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ORIGINAL ARTICLE

Economic Impact of the COVID-19 Pandemic among Dentists in One of the Poorest Brazilian States: A Cross-Sectional Study

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ABSTRACT

Objective: To analyze the impact of the COVID-19 pandemic on dentists' income and to identify associated factors in one of the poorest Brazilian states. **Material and Methods:** A cross-sectional study including dentists who volunteered to answer an electronic questionnaire in Maranhão. Hierarchical multinomial logistic regression analyses were performed, estimating crude and adjusted odds ratios (OR) and respective 95% confidence intervals (95%CI) (alpha=5%). **Results:** The COVID-19 pandemic impacted the professionals´ income negatively [55.44% (50.26-60.52%)] and also positively [6.9% (4.55-9.94%)]. The negative impact on income was greater among male dentists (OR=2.54; 95%CI: 1.16-5.53), over 30 years of age (OR=3.03; 95%CI: 1.34-6.87), with family income below two minimum wages (OR=4.63; 95%CI: 1.50-14.30), who worked in the continent instead of in the capital island (OR=2.21; 95%CI: 1.14-4.29) and in the private sector (OR=31.43; 95%CI: 11.59-85.22). Moreover, those who had been tested for COVID-19, with a negative result, had a 21.3-fold greater chance of having an increased household income when compared to those who had not been tested. **Conclusion:** The COVID-19 pandemic negatively impacted the dentists' income in Maranhão, especially the older, males, with lower incomes, and who worked in the private sector, living far from the capital. The SUS played an important role in the social protection of dentists during the COVID-19 pandemic, mitigating the economic impacts on the public sector working class.

Keywords: Economics; Dentists; Income; COVID-19.

Introduction

The COVID-19 pandemic impacted healthcare professionals and healthcare systems worldwide [1-5]. Many countries have implemented strategies to reduce the risk of SARS-CoV-2 infection to staff and patients. Although Brazil historically has maintained a solid public health care system and has the largest health network in the world, as well as extensive experience in epidemic management, the health system was not prepared for the COVID-19 pandemic. An extraordinary number of cases ravaged the country, reflecting an unfortunate failure of preventive healthcare efforts and strained existing healthcare systems [6]. Moreover, during the pandemic, an oversaturated healthcare system often kept patients away from the hospital, contributing to an increasing number of preventable deaths [7]. The lack of a consistent, centralized approach to preventing the spread of the disease, the delay in vaccination, and the shortage of beds have contributed to the increase in the number of cases and deaths. It is noteworthy that as the country has not adopted broad strategies for testing the population, there has possibly been a large underreporting in the number of cases and deaths [8].

In oral healthcare, some professionals stopped or restricted treatment to emergency cases or do not treat people with signs and symptoms of COVID-19 [9-12] since the virus is spread especially through droplets of saliva in suspension, making the dental office a high-risk environment for spreading the infection [13]. Therefore, dental activities, both public and private, have been deeply affected by the pandemic [2,9-15]. Besides, it is well-known that the COVID-19 pandemic had an economic impact on the dental industry worldwide [3,4] with potential economic impacts for dental professionals. In Brazil, these impacts have been observed especially in three dimensions: in the restricted supply of dental services, in the decreased patient demand for care, and in the increased cost of procedures [14-16]. However, investigations measuring the magnitude of the impact and the factors associated with this outcome are still scarce in Brazil [17]. The few available Brazilian national surveys come from small samples [18] restricted to the private sector [15] or with analyses not grounded in a theoretical model [18]. Besides, we were not able to find evaluations of the pandemic economic impacts on professionals in both public and private sectors in the poorest Brazilian states.

We can hypothesize that the COVID-19 pandemic had an important but differential economic impact on dentists. In the state of Maranhão, the poorest in Brazil and belonging to the legal Amazon, the first cases occurred in the capital - an island - and there was a process of interiorization, with higher mortality in the population of the most vulnerable socioeconomic segments [19] and dental treatments were restricted since the first semester of the pandemic. Thus, the objective of this study was to evaluate the impact of the COVID-19 pandemic on dentists' income in the state of Legal Amazon and to identify associated factors with these potential impacts.

