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Dental attention during the COVID-19 pandemic: a literature review

Atenção odontológica durante a pandemia de COVID-19: uma revisão de literatura

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ABSTRACT

Introduction: Dental care, due to the production of aerosols, brings risks of cross contamination, and the adoption of preventive strategies is essential. In times of the COVID-19 pandemic, such care was reviewed and extended. **Objective:** To analyze the recommendations for dental care during a COVID-19 pandemic. **Method:** Integrative review through access to electronic databases PubMed, Cochrane Library, Scopus, Web of Science, SciELO, LILACS, MEDLINE in Virtual Health Library (VHL) and gray literature, through Google Scholar. The analysis of the retrieved references was carried out by two reviewers, to identify qualified studies based on the titles and abstracts. Then, they were written as full-text versions of the articles for reading and extracting data. **Results:** Of the 359 studies extracted from the procedures of search, 35 articles were included in this review. It was observed the adoption of preventive measures prior, concomitant and subsequent to dental care, with greater emphasis on the first two. Among the most basic measures, the following can be mentioned: patient screening; measurement of body temperature; urgent and emergency care only; the use of pre-procedure mouthwash; the use of *Personal Protective Equipment*, including the N95 or FFP2/3 respirator; avoiding the production of aerosol; care in hand hygiene; disinfecting surfaces, among others. **Conclusions:** There was a consensus regarding measures to prevent contamination by COVID-19 in the studies included in this review and between these and the results generated by institutions. Knowledge of these measures, as well as their practical application, is of great value to dentists.

KEYWORDS: COVID-19; Pandemic; Dentistry; Disease Prevention

RESUMO

Introdução: O atendimento odontológico, em função da produção de aerossóis, traz riscos de contaminação cruzada, sendo essencial a adoção de estratégias preventivas. Em tempos de pandemia de COVID-19, tais cuidados foram revistos e ampliados. **Objetivo:** Analisar as estratégias de prevenção recomendadas para a atenção odontológica durante a pandemia da COVID-19. **Método:** Revisão integrativa por meio do acesso às bases de dados eletrônicas: PubMed, *Cochrane Library*, Scopus, *Web of Science*, SciELO, LILACS, MEDLINE via Biblioteca Virtual em Saúde (BVS) e à literatura cinzenta, por meio do Google Acadêmico. A análise das referências recuperadas foi realizada por dois revisores, para identificar estudos elegíveis com base nos títulos e resumos. Em seguida, foram obtidas as versões em texto completo dos artigos para leitura e extração de dados. **Resultados:** Dos 359 estudos obtidos a partir dos procedimentos de busca, 35 artigos foram incluídos nesta revisão. Observou-se a adoção de medidas preventivas prévias, concomitantes e posteriores ao atendimento odontológico, com maior destaque para as duas primeiras. Entre as medidas mais referidas, podem ser citadas: triagem do paciente; aferição de temperatura corporal; o atendimento somente de urgência e emergência; o uso de enxaguatório pré-procedimento; o uso de equipamentos de proteção individual, incluindo o respirador N95 ou FFP2/3; evitar a produção de aerossol; o cuidado na higiene das mãos; a desinfecção das superfícies, entre outros. **Conclusões:** Houve consenso no que se refere às medidas de prevenção da contaminação por SARS-CoV-2 nos estudos incluídos nesta revisão e entre estes e os protocolos gerados por instituições competentes. O conhecimento destas medidas, bem como sua aplicação prática, revela-se de grande valia para os cirurgiões-dentistas.

PALAVRAS-CHAVE: COVID-19; Pandemia; Odontologia; Prevenção de Doenças

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INTRODUCTION

On December 31, 2019, the World Health Organization (WHO) was informed that, in the city of Wuhan, Hubei province, in the People's Republic of China, cases of pneumonia of unknown etiology were detected^{1,2}. It was a new strain of coronavirus that had not been identified in humans before and was named SARS-CoV-2. Subsequently, on January 30, 2020, it was declared that the outbreak of the disease caused by the new coronavirus, COVID-19, constituted a Public Health Emergency of International Importance, and on March 11, 2020, COVID-19 was characterized by WHO as a pandemic².

The new coronavirus has a high infection rate but a relatively low lethality rate⁴. According to data from the Ministry of Health, Brazil has a lethality rate of 4.5%, which may be higher in the elderly and patients with other comorbidities^{3,4}. Symptoms can range from a cold to severe pneumonia, the most common of which are fever, dry or secretive cough, sore throat, and shortness of breath. They may also occur: tiredness, runny nose, headaches, nausea, vomiting, diarrhea, loss of smell and taste, muscle pain, and chills^{5,6}.

The main transmission routes of SARS-CoV-2 include direct transmission through coughing, sneezing, and splutter, in addition to transmission by contact with oral, nasal, and ocular mucosa after contaminated surfaces are touched^{4,7}. Aerosol is also a possible route of transmission, especially when the virus is in high concentration and this is occurring indoors. Thus, routine dental procedures are a potential risk for professionals and patients⁸.

