



COVID-19: changes in individual and collective biosafety in dental practice

COVID-19: mudanças na biossegurança individual e coletiva na prática odontológica

COVID-19: cambios en la bioseguridad individual y colectiva en practica dental

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ABSTRACT

Objective: The purpose of this research is to investigate and evaluate the situation of dental practice during the COVID-19 pandemic. **Methods:** A survey was carried out among dental professionals located in the state of Pará, Brazil. The survey was anonymous and carried out online, analyzing dental procedures carried out during the pandemic, preventive measures adopted and predictions about future changes in dentistry, after the pandemic. **Results:** The analyzes indicated that the majority of dentists were aware of the consequences of the pandemic for dental practice and adopted preventive measures to avoid contamination and reduce transmission, such as removing objects from the waiting area, cleaning and disinfecting between patients, questioning of signs and symptoms and increased use of personal protective equipment such as surgical masks, waterproof coats and face shields. **Conclusion:** Therefore, it is essential that dental professionals persist in biosafety methods, as they can be a great ally against the rapid transmission of COVID-19.

Keywords: Pandemic, Dentistry, COVID-19.

RESUMO

Objetivo: O intuito desta pesquisa é investigar e avaliar a situação da prática odontológica durante a pandemia da COVID-19. **Métodos:** Foi realizada uma pesquisa entre profissionais de odontologia localizados no estado do Pará, Brasil. A pesquisa foi anônima e realizada online, analisando procedimentos odontológicos realizados durante a pandemia, medidas preventivas adotadas e previsões sobre mudanças futuras na odontologia, após a pandemia. **Resultados:** As análises indicaram que a maioria dos dentistas estavam ciente das consequências da pandemia para a prática odontológica e adotaram medidas preventivas para evitar a contaminação e reduzir a transmissão, como a retirada de objetos da área de espera, limpeza e desinfecção entre pacientes, questionamento de sinais e sintomas e acréscimo de uso de equipamento de proteção pessoal como máscaras cirúrgicas, jaleco impermeável e face shield. **Conclusão:** Assim, é fundamental que os profissionais da odontologia persistam nos métodos de biossegurança, pois podem ser um grande aliado contra a rápida transmissão da COVID-19.

Palavras-chave: Pandemia, Odontologia, COVID-19.

RESUMEN

Objetivo: Esta investigación tiene como objetivo investigar y evaluar la situación de la práctica odontológica durante una pandemia de COVID-19. **Métodos:** Se realizó una encuesta entre profesionales odontológicos ubicados en el estado de Pará, Brasil. La encuesta fue anónima y realizada online, analizando los procedimientos dentales realizados durante una pandemia, las medidas preventivas implementadas y las predicciones sobre cambios futuros en la odontología después de una pandemia. **Resultados:** Los análisis indican que la mayoría de los odontólogos son conscientes de las consecuencias de la pandemia para la práctica de las medidas odontológicas y adoptan medidas preventivas para evitar la contaminación y reducir la transmisión, como retiro de objetos de la zona de espera, limpieza y desinfección entre pacientes, prueba. de signos y síntomas y un mayor uso de equipos de protección personal, como mascarillas quirúrgicas, chaquetas impermeables y protectores faciales. **Conclusión:** Por lo tanto, es fundamental que los profesionales odontológicos persistan en los métodos de bioseguridad, ya que pueden ser un gran aliado contra la rápida transmisión de COVID-19.

Palabras clave: Pandemia, Odontología, COVID-19.

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INTRODUCTION

Detected in December 2019, in Wuhan, Hubei's province, the new Coronavirus has quickly spread all over China, causing an outbreak of pneumonia and suggesting a continuous pandemic risk (ZHENG YY, et al., 2020). The transmission can occur through respiratory droplets or of saliva from human to human, such as droplets generated by coughing or sneezing and through surfaces or objects that are contaminated (ALHARBI A, et al., 2020).