Material and Methods

Ethical Aspects

This study was approved by the Research Ethics Committee of the University Hospital of Universidade Federal do Maranhão (CAAE 32362120.3.2003.5086). All participants signed the Informed Consent Form, ensuring confidentiality, anonymity, and all ethical principles regarding research with human beings.

Study Design and Setting

This epidemiological survey, following the STROBE guidelines, was geared toward dentists working in Maranhão, in the Northeast region, part of the Legal Amazon, bordered to the north by the Atlantic Ocean, south and southwest by Tocantins, east by Piauí, and west by Pará. In 2020, the estimated population was 7,114,598 inhabitants distributed in 217 municipalities. It is the 8th largest Brazilian state in land area with

329,642,182 km2 and has a Human Development Index of 0.639, the second lowest in the country, and with the highest proportion of inhabitants living below the poverty line.

Data Collection and Study Sampling

Data collection occurred from July/2020 to September/2021 through an electronic form in *Google Forms*®. The forms were sent to all dentists (voluntary sample) with active registrations in the Regional Council of Dentistry of Maranhão in 2020 (N=4,801) and disseminated on social networks. Professionals away from work (retired or on disability), working in other states, and with inconsistent contact data were not included. The average response time was ten minutes per questionnaire.

A sample of 377 dentists (7.85%) completed the form. This sample size would have a power of 93.57% to identify associations between variables at the distal, intermediate, and proximal levels with the outcome of interest (financial impact), considering a confidence level of 5%, a ratio of 3:1 between the unexposed and the exposed group, in two-tailed tests to compare proportions in independent samples. Since different exposures are being tested, a proportion of the outcome of 50% in the exposed group and 0.2 percentage points of difference in relation to the unexposed group was considered.

Variables and Theoretical Model of the Study

The financial impact was the outcome of the study, categorized as not impacted by the COVID-19 pandemic, impacted negatively (reduced income), or impacted positively (increased income). The explanatory variables were divided into seven blocks: 1) Sociodemographic characterization of the professional; 2) Health behaviors; 3) Knowledge about COVID-19; 4) Access to health services; 5) Health status; 6) Psychological aspects; and 7) Changes in the work process. These blocks were distributed in distal, intermediate (1, 2, and 3), and proximal levels, according to the theoretical model (Figure 1).

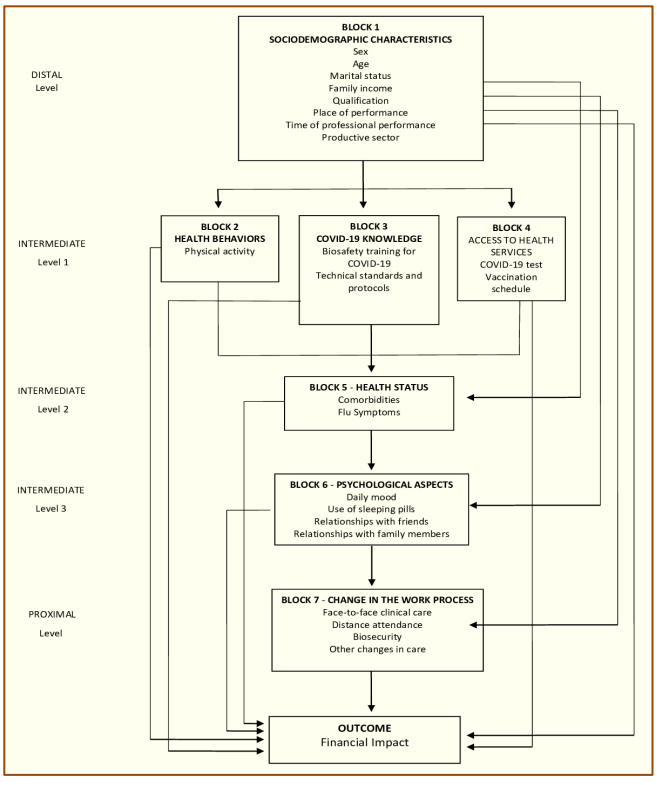

Figure 1. Theoretical Model.