Dental practice involves the use of rotating dental and surgical instruments, such as handpieces, ultrasound, and air and water syringes. These instruments create an invisible spray that contains droplets of water, saliva, blood, and microorganisms, which can remain viable and survive for up to 3 days on inanimate surfaces at room temperature, with greater preference for humidity conditions^{7,9}.

The best way to prevent disease is to take actions to prevent the spread of its etiological agents. For this reason, the control of environments with biological risk is part of the routine and knowledge of all professionals in the field of Dentistry¹⁰. Certain care must be even more rigorous in dental practice to protect staff and patients, such as: care in the waiting room and in the care room, cleaning of surfaces, disinfection of equipment and instruments, use of personal protective equipment (PPE), hand washing, among others^{11,12}.

Since the beginning of the pandemic, several world institutions have commented on changes in the routine of dental care, to avoid the contagion of professionals and the possible cross-contamination among patients. Institutions such as Centers for Disease Control and Prevention (CDC)⁷ and American Dental Association (ADA)¹³; nationwide, the Brazilian National Health Surveillance Agency (Anvisa)¹⁴, the Federal Council of Dentistry (CFO)¹⁵ and the Brazilian Critical Care Association (AMIB)¹¹.

Due to the various protocols published so far around the world and in Brazil, it is necessary to synthesize the main aspects addressed at the moment so that professionals can apply them in their daily routine. The aim of this study, therefore, was to systematize the main strategies adopted in dental care during the COVID-19 pandemic, described in the scientific literature, to prevent cross-contamination.

METHOD

This integrative review was based on the following research question: "Which preventive strategies most recommended in the scientific literature should be adopted in dental care during the COVID-19 pandemic?". The review was performed by accessing the electronic databases PubMed, *Cochrane Library*, *Scopus*, *Web of Science*, *Scientific Electronic Library Online* (SciELO), Latin American & Caribbean Health Sciences Literature (LILACS) and MEDLINE via Virtual Health Library (VHL). There was also the exploration of gray literature, using Google Scholar. The searches were carried out on June 10, 2020. The descriptors used in the search strategy were: ("SARS-CoV-2" OR "COVID-19") AND (Dentist OR Dentistry).

Inclusion criteria were defined: I) studies that addressed the theme of risks of cross-infection in dental care during the COVID-19 pandemic and the necessary care to avoid them; II) studies describing care protocols during the COVID-19 pandemic; III) studies published in English, Spanish, or Portuguese in the years 2019 and 2020. Exclusion criteria were considered: I) studies whose emphasis was not given to care during dental care in times of the COVID-19 pandemic; II) letters, editorials, and brief communication.

The retrieved studies were imported into a reference manager (Endnote). Duplicates were removed and an initial screening of titles and abstracts was carried out by two independent reviewers, according to the inclusion/exclusion criteria. The Kappa concordance test was carried out at the end of this stage, reaching a value of $k = 0.72$, with, therefore, substantial agreement between the reviewers, according to the classification of Landis and Koch¹⁶.

After analyzing the abstracts, all selected articles were obtained in full and subsequently examined according to the established inclusion criteria. When there were disagreements in the final decision on a given article, these were discussed in order to reach consensus. An extraction table was used to specify the characteristics of the sample, the study design, the country in which it was conducted, and to detail the dental care mentioned in the articles.

In order to synthesize the findings in the literature, a bubble chart was drawn up about the preventive strategies adopted in relation to dental care. These were categorized according to the moment in which they must be adopted (before, during, or after the appointment), being represented by different colors. In



addition, the bubbles took on different diameters, according to the number of articles that cited them.

