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Factors associated with dentists' search for oral health information during the COVID-19 pandemic

Ana Sofia BAPTISTA[a]
Alex Junio Silva CRUZ[b]
Teresa PINHO[a]
Mauro Henrique ABREU[b]
Isabela Almeida PORDEUS[c]
Júnia Maria SERRA-NEGRA[c]

[a]Instituto Universitário de Ciências da Saúde – Cespu, Gandra, Portugal.

[b]Universidade Federal de Minas Gerais – UFMG, Department of Public Health, Belo Horizonte, MG, Brazil.

[c]Universidade Federal de Minas Gerais – UFMG, Department of Pediatric Dentistry, Belo Horizonte, MG, Brazil.

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Corresponding Author:
Junia Maria Serra-Negra
E-mail: juniaserranegra@hotmail.com

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Abstract: The aim of this cross-sectional study was to evaluate the factors associated with the search by Brazilian and Portuguese dentists for oral health information on social networks during the COVID-19 pandemic. A total of 597 Brazilian and Portuguese dentists answered an online questionnaire between January 17 and 31, 2021. Respondents were asked about sociodemographic data, weight and height, hours of sleep per night, screen time for work and leisure, and where they sought information about general and/or oral health for themselves and for their loved ones and information about COVID-19. Descriptive statistics and binary regression were used for the statistical analysis. Most participants were Brazilian (62.8%) and 451 (75.5%) were female. Mean age was 42.1 years (± 12.5 years). For every lost hour of sleep, the chances of participants frequently or always searching for information about self-perceived oral health problems on lay websites increased by 1.33 times. For every additional hour spent on social networks or on the Internet, the likelihood of participants frequently searching for self-perceived oral health problems on lay websites increased by 17% (OR = 1.17; 95% CI: 1.06–1.30). Individuals who searched the Internet for information about COVID-19 symptoms before consulting their doctors were 3.85 times more likely (95% CI: 2.22–6.67) to frequently or always search for information about self-perceived oral health problems on lay websites. Dentists used lay websites to search for general and oral health knowledge during the COVID-19 pandemic, and shorter sleep duration favored screen use.

Keywords: Covid-19; Epidemiology; Dentists; Internet; Oral Health.

Introduction

Nowadays, accessing information can be as easy as raising one's finger.[1] The Internet enables access to facts, social networks, and both general and specific knowledge. This ability is increasingly available anytime and anywhere, offering access to a vast range of information.[1,2] For health professionals, this is a challenging issue, as they must both remain constantly updated and not become overwhelmed by the volume of new information created each day.[3] Understanding, searching for, and using health data is critical for decision-making.[4] However, authenticating

sources has never been so important in health-related matters. Some international sources, such as the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO), have provided evidence-based information in order to counter misinformation and information overload.[3]

Since the recent COVID-19 outbreak, online information related to oral health has proven to play a major role in health-related policymaking. During the COVID-19 pandemic, different types of oral health-related information have been shared, some of which, such as social media, may have led to the policy of suspending dental practices in the early stages of the pandemic.[5] SARS-CoV-2 is a contagious virus when present in respiratory droplets that come into contact with a healthy individual's mucosa. These droplets can be expelled from an infected individual's nose or mouth.[6-8] Although airborne transmission of COVID-19 was a possibility during the first months of the outbreak, the lack of evidence of SARS-CoV-2 transmission through dental aerosol-generating procedures led to extreme dental office protocols.[6,9]

The use of screens during social distancing has increased because of distance learning and work from home.[1] In addition to the use of screens for work, their use for leisure has also been intensified. Accessing the internet can be associated with several factors.[2,3] Habits, demographic factors, and anthropometric factors such as the body mass index (BMI) have been considered risk factors for increased consumption of online material.[10] Misleading online information about prevention has been a common phenomenon during emerging situations such as the COVID-19 pandemic. Contact with a new disease often leads health professionals to experience sleep disorders and anxiety.[3] In order to reduce anxiety and/or panic, people who are already in a vulnerable position can benefit from authentic and accurate information.[5]

In view of the uncertainties of the second wave of the COVID-19 pandemic, the aim of this study was to evaluate factors associated with the search by Brazilian and Portuguese dentists for oral health information on social networks during the COVID-19 pandemic.