In the proposed model, the sociodemographic characteristics were in the distal level of determination. Health behaviors, knowledge about COVID-19, and access to health services could impact productivity, efficiency, and confidence in work production. Also, access to knowledge and health status would generate less anxiety, reducing the suspension of care and thereby increasing productivity [3] and the professional's income [1,5,14,15]. Psychological aspects, such as humor and relationships with family and friends, are factors strongly related to the psychological well-being of adults and could cumulatively, during the COVID-19 crisis, generate a negative impact on their income [5,14,15,17]. However, the effect of the pandemic and its implications on increased financial precariousness is unclear among these professionals [5]. The effects exerted by factors related to face-to-face clinical care, telecare, changes in the use of personal protective equipment (PPE), and care protocols situated at the proximal level are represented by a unidirectional arrow connecting this level to the outcome.

Data Analysis

Data were exported to an Excel spreadsheet, version 2019 (Microsoft Corp, USA), and subsequently to the software Stata SE, version 14 (StataCorp LP, Texas, USA). Descriptive analyses were performed, estimating absolute and percentage frequency distributions and their respective 95%CI. Besides, we performed multinomial logistic regression analyses (non-adjusted and adjusted), using hierarchical modeling [19] to estimate the odds ratio (OR) and respective 95%CI between the dependent variable and the independent variables (Alpha=5%). Variables with $p<0.10$ remained in the adjusted models. Multicollinearity between the variables was tested at each hierarchical level of the model, removing those with a Variable Inflation Factor (VIF) greater than 4.0.

Furthermore, as the outcome is a multinomial categorical variable, we created dummy variables – having no impact as the reference category – and we also fitted the models using Poisson regression with robust variance and negative binomial regression. Analyses with multinomial logistic regression were the best adjusted, with lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values, as well as pseudo-R2 values above 30%. Therefore, multinomial logistic regression was chosen for the study.

Results

The mean age of the 377 dentists analyzed in this study was 36.4 (±10.2) years, ranging from 20 to 69 years. Most were female, living without a partner, with a family income of five or more minimum wages, with a postgraduate degree, working on the continent in both public and private sectors, and with more than 10 years of experience. Most professionals reported practicing physical activity, participating in biosafety courses, and having knowledge of technical standards and protocols for COVID-19 care. Most had completed the vaccination scheme but had not yet been tested for COVID-19. They also reported no comorbidities, no flu symptoms, and no use of sleeping pills, but reported that social isolation worsened their humor, although it did not affect their relationships with family and friends. Most continued their clinical activities in person, but 35.5% also incorporated remote care. The pandemic required changes in the work environment and/or processes for 86.7% of dentists, including the use of new PPE, including face shields, N95 masks, and oximeters. For 55.4% (50.3-60.5%) of respondents, the pandemic resulted in a family income reduction, while 37.7% (32.8-42.8%) reported no impact and 6.9% (4.6-9.9%) reported an increase in the family income (Table 1).

Table 1. Socioeconomic, demographic, and work practice characteristics of dentists, Maranhão, Brazil.

Variables	N*	%	95%CI
Block 1: Socioeconomic and Demographic			
Gender			
Male	84	22.3	18.2-26.8
Female	293	77.7	73.2-81.8
Age (in years)			
20-29	118	31.3	27.9-37.8
30-39	120	31.8	28.4-38.4
40 or +	123	32.6	29.2-39.2
No information	16	4.2	2.4-6.8
Marital status			
With partner	177	47.0	41.8-52.1
No partner	200	53.1	47.9-58.2
Family income (Minimum wage)[1]			
Up to 2	38	10.1	7.2-13.6
3-4	103	27.3	27.8-38.5
5 or more	171	45.4	49.1-60.4
No information	65	17.2	13.6-21.4
Higher education			
Graduate	72	19.1	15.3-23.4
Postgraduate	257	68.2	63.2-72.8
No information	48	12.7	9.5-16.5
Municipality where professional activities take place			
Big island	167	44.3	39.2-49.5
Continent	210	55.7	50.5-60.8
Time of graduation (years)			
≤ 1 year	37	9.8	8.5-16.0
1-4 years	86	22.8	22.7-32.9
5-9 years	65	17.2	16.5-25.8
10 or + years	124	32.9	34.3-45.4
No information	65	17.2	13.6-21.4
Productive sector			
Public	135	35.8	31.0-40.9
Private	77	20.4	16.5-24.9
In both	157	41.7	36.6-46.8
No information	8	2.1	0.9-4.1
Block 2: Health Behaviors			
Practiced physical activity			
Yes	257	68.2	63.2-72.8
No	120	31.8	27.2-36.8
Block 3: Knowledge about COVID-19			
Biosafety training			
Yes	221	58.6	65.4-75.8
No	91	24.1	24.2-34.6
No information	65	17.2	0.1-21.4
Knowledge of technical standards and protocols			
Yes	336	89.1	85.5-92.1
No	41	10.9	7.9-14.5
Block 4: Access to Health Services			
COVID-19 Test			
Yes, positive result	61	16.2	12.6-20.3
Yes, negative result	103	27.3	22.9-32.1
Not performed	213	56.5	51.3-61.6
Vaccination Scheme			
Yes, for hepatitis and influenza	320	84.9	80.9-88.3
No	57	15.1	11.7-19.1
Block 5: Health Status			