RESULTS

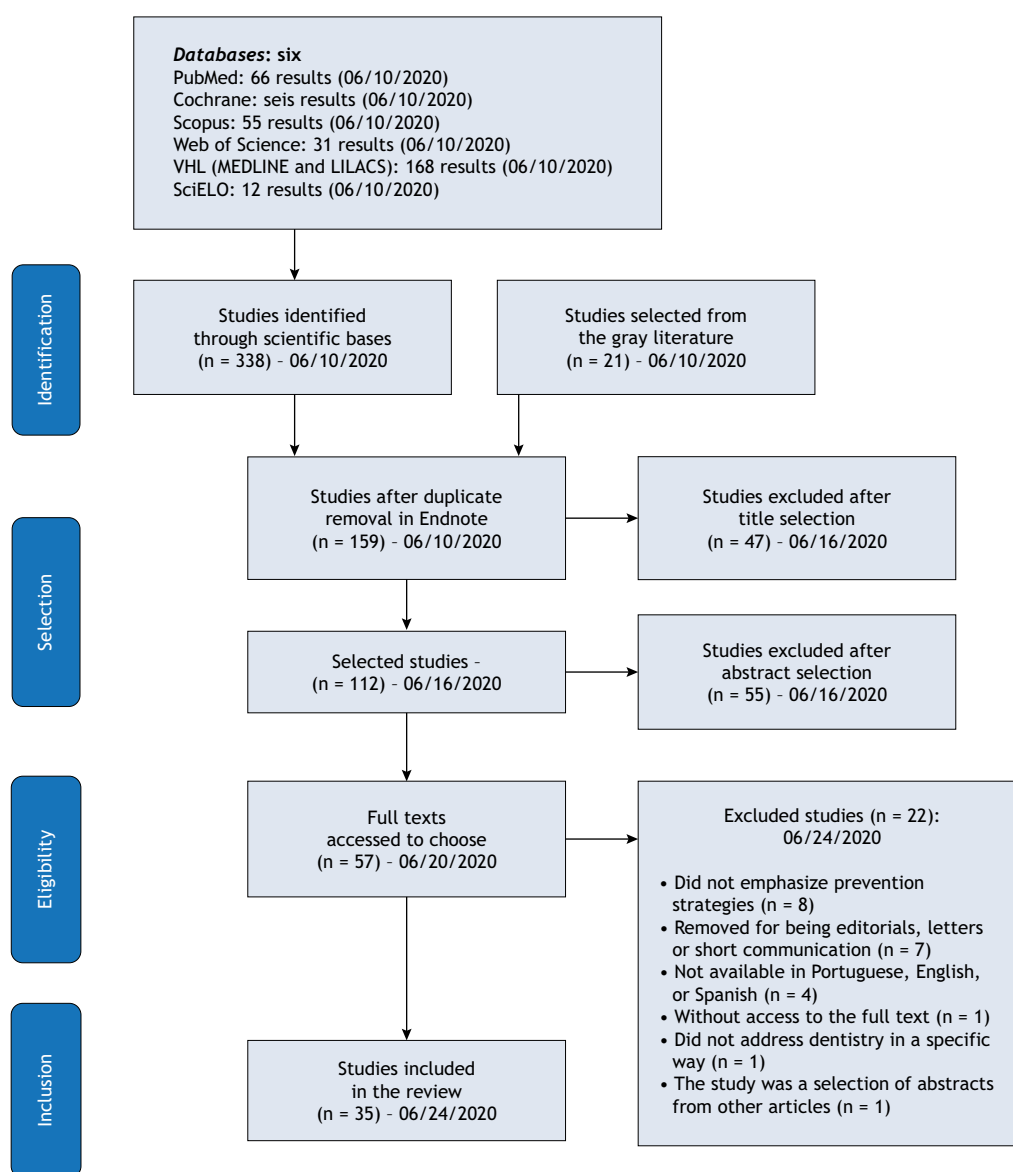
The search strategies and their results are described in Figure 1. Initially, 338 studies were found in the informed databases and 21 in the gray literature. After removing duplicates, analyzing titles, abstracts, and reading the full text, when applicable, 35 studies remained for inclusion.

In Chart 1, the characteristics of the included studies are described, such as: author, country, study design, and objective. In the articles analyzed and selected in this study, there is a predominance of studies conducted in the American continent^{4,9,17,18,19,20,21,22,23,24,25,26,27,28}.

As for the study design, literature reviews were the most frequent^{4,8,9,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43}. Only four studies were classified as cross-sectional quantitative surveys^{44,45,46,47}.

Figure 2 shows the main preventive strategies suggested in the articles, which were divided into before, during, and after dental care.

In the case of strategies prior to assistance, the following categories emerged: previous screening^{4,8,9,17,19,20,21,22,23,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,45,47,48}, care in the waiting room^{4,8,9,21,22,23,24,25,26,27,29,30,31,32,34,35,37,38,39,40,41,42,43,45,47,48}, protection measures for the patient^{4,8,9,17,18,19,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,45,46,47,48} and other preventive care^{4,8,9,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,35,36,37,38,39,40,41,42,43,44,46,48}.



Source: Elaborated by the authors, 2020.

Figure 1. Flowchart about the study selection process.



Chart 1. Articles included in the review and their characteristics according to country of publication, study design and objective.