Methodology

Design, population, and study sample

This cross-sectional study involved Portuguese and Brazilian dentists who agreed to answer an online questionnaire available on the Google Forms platform between January 17 and 31, 2021. During this period, both countries were facing the second wave of the COVID-19 pandemic.[6,8] Participants were recruited through a link provided via WhatsApp, Facebook Messenger, and online forums for dentists.

The present study is part of a project in which other indicators were measured. The questionnaire was structured into three sections for collection of the dentists' demographic information, general health features, and behaviors during the COVID-19 pandemic.

In order to participate in the study, each participant signed an informed consent form. Only dentists were included. Exclusion criteria were all individuals who were not dentists from Portugal or Brazil. Participants were compensated with individual educational information after answering all questions.

Data collection and variables

Participants answered a questionnaire with 13 closed-ended questions. The questionnaire collected the participants' demographic information in seven questions. The dependent variable was self-reported habit of searching for information about oral health problems on lay websites during the COVID-19 pandemic, assessed through the following question: "Do you have a habit of searching about oral health problems perceived by yourself and/or for your family members on lay Internet sites (example: Google)?" This question was developed by the investigators and had the response options "never," "rarely," "sometimes," "frequently," and "always."

The questionnaire also inquired about the number of hours participants slept each night, as well as their alcohol and tobacco consumption frequency. Height and weight were collected for later calculation of BMI.[9]

BMI was calculated by dividing an individual's weight (in kilograms) by the square of their height (in meters). According to the CDC, adult nutritional status can be divided into four categories: underweight

(below 18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obesity (above 30 kg/m^2). To simplify our analysis, in this study, the categories above 25 kg/m^2 were combined.[9] So, there were three categories for analysis: underweight, normal weight, and overweight.

Average time spent on smartphones and/or computers per day and dentists' behavior during the COVID-19 pandemic were evaluated with four questions developed by the authors. Regarding time spent on smartphones and/or computers, the questions separated work time from leisure time. Participants were asked: "For how many hours in your day, on average, do you use your smartphone and/or computer for work/meetings/distance learning?" and "For how many hours in your day, on average, do you use your smartphone and/or computer for social media/the Internet?" These questions were developed based on questions from a previous study related to smartphone overuse and productivity.[10]

This questionnaire was answered during the COVID-19 pandemic. Dentists' anxiety during this period was measured with the question "Comparing your behavior before and during the COVID-19 pandemic, how do you consider your anxiety about your health signs and symptoms and/or those of your loved ones?" Response options were "decreased," "the same," and "increased."

Regarding how dentists perceived their Internet searches about COVID-19 symptoms, the question "Have you searched the Internet about COVID-19 symptoms before consulting your physician/health professional?" could be answered "never," "rarely," "sometimes," "frequently," or "always." In order to simplify our statistical analysis, the categories "never," "rarely," and "sometimes" were clustered into one group and "frequently" and "always" into another.

Independent variables included age, years since graduation, country of residence, sex, marital status, BMI, highest educational attainment, children, alcohol and tobacco consumption, hours of sleep at night, average hours spent working on a smartphone or computer, average hours spent on a smartphone or computer using social media or the Internet, level of anxiety during the COVID-19 pandemic, and Internet searches related to COVID-19 symptoms.

Pilot study

Two Brazilian dentists residing in Portugal and two Portuguese dentists residing in Brazil for 20 years participated in the preparation of the questions, with the concern of using terms that could be understood in both countries. The instrument was tested in a pilot study, and it was found that the comprehension of the questions was positive for both Brazilians and Portuguese. A pilot study of 21 dentists (11 Brazilians and 10 Portuguese) was carried out to evaluate the proposed methodology. The results of the pilot study demonstrated that there was no need to modify the proposed methods of the main study. Pilot study participants were not included in the main study.

Ethical aspects

This study was conducted following the principles expressed in the Declaration of Helsinki (revised by the World Medical Association 2013). The study was approved by the Human Research Ethics Committee of the Federal University of Minas Gerais (Brazil) (protocol #91561018.5.0000.5149).