Comorbidities			
Yes	95	25.2	20.9-29.9
No	282	74.8	70.1-79.1
Flu symptoms			
Yes	115	30.5	25.9-35.4
No	262	69.5	64.6-74.5
Block 6: Psychosocial Aspects			
Social isolation affected daily humor			
Improved	7	1.9	0.7-3.8
Worsened	273	72.4	67.6-76.9
Still unchanged	97	25.7	21.4-30.5
Use of sleeping pills			
Yes	59	15.7	12.1-19.7
No	318	84.4	80.3-87.9
Social Isolation Affected Family Relationships			
Improved	76	20.2	16.2-24.6
Worsened	83	22.0	17.9-26.5
Still unchanged	218	57.8	52.7-62.9
Social isolation affected relationships with friends			
Improved	19	5.0	3.1-7.8
Worsened	20	5.3	3.3-8.1
Still unchanged	338	89.7	86.1-92.5
Block 7: Changes in the Work Process			
Face-to-face clinical care			
Yes	323	85.7	81.7-89.1
No, continued	54	14.3	10.9-18.3
Remote Care			
Yes	134	35.5	37.5- 48.8
No	177	47.0	51.2-62.5
No information	66	17.5	13.8-21.7
Biosecurity[2]			
Yes	328	87.0	58.0-68.0
No	49	13.0	9.8-16.8
Other changes in care			
Yes	326	86.7	82.8-90.0
No	50	13.3	10.0-17.2
No information	1	0.3	0.01-1.5
Outcome			
Impact on financial life			
Not impact	142	37.7	32.8-42.8
Negative impact (reduced income)	209	55.4	50.2-60.5
Positive impact (increased income)	26	6.9	4.6-9.9

*Variance of total N due to missing data for different questions; 95%CI: 95% Confidence Interval; [1]Minimum wage equal to R$ 1,045.00; [2]N95 mask, face shield, oximeter, or antimicrobe.

Table 2 presents the unadjusted and adjusted associations between the different exposures and the financial impact of the pandemic on dentists. In the adjusted regression analysis, the negative impact of income was greatest among dentists who were male [OR=2.5 (1.2-5.5)], over 40 years of age [OR=6.4 (2.4-17.3)], with a family income of less than 2 minimum wages [OR=4.6 (1.5-14.3)] as compared to those who earned five or more wages, and who practiced dentistry in the private sector [OR=31.4 (11.6-85.2)] or in both public/private sectors [OR=15.9 (7.0-36.5)] compared to those who worked only in the public sector. Besides, the negative impact on income was 2.2 times greater for professionals who worked on the continent when compared with those who worked only on the large island as well as 3.4 times greater amongst those who implemented any strategy of distance attendance.

On the other hand, dentists who lived with a partner had a 300% higher chance of having a positive impact on family income during the pandemic when compared to those who not had partners; and those who had income in the middle range (2 to 4.9 minimum wages) had a 4.9-fold greater chance of having an increase in family income when compared to those with an income of five or more wages. Moreover, those who had been tested for COVID-19, with a negative result, had a 21.3-fold greater chance of having an increased household income when compared to those who had not been tested (Table 2).

Table 2. Variables associated with financial impact among dentists, Maranhão, Brazil.