Author	Country	Design	Objective
Araya-Salas ²⁸	Chile	Literature review	Present several considerations for dental care in order to reduce the risk to the virus.
Ather et al. ⁹	USA	Literature review	Provide a brief overview of the epidemiology, symptoms and disease transmission routes.
Bizzoca et al. ⁴³	Italy	Review of narrative literature	Build protocols addressed to dentists, assess and modulate the risks of contagion in dentistry.
Cagetti et al. ⁴⁷	Italy	Cross-sectional quantitative study	Assess signs/symptoms, protective measures, level of awareness, and perception of the outbreak of COVID-19 among dentists working in northern Italy.
Careddu et al. ⁴²	Ireland	Literature review	Collect available literature and provide access based on publications and guides on SARS and MERS epidemics and information available at the time of SARS-CoV-2.
Cirillo ⁴¹	Australia	Literature review	Collect evidence and resources currently available to help dental professionals minimize the spread of SARS-CoV-2.
Duruk et al. ⁴⁶	Turkey	Cross-sectional quantitative study	Investigate what kind of precautions Turkish dentists take in dental clinics during the COVID-19 pandemic.
Fallahi et al. ⁴⁰	Iran	Literature review	Provide a comprehensive protocol to manage possible exposure to patients or those suspected of having COVID-19.
Fini ²⁷	USA	Literature review	Collect all necessary information for dentists about the COVID-19 pandemic worldwide.
Franco et al. ²⁵	Brazil	Literature review	Direct the concepts presented in the world literature on biosafety and PPE, to systematize the recommendations for the clinical practice of dental care during the COVID-19 pandemic.
Gambhir et al. ⁴⁴	India	Cross-sectional quantitative study	Assess the knowledge, awareness, and hygiene practices regarding COVID-19 among private dentists in Tricity in India during these critical moments.
Ge et al. ⁸	China	Literature review	Understand the meaning of aerosol transmission and its implications in dentistry to facilitate the identification and correction of negligence in daily dental practice. In addition to raising some special precautions that must be implemented during the outbreak.
Giudice ³⁷	Italy	Literature review	Discuss and suggest the most appropriate procedures in all aspects of dental practice to reduce the risk of infection.
Izzetti et al. ³⁹	Italy	Literature review	Discuss the risks related to dental practice and current recommendations for dentists.
Jamal et al. ³⁸	Arab Emirates	Literature review	Provide a review of guidelines and recommendations to limit the transmission of SARS-CoV-2 to dentists.
Khader et al. ⁴⁵	Jordan	Cross-sectional quantitative study	To assess the level of awareness, perception, and attitude towards coronavirus disease in Jordanian dentists.
Long et al. ³⁶	Georgia	Literature review	Present reviews and protocols implemented by principals and residents at Dental College of Georgia to manage a dental emergency clinic during the COVID-19 pandemic.
Maia et al. ²⁴	Brazil	Literature review	To systematize the bibliographic production on the recommendations, practices and care adopted in dental care in times of COVID-19, as well as to propose a dental care protocol in the oral health units of the Military Police of the state of Rio de Janeiro.
Martins-Chaves et al. ²³	Brazil	Literature review	Review the literature and discuss immunological issues related to COVID-19. Suggestions were also made to support immunocompromised patients in this new emerging context of clinical dental practice.
Meng et al. ³⁵	China	Literature review	Present essential knowledge about COVID-19 and hospital infection in dental environments and provide recommended management protocols for dentists and students in (potentially) affected areas.
Passarelli et al. ³⁴	Italy	Literature review	Propose a brief questionnaire and a flowchart to define the risk that each patient carries and adapt each procedure appropriately based on the patient's risk.
Peditto et al. ⁴⁸	Italy	Experience report	Present a workflow to manage dental procedures already in use at the Dentistry Unit of the Messina UH.
Peng et al. ³³	China	Literature review	Summarize the possible 2019-nCov transmission routes, and their propagation. In addition to reviewing practical strategies to block virus transmission during dental diagnosis and treatment.
Pereira et al. ²²	Brazil	Literature review	Clarify dentists about the history and microbiology of the virus, as well as provide guidance on how to proceed during emergency consultations based on international documents.
Pinto et al. ²¹	Brazil	Literature review	Describe the necessary recommendations for the care of patients in dental clinics in the midst of the COVID-19 pandemic.
Ren et al. ²⁰	USA	Literature review	Help dental professionals better understand the risks of disease transmission in dental environments.
Sales et al. ¹⁹	Brazil	Literature review	Establish conducts that can reduce contamination by SARS-CoV-2 between the population and the dental team during care in the public and private health system.
Sepúlveda-Verdugo et al. ¹⁸	Chile	Literature review	Provide updated and relevant recommendations for our national reality, in order to reduce the chances of contagion in the face of the imminent exposure of patients with suspicion or who may present COVID-19.

Continue



Continuation

Author	Country	Design	Objective
Shamszadeh et al. ³²	Iran	Literature review	Review basic knowledge about COVID-19 and address recommended infection control protocols for dentists and treatments in hypothetically affected areas.
Silva et al. ²⁶	Brazil	Documentary research and literature review	Analyze the dental protocols available in the Mercosur countries, pointing out the main similarities and discrepancies between them.
Tuñas et al. ⁴	Brazil	Literature review	Present clinical characteristics of COVID-19 disease, transmission routes, present preventive measures to control and minimize infection in the dental service.
Turkistani ³¹	Saudi Arabia	Literature review	Report to orthodontists the appearance, epidemiology, risks, and precautions during the disease crisis.
Volgenant et al. ³⁰	Netherlands	Literature review	It summarizes infection control measures for the dental care environment in relation to SARS-CoV-2, based on currently available scientific evidence.
Wu et al. ²⁹	Canada	Literature review	Share the perspectives of dentists who practice in private practice and clinical researchers in academic dentistry institutions.
Xavier et al. ¹⁷	Brazil	Literature review	Clarify the importance of CTBMF practices and clinical management, using as a basis the residence in CTBMF in the UH of Belém, in the care of patients during the coronavirus pandemic.