According to the World Health Organization (WHO), the most common symptoms are dry cough, fever and fatigue. In addition to these, other symptoms may manifest, such as: headache, nasal congestion, diarrhea, dysphagia, hyposmia or anosmia, ageusia, hyporexia, dyspnea, conjunctivitis, sore throat, gastrointestinal disorders, verbal eruptions and even severe pneumonia. Around 80% of those infected are asymptomatic or oligosymptomatic (they present mild symptoms). Some factors make the disease more severe, such as advanced age, diabetes, hypertension, heart disease and respiratory diseases (MAIA, 2020; REGIS et al., 2020).

As the number of cases exponentially grew, the World Health Organization (WHO) declared, on January 30th, 2020, a public health emergency of international concern (GARCIA L, et al., 2020). In summary, COVID-19, officially called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) by the World Health Organization (WHO), consists of an acute respiratory disease that may result in death, due to massive alveolar damage and progressive respiratory failure, exhibiting a 2% mortality rate (LIMA DLF, et al., 2020; JACKSON F, et al., 2020).

The concept of biosafety consists of a set of actions to prevent, control, mitigate or eliminate risks inherent to activities that may interfere with or compromise quality of life, human health and the environment. Therefore, biosafety is characterized as strategic and essential for research and sustainable development, being of fundamental importance for evaluating and preventing catastrophic effects of possible pandemic crises on health (PERREIRA LJ, et al., 2020). Thus, during the health crisis caused by COVID-19, the importance of applying antiseptic techniques to combat the spread of the SARS-CoV-2 virus was highlighted.

The world's attention was focused on health professionals who also had to adapt to the new global scenario, especially dental practitioners, as the dental office, as it is characterized as a health service, is a place vulnerable to various microorganisms, with risk of cross-infections. It is a matter of fact that dentists are exposed to a high risk of contamination, given that the dentistry field acts in areas such as the oral cavity, one of the main transmission routes of SARS-CoV-2, which includes direct transmission through coughing, sneezing, spitting, direct contact with contaminated surfaces and indirect transmission through saliva and other fluids (TAVARES ACP, et al., 2020; IZZETTI R, et al., 2020).

Therefore, biosafety actions are essential in this pandemic scenario as a way to guarantee the safe functioning of places that serve the public, preventing, controlling and even eliminating the risks inherent to activities that may interfere with quality of life (PEREIRA BCC, et al., 2021). In that regard, dentists reviewed and reinforced protective safety measures through physical barriers, such as PPE (Personal Protective Equipment) which includes masks, gloves, aprons, glasses or face shields, to protect the skin and mucosa from contact with possibly infected blood or secretions and constant cleaning of the dental office, which must be rigorously sanitized before and after each service in order to protect professionals and patients.

Thus, significant changes in dental practice are notable in the current epidemiological scenario, as with the presence of the SARS-CoV-2 virus, the adoption of dental practices has intensified. Even more rigorous and systematic biosafety measures to provide dental care were necessary, thus resulting in a series of modifications and biosafety protocols for dental professionals and patients with the purpose of ensuring the promotion and protection of health during the pandemic (SILVA JFM, et al., 2020; FRANCO JB, et al., 2020). This article aims to analyze the implications of SARS-CoV-2 in dentistry and professional practice with regard to adjustments in the structure of the clinical environment considering constant exposure to saliva and other fluids, in order to minimize the spread of the virus.

METHODS

This research takes a cross-sectional, observational, and qualitative approach conducted in the form of a survey created in the Oral Pathology department of Pará University Center, to investigate and measure the dentist’s knowledge regarding the main topic of this article. The survey was conducted via the Google Forms Software and sent to dental practitioners located in Pará, through social media. The following issues were addressed.

- Professional and demographic characteristics
- Professional activities during the pandemic
- Adherence to preventive measures
- Questions on the future perspective of the dental practice

The data collected was related to age, gender, dental practice location, professional field, and dental practice organization (number of dental chairs, collaborators, and assistants). The status of professional activities during the pandemic aims to investigate the types and numbers of treatments performed per week. Furthermore, potential changes during the pandemic were analyzed to present a complete context of the dentist’s practice.