Results

A total of 598 dentists participated in our study. The statistical power was calculated later for the three covariables in the final model using OpenEpi (Open Source Epidemiologic Statistics for Public Health) version 3.01. Power was 62.7%, 95.5%, and 99.99%, respectively, for the covariates "Hours of sleep at night," "For how many hours in your day, on average, do you use your smartphone and/or computer for social media/the Internet?" and "Have you searched the Internet about COVID-19 symptoms before consulting your physician/health professional?"

One dentist was excluded for providing an incomplete response. Complete data were obtained from 597 dentists. Mean age was 42.1 years (SD = 12.5 years, range = 22–77 years), and 451 respondents (75.5%) were female. Almost 73% (62.8%) of our sample was Brazilian, and 361 respondents were married or in a common-law marriage (60.5%). Most participants had obtained a master's degree or higher (57.1%), with an average of 18.4 years since graduation (SD = 12.6 years; range: 0–51

years). More than half of the sample had children (55.6%). BMI scores showed that approximately 61% (60.8%) had normal weight and 210 (36.7%) were overweight. Participants reported a maximum of 10 and a minimum of three hours of sleep. Mean time spent on the smartphone and/or computer was 3.7 hours per day (SD = 2.9 hours) for work, meetings, and distance learning and 2.6 hours per day (SD = 2.1 hours) on social media and on the Internet (Table 1).

Table 1. Internet search for oral health signs and symptoms among Brazilian and Portuguese dentists during the COVID-19 pandemic.

Variables	Mean (SD)	Minimum-Maximum
Age (n = 596)	42.1 (12.5)	22–77
Years since graduation (n = 597)	18.4 (12.6)	0–51
Hours of sleep at night (n = 597)	6.9 (0.9)	3–10
For how many hours in your day, on average, do you use your smartphone and/or computer for work/meetings/distance learning? (n = 597)	3.7 (2.9)	0–15
For how many hours in your day, on average, do you use your smartphone and/or computer for social media/the Internet? (n = 597)	2.6 (2.1)	0–18
	Frequency	%
Do you have a habit of searching about oral health problems perceived by yourself and/or by your family members on lay Internet sites (example: Google)? (n = 597)		
Never/ Rarely/ Sometimes	530	88.8
Frequently/ Always	67	11.2
Country of residence (n = 597)		
Brazil	375	62.8
Portugal	222	37.2
Sex (n = 597)		
Male	146	24.5
Female	451	75.5
Marital status (n = 597)		
Married/Common-law marriage	361	60.5
Single/ Divorced/ Widowed	236	39.5
BMI (n = 597)		
Underweight	15	2.5
Normal weight	363	60.8
Overweight	219	36.7
Highest educational attainment (n = 596)		
College degree/teaching degree	83	13.9
Specialization	172	28.8
Master's degree/PhD; PhD/Post-doctoral degree	341	57.1
Children (n = 597)		
No	265	44.4
Yes	332	55.6
Alcohol consumption (n = 597)		
I do not consume alcohol	264	44.2
1–2 times per week	276	46.2
3–4 times per week	48	8.0
5 or more times per week	9	1.5
Tobacco consumption (n = 597)		
No	485	81.2
Yes	112	18.8
Comparing your behavior before and during the COVID-19 pandemic, how do you consider your anxiety about your health signs and symptoms and/or those of your loved ones? (n = 597)		
Decreased/ The same	251	42.0
Increased	346	58.0
Have you searched the Internet about COVID-19 symptoms before consulting your physician/health professional? (n = 596)		
Never/ Rarely/ Sometimes	457	76.5
Frequently/ Always	139	23.3

Not all questions were answered by all the participants.

For every additional hour of sleep, the likelihood of the participants and/or their family members frequently or always searching lay Internet sites (*e.g.*, Google) for information about oral health problems decreased (OR = 0.75; 95%CI: 0.56–0.99). For every lost hour of sleep, the chances of the dentists and/or their family members frequently or always searching about oral health problems on Internet sites (e.g., Google) increased by 1.33 times. For every hour spent using a smartphone and/or computer on social networks and on the Internet, the chances of the dentists and/or their family members frequently or always searching about oral health problems on lay Internet sites (*e.g.*, Google) increased by 17% (OR = 1.17; 95%CI: 1.06–1.30) (Table 2).