Source: Elaborated by the authors, 2020.

USA: United States of America; SARS: severe acute respiratory syndrome; MERS: Middle East respiratory syndrome; Mercosur: Southern Common Market; PPE: personal protective equipment; HU: university hospital; CTBMF: Buccomaxillofacial Surgery and Traumatology Service.

The following screening strategies were established: face-to-face screening^{4,8,9,17,19,20,23,25,27,28,30,31,32,33,35,36,38,39,40,41,47,48}, telephone contact^{9,21,22,25,26,27,29,30,34,36,37,38,39,41,42,43,47,48} and referral of symptomatic patients to medical care^{4,20,21,31,32,33,35}. Care in the waiting room was often mentioned^{4,8,9,21,22,23,24,25,26,27,29,30,31,32,34,35,37,38,39,40,41,42,43,45,47,48}, including: the organization of the patient flow through scheduling^{21,22,23,25,26,29,30,31,34,35,37,38,39,41,43,47,48}, ventilation^{8,9,21,27,30,31,32,37,39,41,42,45,47,48}, the distance between patients^{8,23,24,27,29,31,32,34,37,38,41,43,45,47}, the removal of objects^{4,21,25,29,30,37,38,39,43}, the separation of suspected cases^{4,9,27,40,41,42,45} and surface hygiene^{25,38,48}.

With regard to protective measures for the patient^{4,8,9,17,18,19,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,45,46,47,48}, were recommended: the use of pre-procedure mouth-wash^{4,8,9,18,19,20,22,23,24,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,46,47,48}, temperature measurement^{4,8,9,19,21,23,25,27,28,31,32,33,34,35,36,38,39,40,41,47,48}, the use of PPE by patients^{4,9,21,22,23,25,27,32,34,35,36,38,40,41,42,45,47,48}, hand hygiene with soap and water and/or alcohol^{4,21,23,24,25,28,32,34,37,39,41,42,43,45,47,48}, the orientation of the respiratory etiquette^{4,8,9,17,18,25,26,27,29,32,37,38,41,42}, the specification of care/auto quarantine for confirmed/suspected/symptomatic patients^{20,23,27,30,31,33,35,36,40,42}, the specification of care for patients at risk^{23,26,34,37,47}, care for personal objects^{37,39,47,48} and extraoral antisepsis^{24,25,26}.

Other preventive care cited were: prioritizing urgent and emergency care^{8,9,17,18,19,20,21,22,24,25,26,28,29,30,32,35,36,37,38,39,40,41,42,44,46,48}, the pharmaceutical approach^{9,17,18,22,23,27,29,30,38,48}, the care of all patients as if they were positive for the virus^{4,9,20,22,25,36,43}, avoid bringing companion^{25,29,37,38,39,41,43}, care for the dental team^{4,25,31,36,37,40,48} and the provision of a rapid test kit^{20,30,36}.

Regarding preventive strategies during treatment, four categories were identified: PPE^{4,8,9,17,18,19,20,21,22,24,25,26,27,28,30,31,32,33,34,35,36,37,38,39,40,41,42,43,45,46,47,48}, dental environment^{4,8,9,20,22,23,24,28,30,31,32,34,35,36,37,38,39,41,42,43,48}, clinical procedures^{4,8,9,17,18,19,20,21,22,23,24,25,26,27,28,29,30,32,33,34,35,36,37,38,39,40,41,42,43,46,48} and

professional care^{4,8,9,17,18,19,20,21,23,24,25,27,28,30,31,32,33,35,37,39,40,41,43,44,45,46,47,48}. In the PPE category, the use of equipment in general was mentioned, such as: glasses, cap, surgical mask, gloves, face shield, apron^{4,8,9,17,18,19,20,21,22,24,25,26,27,28,30,31,32,33,34,35,36,37,38,39,40,41,42,43,45,46,47,48} and the use of respirators such as N95, FFP2/3^{4,8,17,18,17,20,21,22,24,25,26,27,28,30,31,32,34,35,36,37,38,39,40,41,42,43,47,48}.