The sample size was based on the Regional Council of Dentistry in the state of Pará. Data collected in 2019 showed that approximately 5.118 dental practitioners had active registrations on the Council. Therefore, sample size estimation was set at 200 responses, considering a 90% confidence interval and 5% error margin. Data were analyzed using Microsoft Excel software and statistical analysis was performed in the GraphPad Prism 6.0 Software. This research was approved by the Ethics Committee accredited by the National Health Council under number 40775520.2.0000.5169 and under opinion number 4.520.199.

RESULTS

The COVID-19 repercussion on dental practice questionnaire obtained the final sample of 210 answers. Of this total, 71% were females and 29% were males. 4% of the sample declared working only in the private field, while 65% worked in the public fields and 31% declared working in both private and public fields. When questioned if they had their own dental office, 66% confirmed and 34% denied. Regarding years of practice, the mean age was 25 years (range 21- 43) (**Table 1**).

Table 1 - Demographic and professional profile.

Group sample	210 (29% M, 71% F)	N (%)
Dental office owners		138 (66%)
Dental professionals working only at university / public health service / Hospital		136 (65%)
Dental professionals working only at dental office		9(4%)
Dental professionals working in both		65 (31%)
Dental professionals diagnosed with COVID-19		91 (43%)
Covid-19 diagnosis method by RT-PCR		68 (43%)
Covid-19 diagnosis method by rapid test		23 (15%)
Covid-19 diagnosis method by RTC-PCR and rapid test		40 (25%)

Fonte: Oliveira GL, et al., 2024.

In the matter of professional activities performed during the pandemic, 99% of the sample declared positive answers as to information about preventive measures in the dental area during the COVID-19 exposure, meanwhile only 1% declared not being aware of such information. As to the number of patients treated per day, before the pandemic, predominated quantities were more than 5 patients (corresponding to 79% of the sample), 5 patients (9%), 4 patients (7%), and 3 patients (18%). From this sample, 82% suspended activities during the pandemic and 18% kept normally functioning. Regarding the number of patients treated per day during the pandemic, from April 2020 to August 2020, 40% of the sample treated more than 5 patients a day,

17,1% treated 5 patients, 16,7% treated 3 patients, 12,4% treated 4 patients, 7,1% treated exclusively 1 patient and 6,7% treated 2 patients daily. Among dental practitioners that interrupted their practices, the highest percentages of suspension duration were 2 to 3 months (32%), 1 to 2 months (23%), less than a month (22%), more than 3 months (15%) and practices still interrupted at the time of the survey (8%) (**Table 2**).

Table 2 - Professional activity during the epidemic.

Activity	N (%)
Dental professionals informed on COVID-19 preventive measures	207 (99%)
Suspension of activities during the pandemic	173 (82%)
Suspension period of 1 months	40 (22%)
Suspension period of 1 to 2 months	48 (23%)
Suspension period of 2 to 3 months	58 (32%)
Suspension period for more than 3 months	27 (15%)

Fonte: Oliveira GL, et al., 2024.

Furthermore, in the matter of COVID-19 contamination, 131 dentist (62%) of the sample confirmed being infected with SARS-CoV-2 at some point, and 79 (38%) denied any contamination. Regarding the diagnosis methods used, 68 (53%) were tested by RT-PCR exam, while 23 (17%) used rapid tests, 40 (30%).

Considering hospitalization cases, 97% were not hospitalized and 3% confirmed were hospitalized. When analyzing if patients were asked about signals and symptoms of the COVID-19 disease, the most common ones were fever (94,9%), cough (92,1%), and respiratory difficulties (74,2%). Dental professionals declared questioning their patients about possible contact with infected people, and, among their answers, 73% of the dentists had a positive answer, while 27% had a negative answer. In the matter of dental office organization and preventive measures, dentists were questioned about providing hydroalcoholic solutions to their patients, to disinfect their hands. 99% of the sample confirmed providing hydroalcoholic solutions, while only 1% did not. Furthermore, the use of thermometers for temperature recording corresponded to 45% of the sample, meanwhile, 55% of dentists did not record their patient's temperature.