Individuals who searched the Internet for information about COVID-19 symptoms before consulting their physician or another health professional were 3.85 times more likely (95%CI: 2.22–6.67) to frequently or always search for information about oral health problems perceived by themselves and/or by their family members on lay Internet sites (*e.g.*, Google).

Despite the difference between Brazil and Portugal (p=0.009) regarding the frequency of searches for health content on social networks, this covariate was not incorporated into the final model. Therefore, there was no difference between these two groups (Table 2).

There was no violation of the linearity of the logit for the quantitative covariates in the final model ($p > 0.05$). The final model is appropriate according to the Hosmer–Lemeshow test ($p = 0.213$) (Table 2). There were no problems related to collinearity between the covariates of the final model when the variance inflation factor was evaluated.

Table 2. Factors associated with the habit of searching the Internet for oral health signs and symptoms among Brazilian and Portuguese dentists during the COVID-19 pandemic.

Variables	Do you have a habit of searching about oral health problems perceived by yourself and/or by your family members on lay Internet sites (example: Google)? Frequency (%)	Unadjusted odds ratio (95%CI)	p-value	Adjusted odds ratio (95%CI)	p-value
Age (n = 596)		0.98 (0.96–1.00)	0.056		
Years since graduation (n = 597)		0.98 (0.96–1.00)	0.044		
Hours of sleep at night (n = 597)		0.71 (0.55–0.93)	0.013	0.75 (0.56–0.99)	0.039
For how many hours in your day, on average, do you use your smartphone and/or computer for work/reunions/distance learning? (n = 597)		1.09 (1.01–1.18)	0.032		
For how many hours in your day, on average, do you use your smartphone and/or computer for social media/the Internet? (n = 597)		1.23 (1.12–1.35)	<0.001	1.17 (1.06–1.30)	0.002
Country of residence (n = 597)					
Brazil (n = 375)	52 (13.9)	2.22 (1.22–4.05)	0.009		
Portugal (n = 222)	15 (6.8)	1			
Sex (n = 597)					
Male (n = 146)	14 (9.6)	0.80 (0.43–1.48)	0.473		
Female (n = 451)	53 (11.8)	1			

Continue

Continuation

Marital status (n = 597)					
Married/Common-law marriage (n = 361)	39 (10.8)	0.90 (0.54–1.51)	0.688		
Single/ Divorced/ Widowed (n = 236)	28 (11.9)	1			
BMI (n = 597)					
Underweight (n = 15)	1 (6.7)	0.47 (0.06–3.69)	0.471		
Normal weight (n = 363)	37 (10.2)	0.74 (0.44–1.25)	0.262		
Overweight (n = 219)	29 (13.2)	1			
Highest educational attainment (n = 596)					
College degree/Teaching degree (n = 83)	9 (10.8)	0.97 (0.45–2.09)	0.938		
Specialization (n = 172)	19 (11.0)	0.99 (0.55–1.78)	0.974		
Master's degree/PhD; PhD/Post-doctoral degree (n = 341)	38 (11.1)	1			
Children (n = 597)					
No (n = 265)	31 (11.7)	1.09 (0.65–1.81)	0.742		
Yes (n = 332)	36 (10.8)	1			
Alcohol consumption (n = 597)					
I do not consume alcohol (n = 264)	28 (10.6)	0.95 (0.11–7.87)	0.961		
1–2 times per week (n = 276)	32 (11.6)	1.05 (0.13–8.66)	0.964		
3–4 times per week (n = 48)	6 (12.5)	1.14 (0.12–10.82)	0.907		
5 or more times per week (n = 9)	1 (11.1)	1			
Tobacco consumption (n = 597)					
No (n = 485)	56 (11.5)	1.20 (0.61–2.37)	0.603		
Yes (n = 112)	11 (9.8)	1			
Comparing your behavior before and during the COVID-19 pandemic, how do you consider your anxiety about your health signs and symptoms and/or those of your loved ones? (n = 597)					
Decreased/The same (n = 251)	29 (11.6)	1.06 (0.63–1.77)	0.827		
Increased (n = 346)	38 (11.0)	1			
Have you searched the Internet about COVID-19 symptoms before consulting your physician/health professional? (n = 596)					
Never/ Rarely/ Sometimes (n = 457)	33 (7.2)	1		1	
Frequently/ Always (n = 139)	34 (24.5)	4.17 (2.44–7.14)	<0.001	3.85 (2.22–6.67)	<0.001

Not all questions were answered by all the participants; p: probability value.