Regarding the dental environment, the following were mentioned: the use of a negative pressure room^{4,8,9,20,23,28,30,32,34,35,36,38,42}, the use of an air purifying filter/HEPA^{4,8,31,36,37,38,41,43,48} and the use of disposable physical barriers^{23,24,37,39,48}. Clinical procedures have been described in more detail, including the use of absolute isolation^{4,8,9,17,18,19,20,21,22,23,25,27,28,29,30,32,33,34,35,36,37,38,39,40,41,42,43,46}, the saliva aspiration^{4,17,18,19,21,22,23,24,25,27,28,29,30,32,33,35,36,38,39,40,41,43,46,48}, avoid production of aerosol with syringe, ultrasound and high rotation^{8,9,17,18,19,20,21,22,23,24,25,26,27,28,29,30,35,36,38,39,40,41,42,43,46,48}, the preference for extraoral radiography^{9,18,21,22,23,24,27,28,29,32,35,36,37,38,39,43,48}, preference for manual instruments and/or low rotation^{8,18,21,22,24,25,27,28,32,33,34,38,39,40,43}, the use of anti-reflux systems^{4,23,27,33,37,38,39,40,41,43,48}, four-handed work^{4,19,24,29,32,33,35,38,39}, the use of resorbable suture^{18,28,32,35,36,43,48} and avoid procedures that induce vomiting or coughing^{8,30,35,37,41}. As for professional care, hand hygiene^{4,8,9,17,18,19,20,21,23,24,25,27,28,30,31,32,33,35,37,39,40,41,43,45,46,47,48} and the respiratory etiquette^{4,30,40,48} were the most frequently cited strategies.

Finally, in the case of preventive strategies after care, the following categories were identified: care in the dental environment^{4,8,9,17,18,19,20,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,39,40,41,42,43,44,45,46,47,48} and care with the materials and PPE used in attendance^{4,8,17,18,22,24,25,26,27,30,32,33,36,37,39,40,41,43,47,48}. The precautions described in relation to the dental environment were: disinfection of surfaces^{4,8,9,17,18,19,20,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,39,40,41,42,43,44,45,46,47,48}, the correct disposal of the contaminated^{9,18,23,24,25,27,28,31,32,33,36,37,40,43}, ventilation of the operating room^{9,24,30,31,35,36,39,43,47}, and temporarily close the room after the care^{23,25}. Regarding the care with materials and PPE used in the consultations, 11



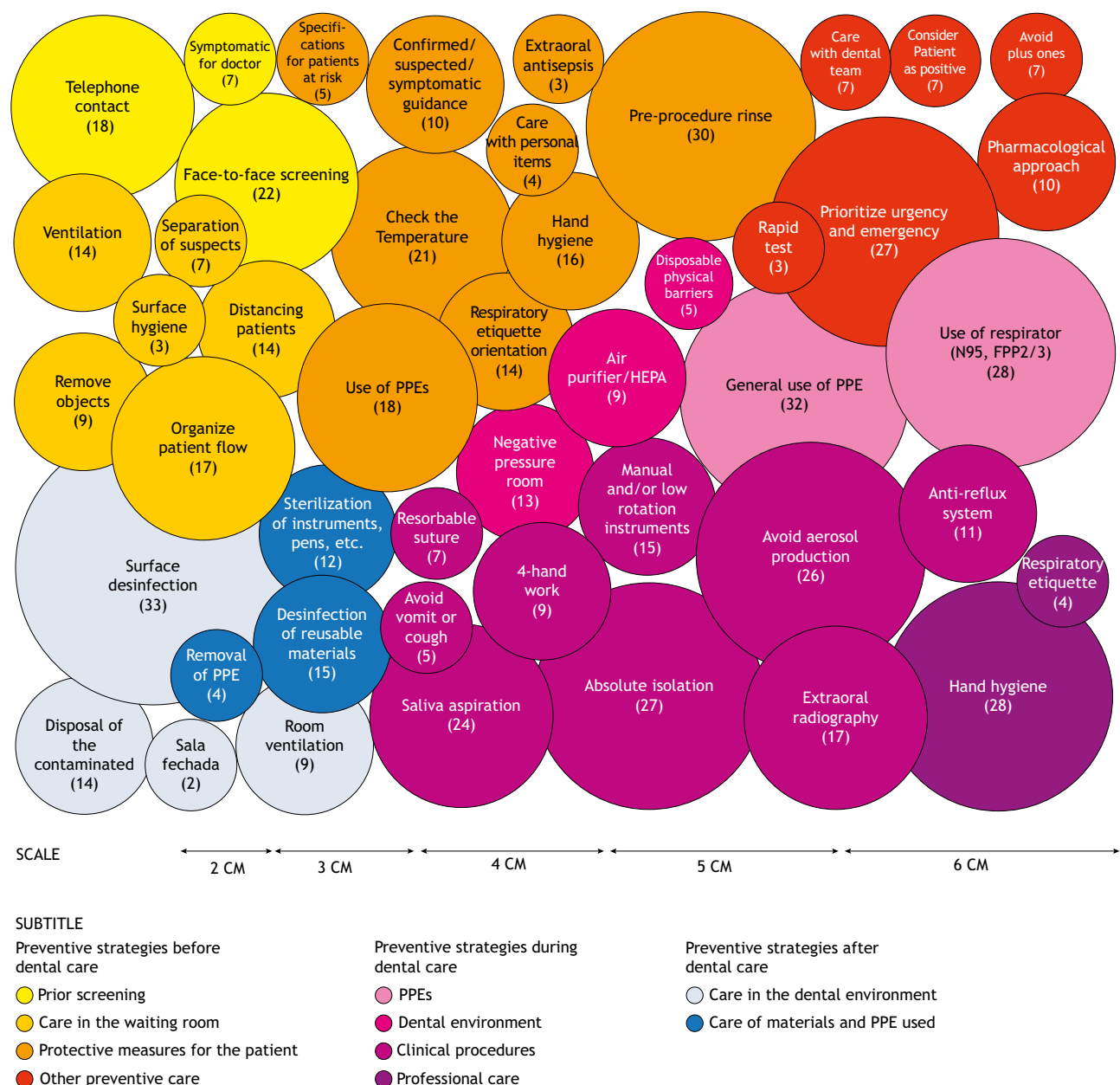
studies cited sterilization of instruments and pens^{4,17,24,25,27,30,33,36,37,40,41,43}, 15 addressed the disinfection of reusable materials^{8,17,18,25,26,27,30,32,33,39,40,41,43,47,48} and four studies cited the correct removal of PPE^{4,22,24,37}.