As to the removal of unnecessary objects from the waiting room, 81% answered positively and 19% denied. Moreover, 91% declared avoiding crowds in the waiting room by carefully organizing their agenda, while 9% declared not doing so.

Regarding the time spent during each treatment, 58% of the sample spent an hour per treatment, 27% spent 30 minutes and 15% spent more than an hour per treatment. Besides that, 91% of dentists declared discouraging the presence of escorts to restrict the waiting room's capacity, and 9% of dentists did no. Regarding the four-hand technique in dentistry, 71% of the sample expressed working alongside a dental assistant, meanwhile, 29% did not. Room ventilation post-treatment was provided in 55% of the cases, and not provided in 45%. When questioned about post-treatment hand hygiene, 99% of answers were positive and 1% were negative.

Concerning the dental office's hygiene, 69% of dentists declared using 70% Isopropyl Alcohol solution for disinfection. 16% used 0,1% Sodium Hypochlorite solution and 15% stated using alternative solutions for disinfecting purposes. In terms of the time spent washing hands, 59% of the sample stated spending 20 seconds, 32% answered 40 seconds and 10% answered 60 seconds.

In addition to hand washing, 99% said they used a hydroalcoholic solution for the hands, meanwhile, 1% denied doing so. Evaluating personal protective equipment used due to the pandemic, 76,2% of dentists declared using disposable or fluid-resistant lab coats. 90% stated wearing masks (PFF2/PFF3; surgical mask; both or alternative barrier respiration devices) and 85,2% used face shields.

Regarding the supply of shoe and feet protection to their patients, 54% of dental practitioners confirmed supplying feet protection, while 46% didn't. About the type of antiseptic mouthwash solution offered to the

patient before the dental treatment, 65% declared using Chlorhexidine, 14% used Hydrogen Peroxide, 1% used Cetylpyridinium and 19% did not offer any type of antiseptic mouthwash to their patients. Among these professionals, 57% declared trying to minimize aerosol generation during the dental treatment, 13% denied it, and 30% admitted carefully proceeding with aerosol reduction only sometimes. The most used strategies for this purpose were the utilization of manual instruments and surgical aspirators (**Table 3**).

Table 3 - Adherence to preventive measures.

Patient triage	N (%)
Dentists investigating symptoms over the phone	178 (85%)
Fever	169 (95%)
Ocular conjunctivitis	24 (13%)
Cough	164 (92%)
Breathing difficulties	132 (74%)
Diarrhoea	56 (32%)
Muscular pain	59 (33%)
Anosmia/ageusia	76 (43%)
Questions on patient	
Patient arriving at the dental office body temperature check	95 (45%)
Contacts with infected or potentially infected subjects	154 (73%)
Waiting room organization	
Hydro-alcoholic solution for hand disinfection	207 (99%)
Removal of unnecessary objects from the waiting room	170 (81%)
Agenda organization	
30 min per appointment	57 (27%)
1 hr per appointment	122 (58%)
>1 hr per appointment	31 (15%)
Discouraging the presence of accompanying people	192 (91%)
Clinical area / Environment disinfection	
0.1% Sodium hypochlorite	33 (16%)
70% Isopropyl Alcohol	145 (69%)
Other disinfectants	32 (15%)
Clinical staff hand washing before treatment	
20 seconds	123 (59%)
40 seconds	67 (32%)
60 seconds	20 (9%)
Hand disinfection with hydro-alcoholic solution	207 (99%)
Personal protective equipmen	
Double pair of gloves	2 (6%)
Mask (FFP2/FPP3, surgical mask, other)	189 (90%)
Eye protection	89 (42%)
Face shield	179 (85%)
Mouthwash	
Chlorhexidine	137(65%)
Hydrogen peroxide	30 (14%)
Dental treatment managemen	
Minimizing aerossol production	120 (57%)
Minimizing aerossol production by dedicated handpieces	34 (14%)
Minimizing aerossol production by use of manual instruments	91 (52%)
Minimizing aerossol production by use of surgical aspiration systems	71 (41%)
Minimizing aerossol production by rubber	28 (16%)
After dental treatmen	
Ventilation	94 (45%)
Hand hygiene (dentist)	208 (99%)

Fonte: Oliveira GL, et al., 2024.

