandemic and aggravated this problem[30].

The findings of this study, in which participants under most occupational stress were younger, women and more recent graduates, demonstrate the existence of precarious work relations in the private dental sector. In practice, it is increasingly common for employment situations not to assure favourable conditions of care and adequate PPE, but subject dental workers' wage gains to their quantitative performance of procedures, which diminished or were abruptly stopped during the pandemic period. This thus resulted in substantial financial losses and, consequently, affected these workers' emotional health. Also, informal employment lacking guarantees has devalued and impaired working conditions. That dental practice in the supplementary health market is precarious is recognised in the literature[31], and in Brazil, it has to be acknowledged that the labour market is over-supplied with dental surgeons, as a result of the excessive number

of schools of dentistry across the country, plus a lack of market regulation and State control[31].

The findings of this study may thus be reflecting the effects of problems existing in the dental sector labour market prior to the pandemic, especially in southern Brazil, where this study took place and where, after the southeast, most of Brazil's dentists are concentrated[32]. The findings, which are grounded in the concepts of the theoretical models applied[33,34], help to explain, in part, socioeconomic points of view on occupational stress among dentists, which was aggravated during COVID-19.

Having been tested for COVID-19, although not associated at the 5% level, was an important variable in fitting the final explanatory model. This finding may be connected with uncertainty about possible infection by the disease, which would affect dentists emotionally, especially at a time when there were no proven effective drugs nor vaccines available for the disease. The sample comprised liberal professionals from the private sector, most of whom had only one job and were thus not only concerned over their own health with regard to this newly-arrived installed infectious disease, but were suffering direct impact on their financial situation from the necessary period of isolation, quarantine and resulting absence from work, which left them apprehensive and worried about the future of the profession[35,36].

Vaccination has been highly effective in controlling COVID-19[37] and may impact the responses of participants who answered the questionnaire early in the pandemic. Accordingly, the multicentre research team plans to conduct a further wave of data collection. Although the instrument used to measure occupational stress was a proxy for occupational stress and the validation of the research instrument has yet to be published, the data obtained here are consistent with findings in the literature on the subject[19,24]. Note that the data were collected between August 10 and October 7, 2020 and, given the spread of the pandemic into new phases, accentuated by the emergence of new variants of the virus, the findings should be interpreted with caution, as they may not be representative of the whole pandemic period. One limitation of this study is the bias inherent to participation in an online questionnaire by a convenience sample. However, sample calculation found that the study sample was of sufficient sise to represent the state of Paraná.

The findings of this study underline the need to build strategies to minimise the emotional impacts suffered by private sector dentists during the COVID-19 pandemic. It is the job of Brazil's federal and regional boards of dentistry to enable and encourage dental caregivers to qualify through permanent health education to afford them effective preparation and safety for working in clinical practice. It is the function of the regulatory bodies to supervise and seek to improve labour relations and working conditions in the private dental sector, so as to guarantee dentists' rights, given that these conditions are intrinsically related to the occupational stress suffered by workers, which may potentially affect their mental health.

Collaborations

EC Pacheco and LS Avais: study design, data collection and interpretation, drafting of the article. RG Ditterich, MF Silva-Junior e MH Baldani: study design, data collection and interpretation, final review of the article.

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