DISCUSSION

The main strategies prior to dental care found in this integrative review involved: prior screening; prioritizing urgent and emergency care; care in the waiting room and some specific protective measures for the patient, including the use of mouthwash, temperature measurement, the use of PPE, hand hygiene, among others.

Prior screening is indeed very important for the identification of suspected or possible cases infected with COVID-19. It can be done via telephone, asking if there was contact with a positive or suspicious case; checking recent travel history and presence of any respiratory symptoms such as fever or cough. If any of the answers is positive, the service must be postponed for at least 14 days^{9,27,42}.

Some authors suggested questioning about the urgency and the dental emergency in which the patient is^{36,39}. This is because, due to the high spread of the virus, the treatment of patients in these two circumstances has been recommended, postponing the treatments considered elective. To facilitate this classification,



Source: Elaborated by the authors, 2020.

Diameter of circles: 1-8 references = 2 cm; 9-16 references = 3 cm; 17-24 references = 4 cm; 25-32 references = 5 cm, 33-35 references = 6 cm.

Figure 2. Preventive strategies before, during, and after dental care.



ADA¹³ issued a guide defining urgent and emergency conditions, as described in Chart 2.

Another very important aspect is the organization of the flow of patients in the dental clinic. It is recommended to limit the number of individuals in the waiting room, spacing appointments and receiving only one patient at a time and, when possible, avoiding allowing companion^{25,37,41}.

Upon arrival, the patient must complete a detailed medical history and answer a real emergency questionnaire^{9,32}. Body temperature should be measured, preferably with a frontal thermometer in which there is no contact with the patient and, if the patient detects fever above 37.5°C with or without other symptoms, the care must be postponed and the patient should be guided regarding isolation and looking for a health service^{4, 9,10,27,33,39,10}.

The vast majority of articles analyzed indicated the use of mouthwash before the procedure, with the aim of decreasing the viral load present in the oral cavity, with hydrogen peroxide from 0.5 to 1.0% or povidone iodine at 0.2% being the most indicated^{9,10,33}. It is known that SARS-CoV-2 is sensitive to oxidation, therefore the most suitable is hydrogen peroxide³³. Regarding this issue, the Ministry of Health announced by means of a technical note, that the use of hydrogen peroxide should only be used with professional supervision, as there is a risk of side effects due to its use¹². Some studies also indicate mouthwash with chlorhexidine, cetylperidinium chloride, and essential oils, however there is no confirmation of the efficacy of these mouthwashes against the virus^{27,46}.

Care with the dental team was also mentioned by some authors, including: the removal of adornments, such as earrings, bracelets, rings and watches before hand washing²¹; maintaining clean nails and covering cuts with waterproof

dressings^{37,48}; and the measurement of body temperature before entering the clinic¹⁰.

In addition to the care in the waiting room mentioned in the flowchart, it is important to advise patients on respiratory etiquette, having visual alerts such as posters, signs, and posters, in addition to emphasizing the constant use of a mask¹⁰. According to a technical note from the Brazilian Ministry of Health¹², in order to reduce contamination by microorganisms from the aerosol of dental care, surfaces and benches must be free of any material, such as medical records, prescriptions and the patient's personal objects.

Among the preventive strategies during the procedures is the use of PPE, such as: waterproof coat/apron, cap, gloves, surgical mask, glasses, face shields, surgical clothes and pajamas, and shoe covers^{10,33}. In a survey of dentists in Lombardy in Italy, they reported using, among others, disposable gloves; surgical masks; glasses/visors and facial filters⁴⁷. As for the use of respirators such as N95 or FFP2/3, as analyzed in Figure 2, some articles^{21,24,37,43} indicated the use only when there is aerosol production, and others^{17,25,39} did not specify the time of use or indicated the use for the dental routine in general.