DISCUSSION

With exponential growth in the global health scenario, the Covid-19 pandemic spread rapidly since the beginning of its discovery and caused a worldwide health problem due to the high transmissibility of the Sars-CoV-2 virus. Consequently, this new social context directly impacts and influences the safety of professionals involved in dental care, while also increasing the concern about the need to evaluate Covid-19's prevention measures among workers exposed to the virus during their professional activities. Our results indicate that adaptations were, indeed, applied in health's biosafety system during clinical dental practice. Some of the adaptations consisted of the addition of new individual protection equipment, structural adjustments, changes in operational and clinical flows, and the adoption of strict control protocols to contain the spreading of the Sars-CoV-2 virus.

In general, countries have established different measures for the overall dental care, even during the 'Widespread Human Infection' phases of the pandemic, leading up to the peaks of infection. As an example of that matter, the United Kingdom's health system usually had all patients and dental cases sorted by telephone contact before the consultation, and they only attended in-person dental offices for very basic treatments in designated centers. Likewise, similar protocols were observed in the United States of America (USA), with telephone-based health systems being implemented to continue the patient's treatments and services during the COVID-19 pandemic, providing physical dental services only during emergencies (SPAGNUOLO G, et al., 2020; ROSA ACG, et al., 2020).

In our questionnaire, the overall responses showed that the patients had to go through screening to schedule an appointment, and this was performed by telephone with the investigation of the majority of COVID-19 signs and symptoms, such as fever, cough, and respiratory difficulty, all of them used to analyze the patient's health and disease criteria. However, our results exhibited that most interviewees stated that temperature measurement with a thermometer was not used.

A study found in the literature states that the SARS-CoV-2 virus can survive on surfaces from 56 to 72 hours, and all surfaces should be disinfected using the proper chemicals to eliminate the virus (MALLINENI SK, et al., 2020). Based on this information, changes in the waiting room and the overall clinical environment were made, objects such as books, magazines, decorative items, and other surfaces that could potentially be a source of contamination were removed from the facility as reported by 81% of interviewees.

Considering that the Covid-19 can be transmitted by both asymptomatic and symptomatic patients, mouthwashes of oral antiseptics in pre-dental care are necessary and also highly indicated as a strategy to reduce the salivary viral load and the risk of cross-infection during the treatment, although are not clear the efficacy and safety of these rinses in Covid-19 positive patients (MONTORO LA, et al., 2020; OLIVEIRA JJM, et al., 2020). Thus, the literature report to the use the of chlorhexidine, hydrogen peroxide and povidone iodine as a mouthwash to control the transmission of the virus (BARROS BFM, et al., 2021). However, our findings the chlorhexidine was the most used mouthwash before the treatment followed by hydrogen peroxide.

The literature reports that the use of personal protective equipment used by dental professionals is essential to reduce contamination of the Sars-CoV-2 virus. Although a specific personal protective equipment protocol to combat exposure to the presence of Sars-CoV-2 has not yet been established, a survey carried out in the USA by the National Institute for Occupational Safety and Health (NIOSH) classifies surgical masks as efficient for filtration of impurities in the dental environment, besides, in association with other safety equipment, such as protective eyewear, face shield and lab coat, there is a perfect combination of protection against this highly virulent disease (PENG X, et al., 2020; MARQUES-MEDEIROS AC, et al., 2022; SANTOS IG et al., 2021).

Another important finding in our research was that the stoppage of professional activities occurred at the peak of the Covid-19 pandemic, and this scenario of fear and uncertainties caused a suspension for a longer period, from 2 to 3 months. After this period of stoppage, the physical dental services return was influenced by adjustments among dentists, with the addition of personal protective equipment by professionals, such as disposable lab coats, surgical masks, and face shields, along with safety equipment already used in clinical

practice such as caps, gloves and plastic barriers to avoid contamination by the SARS-CoV-2 virus. Besides, our results also report that there was a concern to reduce the production of aerosols in clinical care, thus prioritizing delicate and surgical aspiration instruments in the performance of dental treatments.