Discussion

Several factors have impacted people's lives during the COVID-19 pandemic.[3] Routines and lifestyles were modified because of the need for social distancing resulting from the COVID-19 pandemic.[16-20]

In the present study, participants sought health information on the Internet and on social networks, even during their leisure time. The Internet, by allowing instant communication, brought about an important change in human behavior and increased the chance of misinformation through

the dissemination of concepts without scientific basis.[20] An important observation is that participants' searches were performed on lay websites and not in scientific databases.[21] The questionnaire did not involve any questions that would allow the investigators to understand whether the dentists sought information on scientific evidence-based sites during the COVID-19 isolation period. This is a limitation that should be considered when analyzing the results of this study. Healthcare information provided on websites can prove difficult for the general population to understand.[22] This is one of the main reasons to search for information on social networks, where information is easy to understand and rapidly spread, but generally lacks a scientific basis.[23] A recent study has found that, during the SARS-CoV-2 pandemic, most dental professionals sought information about COVID-19 on social networks.[24] This observation converges with our results. This behavior was significantly associated with younger age, less clinical experience, and fewer academic qualifications.[24] There is a general consensus that misinformation is highly prevalent on lay websites, such as social media.[20] However, dentists are included in a group of professionals with medical training, good levels of health literacy, and ability to critically assess the credibility of information.[25]

Social media were the first to react to the effects of the emerging SARS-CoV-2 pandemic on the dental profession.[5,26] The relevance of the healthcare information found on social media has increased, but scientific knowledge is limited.[22] Therefore, dentists should be encouraged to seek information with scientific evidence.

COVID-19 is a new disease. In the area of oral health, further investigations are still needed. This may be the reason why the dentists in this study searched for information on lay websites. There is growing concern with the high virulence and routes of transmission of this disease through saliva aerosols. This concern makes the practice of dentistry a risk for dentists.[11]

In the United Kingdom, a longitudinal study found that individuals who perceived themselves as having sufficient information about the COVID-19 pandemic reported lower levels of anxiety and sleep disorders.[27] There is a complex effect of social conditions, country politics, and environmental factors on individual experience, which needs further exploration to help prevent unwanted consequences from COVID-19 control measures.[28,29]

One of the factors associated with seeking health information on social networks in this study was short sleep duration. Our study found that shorter sleep duration was associated with longer average screen time. These results are consistent with a study conducted among young American adults.[11,12] People who sleep later and/or wake up in the middle of the night tend to use screens until they can sleep again.[13] This behavior can negatively influence the production of melatonin because of the stimulus of blue light emitted by the screens.[14]

Social isolation is an important measure for mitigating the risk of COVID-19 infection.[15] However, mental and physical health effects affect sleep schedules.[16] Screen use has increased.[17] In the present study, decreased sleep increased the dentists' chances of frequently or always searching for information about oral health problems on lay Internet sites by 1.33 times. Sleep is critical to physical and mental health and helps reduce stress and anxiety indicators.[17] High screen exposure, particularly cell phone use, is a risk factor for sleep disorders.[18] Reductions in sleep duration may influence cognitive appraisal of situations because the frontal region of the brain, which is involved in executive functioning, is affected by sleep deprivation.[19] Sleep behavior and screen use were important confounding variables in the present study.

Some limitations of this study should be noted. The sample of this investigation comprised dentists from Portugal and Brazil. It is important to conduct major multicenter studies that include other countries and other types of health professionals. The results of the present study emphasize the need to create guidelines and platforms that are reliable and easily accessible to health professionals and simplify their searches for health information. Longitudinal studies evaluating general and oral health information sought by dentists during this pandemic period are important, as are post-pandemic studies. Research is needed to develop interventions that can limit screen time and help reduce the negative impacts of sleep deprivation.

Conclusions

We conclude that Brazilian and Portuguese dentists searched for general and/or oral health information on lay websites during COVID-19-related social distancing, even during their leisure time. The use of screens increased among those who slept for fewer hours each night. Searching for health content related to the COVID-19 pandemic on lay websites before a medical consultation was routine among the sampled dentists.

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