Variables	Non-Adjusted						Adjusted					
	Negative Impact			Positive Impact			Negative Impact			Positive Impact		
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Block 1: Socioeconomic and demographic												
Gender (Ref: Female)												
Male	2.6	1.4-4.5	0.001	1.9	0.7-5.5	0.208	2.5	1.2-5.5	0.019	3.5	0.9-13.2	0.068
Age (Ref: 20-29 years)												
30-39	1.0	0.6-1.8	0.929	0.5	0.2-1.3	0.152	3.0	1.3-6.9	0.008	0.3	0.1-1.2	0.092
≥40	1.2	0.7-2.0	0.617	0.2	0.05-0.7	0.012	6.4	2.4-17.3	<0.001	<0.01	N.E.	0.987
Marital status (Ref: No partner)												
With partner	1.1	0.7-1.7	0.609	1.2	0.5-2.8	0.643	0.6	0.3-1.2	0.136	4.0	1.01-15.8	0.048
Family income[1] (Ref: ≥5 minimum wages)												
2.0-4.9 minimum wages	1.6	0.9-2.8	0.087	6.9	2.0-23.6	0.002	2.8	1.3-6.3	0.012	4.9	1.2-20.0	0.028
<2 minimum wages	0.8	0.4-1.5	0.431	1.0	0.1-9.1	0.969	4.6	1.5-14.3	0.008	0.5	0.1-6.4	0.601
Municipality (Ref: Island)[2]												
Continent	1.3	0.9-2.1	0.171	2.7	1.1-6.9	0.035	2.2	1.1-4.3	0.018	1.9	0.5-7.5	0.358
Productive Sector (Ref: Public)												
Private	8.7	4.4-17.1	<0.001	1.4	0.4-4.6	0.617	31.4	11.6-85.2	<0.001	1.5	0.2-10.4	0.671
Both	9.0	5.2-15.7	<0.001	1.2	0.5-3.2	0.723	15.9	7.0-36.5	<0.001	0.9	0.2-3.7	0.916
Block 2: Health Behaviors												
Practiced physical activity (Ref: No)												
Yes	1.1	0.7-1.7	0.732	2.1	0.8-6.0	0.149	0.9	0.5-1.7	0.771	9.1	0.8-11.4	0.072
Block 4: Access to Health Services												
COVID-19 Test (Ref: Yes, positive result)												
Yes, negative result	1.4	0.7-6.5	0.609	1.5	0.3-6.5	0.609	1.2	0.4-3.2	0.737	21.3	1.3-56.9	0.033
Did not perform	1.0	0.6-1.9	0.918	1.7	0.5-6.3	0.422	1.0	0.4-2.5	0.902	7.6	0.6-94.1	0.115
Block 7: Changes in the work process												
Distance attendance (Ref: No)												
Yes	1.7	1.1-2.8	0.027	1.5	0.5-4.3	0.477	3.4	1.6-7.0	0.001	1.0	0.2-5.0	0.990

[1]Minimum wage equal to R$ 1,045.00; [2]N95 mask. face shield. Oximeter, or antimicrobial carpet; S.I. - Social Isolation; OR: Odds Ratio; 95%CI: 95% Confidence Interval; Only the variables that remained in the final model are presented (p<0.20).

Discussion

The present study investigated the impact of the COVID-19 pandemic on dentists in a state in the Legal Amazon, identified as the poorest state in Brazil in monetary terms, with 53% of the population living below the poverty line, compared to 25.3% of the country as a whole, in addition, there is large inequality in income distribution and opportunities for economic and social inclusion [20,21]. In this state of Legal Amazon, 55.4% of the interviewed dentists reported a negative impact of COVID-19 on family income. This negative impact was greater in male professionals, over 30 years of age, receiving up to two minimum wages, working in the countryside of the state and in the private sector (or in both public and private sectors), who implemented any way of distance attendance. By contrast, professionals living with a partner, with income of 2-5 minimum wages, and those who had already been tested for COVID-19 (with a negative result) had a greater chance of having a positive impact on income.