Prior studies in the literature have shown a strong relationship between 70% isopropyl alcohol and the elimination of microorganisms. This finding indicates a good use for the mentioned substance as it is an easily accessible disinfectant and is frequently used in all stages of patient care during the pandemic, being used for hand and clinical environment disinfection (VIEIRA LMF, et al., 2022; CHECCHI V, et al., 2021) The current study found that the dental office had to be cleaned after each patient to avoid cross-infection. Thus, the average waiting time for each appointment during the pandemic was of one hour per patient, with a designated period to disinfect the facility with chemical substances. In that matter, our sample reported a preference for 70% isopropyl alcohol.

A recent study found a debate on the return to the “new normality” in a recent study, making it necessary to raise the level of prevention and control of infections in the dental office so that safety is provided not only for patients but also for dentists and assistants (VILLEGAS MJD, et al., 2021; MOURA JFS, et al., 2020). This increased level of biosafety will likely be irreversibly integrated into health professionals’ routines, which will be of enormous benefit to the protection of people during emergency periods. Even though restrictions and lockdown have been eased in many countries, the ongoing Covid-19 pandemic continues to be a significant burden that directly implies strict hygiene protocols.

In the face of this new scenario, this study suggests a robust understanding of prevention and care measures in the dental professional activity, causing impacts on individual and collective biosecurity. Although the peak of the pandemic has passed, dentists remain on alert, following all protocols that will certainly remain present in dental clinics. Some limitations of this research include the participation of a specific population, and not allowing generalizations about other dental care environments in Brazil and other countries. However, this research exposes similar statistical analyzes to previously published studies that report that the Covid-19 was a disease that impacted the dental clinic not only in the State of Pará but throughout Brazil and around the world with the imposition of strict protocols by health authorities, such as the World Health Organization, to decrease the transmissibility of Covid-19. Additionally, research can and should be carried out to describe the knowledge of the changes that have taken place around the world during the Covid-19 pandemic.

CONCLUSION

This study reports changes in individual and collective biosecurity adopted to protect patients, auxiliary staff and dentists in the era of COVID-19, protocols already established in the office and that from now on had to readapt from personal protective equipment, conducts before, during and after dental care. In general, the dental office were during 2 to 3 months, when open the appointment were reduced. Additionally, objects were removed from the waiting room and natural air ventilation were provided. However, the patient temperature were not measured prior the dental procedure. Regarding the protection during the procedure, the dentists started use chlorhexidine mouth wash before the procedure, the use of PFF2 or 3 masks, use of face shield protection and concerning about aerosol productions. Therefore, it is concluded that the dentist must always be up to date with protocols and information on preventive measures with a view to reducing the risk of spreading the virus in the dental clinical environment.

REFERENCES

1. ALHARBI A, et al. Guidelines for dental care provision during the COVID-19 pandemic. *Saudi Dental Journal*, 2020; 32, 181–186.
2. BARROS BFM, et al. Dental care and preventive measures for COVID-19. *Brazilian Journal of Health Review*, 2021; 4(3): 9677–9692.
3. CHECCHI V, et al. COVID-19 Dentistry-Related Aspects: A Literature Overview. *International Dental Journal*, 2021; 71(1): 21–26.