The economic impact of the pandemic on dental professional practice has been previously discussed. However, the magnitude of the impact and what factors influence it are not known, especially in areas with worse socioeconomic indicators in Brazil, such as in the states of Legal Amazon. The increase in costs of materials and PPE, associated with the decrease in demand for dental services [10] and the adequacy of infrastructure, have caused an economic deficit in this class [1,5,15]. This is understandable in a pandemic situation, where the entire country was affected by quarantines and blockades in an attempt to flatten the transmission curve of the infection. These measures, along with the increased incidence of COVID-19, have led to decreased patient flow, reduced elective care, and adjustments in infrastructure for aerosol control. In addition, new disinfection and asepsis protocols [22] have contributed to increasing expenses and reducing income [1,3,14,15], as observed in most professionals in State Region. Dentists aged 30-39 and over 40 years presented higher negative financial burdens when compared to the younger age group. Older professionals have more comorbidities and, possibly, for fear of contagion, may have suspended or reduced their dental practice [23] may have suspended or reduced their work hours to minimize the spread of the virus [24]. In addition, fear and anxiety may also have reduced patient demand for these services [25]. Male professionals have had a greater reduction in income when compared to females. Some studies suggest that women are more likely to work part-time in private practice, probably due to factors related to family and domestic commitments, especially when they have children [26]. It is also possible that, because they have more risk factors for severe COVID-19, such as comorbidities, these professionals have been away from work more often. Given these situations, it seems reasonable that the difference in wage loss is greater for men.

Reduced income was more prevalent among dentists who worked in the private sector and in the countryside. This result agrees with another study [16] and follows the prevailing market logic for dentists in the private network, whose remuneration is determined by the logic of productivity. By contrast, in the Brazilian public network, there is usually a fixed remuneration and maintenance of benefits, regardless of productivity [3]. Thus, even with the activities partially paralyzed and the service focused only on dental emergencies, these professionals continued to receive their salaries and benefits since some were displaced to work in the fight against COVID-19 along with the other members of the health team [18].

In Brazil, there is a greater concentration of jobs in the public sphere in line with the principles of universal access, management decentralization, and municipalization of health services in both hospital and outpatient care [6]. So, the Brazilian public health subsystem (SUS) absorbs most of the health sector workforce, and during the pandemic, these workers did not lose their income, even if they got sick, thus contributing to the reduction of the economic crisis in the health sector during the COVID-19 pandemic. Furthermore, SUS is

responsible for the health care of roughly 75% of Brazilians and is funded through contributions from federal, state, and municipal budgets through a health system that encompasses both public and private health care [6].

It is noteworthy that the COVID-19 pandemic also reduced by half the number of oral health procedures provided by the SUS in almost all Brazilian states, regardless of whether these states had a large number of confirmed cases or deaths [2]. In this study, dentists in the private sector experienced a greater economic impact when compared to dentists who worked only in the public sector (OR=31.4; 95% CI: 11.6-85.2). These results point to the social protection role of the Brazilian SUS for workers as well.

Most respondents (87%) extended the adoption of PPE to protect against and control the dissemination of infection, such as N95 masks, face shields, 70% alcohol, alcohol gel, and oximeters. These materials add additional costs to dental offices, justifying a greater financial burden for the private sector. In addition, due to the shortage in the supply chain, as a global effect of the pandemic, there was also an increase in prices, imposing additional costs to clinics [2,4,14,15,17]. In Brazil, changes in biosafety protocols during the COVID-19 pandemic increased by 19.1 times the costs of a dental appointment, especially due to the increased price and consumption of PPE [3,4]. It is important to note that 58.6% of the dentists in this study reported having received specific biosafety training to control the transmission of COVID-19 in the healthcare environment, most likely with access to free courses offered by the three levels of public management, in addition to private and philanthropic institutions [13] Given the gravity of the epidemiological picture, the ideal would be to reach 100%.

Although this study focuses on dentists, it is essential to recognize the possible impact of the pandemic on all other professionals who perform functions in the dental environment, such as oral health technicians and assistants. One study reported that only 27% of U.S. dentists were able to offer full pay to their employees [27].

Our results pointed out that professionals who lived with companions had a higher chance of a positive impact on income. In times of crisis, such as during the COVID-19 pandemic, family support tends to be very important for mental health [28], increasing the possibilities of coping with financial challenges and helping to deal with the stress and negative consequences of the pandemic [29]. Possibly, professionals who lived with a partner were able to maintain their professional activities, given greater support for domestic chores and the division of work and responsibilities.

On the other hand, dentists living without a partner had a 75% lower chance of having an increase in family income during the pandemic compared to those with partners (OR=0.25; 95%CI: 0.06-0.98); and those with incomes in the middle range (2 to 4.9 minimum wages) had a 4.87 times greater chance of having an increase in family income compared to those with incomes of five or more wages (OR=4.87; 95%CI: 1.19-20.02). The positive impact on income was also observed in the professionals who had been tested, with a negative result for COVID-19. Perhaps these professionals felt more able to maintain their activities and even used the testing as a marketing tool to encourage patients/clients to come. However, there was a high percentage (56.5%) of dentists who had not been tested before this survey was conducted, which demonstrates the low testing in the state.

In Brazil, healthcare professionals were a priority for vaccination, followed by the elderly; thus, dentists were vaccinated in the first stages of the immunization program with the first vaccines available in Brazil [30]. Therefore, the lower the degree of health risk perceived by the patient, the greater will be their intention to reduce the consumption of dental services.

Dentists with lower household incomes were more likely to have a negative financial impact, while those with intermediate incomes (2 to 4.9 minimal wages) reported some increase in household income during the pandemic, which may be due to the lower professional and financial stability of these dentists [17]. In addition,

the implementation of some distance service strategies was especially reported by professionals who experienced reduced income during the pandemic. Remote work probably occurred as an alternative to supplement income, given the difficulty of maintaining face-to-face services. The use of telehealth accelerated dramatically as a result of patient and healthcare worker safety concerns during the SARS-CoV-2 pandemic. Over the years, tele-dentistry has proven beneficial for remote dental triage, making diagnoses, conducting consultations, and proposing a treatment plan, among others. During the pandemic, tele-dentistry was approved in Brazil by the Federal Council of Dentistry (in Portuguese, CFO) through CFO resolution 226 of 2020, which provides for the exercise of dentistry at a distance, mediated by technology and provides for the care of patients who are in treatment but are unable to return to the office, being mandatory the remuneration of these professionals [30].

Some limitations of the present study include the possible risk of selection bias (self-selection) since the study included dentists who had access to their emails and social networks in the period when the questionnaire was released. According to the Regional Council of Dentistry of Maranhão (CRO-MA), the dentists with an active record at the time of the survey had a mean age of 41 years, in the age range of 31-40 years. Most were female (62.22%), living without a partner (76.42%), with a graduate degree (specialization, master's and/or doctorate) (10.89%), and working in the continent (42.35%). Our sample had similar sociodemographic characteristics to the universe studied, although the percentage of professionals with graduate degrees who answered the survey was more expressive. The study was conducted at a time when COVID-19 cases were starting to increase and the lack of interest in completing the online questionnaire may have impacted our ability to achieve a better response rate. Despite this, the power of the sample was acceptable. It is possible that there was also memory bias. However, the data were collected during the critical phase of the first wave of the pandemic in Brazil and, therefore, very close to the occurrence of the events. The external validity of the data is limited, especially when extrapolated to other regions of Brazil, since specific factors, such as regulations, local decrees, and the incidence of the disease at the time, may influence the financial impact. Therefore, caution should be exercised when attempting to make inferences for populations outside the scope of this study. The absence of COVID-19 vaccination in Brazil at the time of data collection did not allow us to collect data on this immunobiology within the "vaccination schedule" variable. In addition, it was not possible to follow up with long-term professionals, thus limiting the evaluation of the financial impact at different times of the pandemic. However, to the best of our knowledge, this is the first study that sought to identify the economic impact of the COVID-19 pandemic among dentists in any state of Legal Amazon.

Conclusion

The COVID-19 pandemic and the new biosafety recommendations and protocols to prevent or reduce the transmission of SARS-CoV-2 have negatively impacted the income of dentists in one state of Legal Amazon, but surprisingly, a few professionals managed to implement strategies that resulted in increased income during the pandemic. Anyway, the SUS played an important role in the social protection for dentists during the COVID-19 pandemic. In presenting these findings, we highlight the importance of labor rights that ensure income preservation, avoid layoffs, and maintain work activities, thus reducing the social and economic impact of the COVID-19 pandemic.

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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