4. FRANCO JB, et al. Cuidados odontológicos na era do COVID-19: recomendações para procedimentos odontológicos e profissionais. *Revista da Associação Paulista de Cirurgiões Dentistas*, 2020; 74(1): 18-21.
5. GARCIA L e DUARTE E. Nonpharmaceutical interventions for tackling the COVID-19 epidemic in Brazil. *Epidemiol Serv Saúde*, 2020; 29(2): e2020222.
6. IZZETTI R, et al. A perspective on dental activity during COVID-19: The Italian survey. *Oral Diseases*, 2020; 27 (3): 694-702.
7. JACKSON F e MOURA KS. COVID-19: Dentistry in the face of the pandemic. *Brazilian Journal of Health Review*, 2020; 3(4): 7276–7285.
8. LIMA DLF, et al. Covid-19 in the State of Ceará: behaviors and beliefs in the arrival of the pandemic. *Ciência Saúde Coletiva*, 2020; 25(5): 1575-1586.
9. MAIA A, et al. Odontologia em Tempos de COVID-19: Revisão Integrativa e Proposta de Protocolo para Atendimento nas Unidades de Saúde Bucal da Polícia Militar do Estado do Rio de Janeiro-PMERJ. *Revista Brasileira de Odontologia*, 2020; 77: 1-8.
10. MALLINENI SK, et al. Coronavirus disease (COVID-19): characteristics in children and considerations for dentists providing their care. *International Journal Paediatric Dentistry.*; 30(3): 245-250.
11. MARQUES-MEDEIROS AC, et al. Staff Knowledge and Attitudes Towards COVID-19 New Biosafety Practices at a Brazilian Dental School. *Pesquisa Brasileira de Odontopediatria e Clínica Integrada*, 2022; 22: e210139.
12. MONTORO LA, et al. Produtos Desinfetantes para o Enfrentamento da Pandemia de COVID-19. *Revista Virtual de Química*, 2020; (5): 1114-1128.
13. MOURA JFS, et al. COVID-19: Dentistry in the face of the pandemic. *Brazilian of Health Review*, 2020; 3(4): 7276-7285.
14. OLIVEIRA JJM, et al. O impacto do coronavírus (covid-19) na prática odontológica: desafios e métodos de prevenção. *Revista Eletrônica Acervo Saúde*, 2020; 46: e3487.
15. PENG X e XU L. Transmission routes of 2019-nCoV and controls in dental practice. *International Oral Scientific*, 2020; 12, 9.
16. PEREIRA BCC, et al. Dental care during the COVID-19 pandemic and adopted biosafety measures: integrative review. *Research, Society and Development*, 2021; 10(2): e16010212248.
17. PEREIRA LJ, et al. Biological and social aspects of Coronavirus Disease 2019 (COVID-19) related to oral health. *Braz. Oral Res.*, 2020; 34: e041.
18. REGIS B, et al. Atualização sobre a pandemia do COVID-19: uma revisão integrativa. *Brazilian Journal Health Review*, 2020; 3(5): 11710-11724.
19. ROSA ACG. COVID-19: Considerações atuais sobre a transmissão salivar em humanos e recomendações para cirurgiões dentistas. *Rev Patol Tocantins*, 2020; 7(2): 118-122.
20. SANTOS IG, et al. Biosafety in Dental Practices Versus COVID-19 Outbreak. *Pesquisa Brasileira de Odontopediatria e Clínica Integrada*, 2021; 21: e0193.
21. SILVA JFM, et al. COVID-19: Dentistry in the face of the pandemic. *Brazilian Journal of Health Review*, 2020; 3(4): 7276–728.
22. SPAGNUOLO G, et al. COVID-19 outbreak: an overview on dentistry. *International Journal Environmental Research Public Health*, 2020; 17(6): 2094.
23. TAVARES ACP e FRANÇA SAS. A COVID-19 e os desafios da urbanização e habitabilidade nas cidades amazônicas: estudo de caso em Belém do Pará. *Papers do NAEA*, 2020; 29(1), 120-141.
24. VIEIRA LMF, et al. COVID-19 - Laboratory Diagnosis for Clinicians. *São Paulo Med J*, 2020; 138(3):259-66 2.
25. VILLEGAS MJD e FERRER RLC. Medidas de prevención y control de la COVID-19 en estomatología: “la nue va normalidad”. *MultiMed*, 2021; 25(2).
26. ZHENG YY, et al. COVID-19 and the cardiovascular system. *Nat Rev Cardiol*, 2020; 17: 259–260.