The respiratory protection mask (N95, N99, N100, PFF2 or PFF3) has a minimum filtration efficiency of 95% of particles up to 0.3 µ, and must be properly adjusted to the face of the professional¹⁴. Studies have recommended speaking little so that the N95 can stay in place, and men should remove their beards to better seal the mask^{25,48}. Care should also be taken when storing, handling, and reusing respirators⁹. As for preventive strategies in the dental environment, some articles cited care in negative pressure rooms, which are effective in reducing the risks of transmitting infectious respiratory diseases, as there is a control of the contaminated ambient air²⁰. Also indicated by the authors was the installation of air filters (HEPA) in the ventilation system, which

Chart 2. Classification of dental urgencies and emergencies according to the American Dental Association

Urgency	Emergency
- irreversible pulpitis; - pericoronaritis; - postoperative surgical osteitis or dry cavity dressing changes; - abscess or localized bacterial infection, resulting in localized pain and swelling; - tooth fracture resulting in pain or causing trauma to the soft tissues; dental trauma with avulsion/dislocation; - making temporary restoration if the restoration is lost, broken, or is causing gingival irritation; - extensive caries or defective restorations that cause pain; - suture removal; - denture adjustments in patients with radiation/oncology; - denture adjustments or repairs when function is impeded; - replace temporary filling in endodontic access openings in patients with pain; - cutting or adjusting a wire or orthodontic appliances that perforate or ulcerate the oral mucosa.	- uncontrolled bleeding; - cellulitis or diffuse bacterial infection of soft tissues with intraoral or extraoral edema that potentially compromises the patient's airways; - trauma involving facial bones that potentially compromises the patient's airways.

Source: ADA¹³.



aims to eliminate biological contaminants from the exhausted air, allowing constant air exchange⁴⁹.

Mechanical barriers such as polyvinyl chloride (PVC) films, plastic bags, and nonwoven fabric fields are ways to inhibit cross-infection and facilitate cleaning, however they were rarely mentioned in the articles. The ideal is to place these protectors in places such as: reflector handles, chair backs and arms, high-speed pens, triple syringe, suction tips, as well as placement in furniture^{10,25,37}.

When there is a need to provide assistance, the professional should give preference to procedures that do not generate aerosol, using manual and low rotation instruments^{25,39}. Likewise, the Ministry of Health¹² recommends avoiding the use of high and low speed, triple syringe, bicarbonate jet and ultrasound, in line with most studies selected in this review. For this reason, authors such as Franco et al.²⁵ and Martins-Chaves et al.²³ recommended that the care room should be closed for a while so that the particles sediment and, after that, disinfection is performed, or that aerosol-generating procedures are left for the end of the day^{25,48}.

In cases where it is necessary to use high speed, the use of absolute isolation with aspiration of saliva was also widely mentioned, as there is a reduction in the dispersion of droplets, secretions and aerosols during the procedure and, undoubtedly, the work with four hands facilitates and decreases the service time^{20,24,32}. In addition, Long et al.³⁶ suggested suctioning for 30 sec after each appointment. Together, it was recommended to use anti-reflux systems, which can significantly reduce the reflux of oral bacteria in the tubes of the dental unit. Parts without this valve can aspirate and expel debris and fluids during the procedure and cause cross infection^{4,33}.

Extraoral imaging techniques, such as panoramic radiography or computed tomography, have been recommended by many authors, to avoid vomiting or coughing reflexes, in addition to reducing the risk of cross-infection due to less contact with saliva^{9,22,28,35}.

Hand washing is a critical measure to prevent the spread of SARS-CoV-2 and has been extensively addressed by the selected authors^{33,35}. Professionals should wash their hands with soap and water for a period of 20 to 30 sec, before examining patients, before procedures, after touching the patient, after touching the surroundings and equipment without disinfection and also after touching the mouth, mucosa, skin or wound, blood, body fluid and secretion^{10,21,33}. After washing, rubbing with 70% ethyl alcohol^{4,21} can be performed.

As preventive strategies after dental care, in almost all of the studies analyzed, surface disinfection was cited. The decontaminating agents and their concentrations varied according to the countries, however, in general, they were indicated: sodium hypochlorite 0.1%, ethyl alcohol 70%, and hydrogen peroxide 0.5%. All touched surfaces must be disinfected, as the virus can remain for 2 to 9 days on surfaces¹⁵. Disposable residues

generated during care must be properly disposed of and, as they are considered to be infectious, stored in double-layer bags of yellow color, and tied with a goose neck bandage^{23,27,33}.

Among the care with the materials after the appointment, some authors suggested that all PPE should be removed before leaving the office, following the standard of lack of care. Together, care must be taken when leaving the clinic and when arriving home²¹. It was recommended to sanitize cell phones, keys, glasses with 70% alcohol, remove shoes, leave personal items in a box at the entrance, wash clothes with bleach above 60°C and bathe to sanitize the most exposed parts^{10,21}.

In general, the preventive measures mentioned in the analyzed articles are in accordance with the manuals, protocols and technical notes, both from the Ministry of Health¹², and the Federal Council of Dentistry¹⁵, and other competent institutions.

In the present study, there was a predominance of literature review articles, on the other hand, few quantitative research^{44,45,46,47}. They assessed: whether dentists continued to work during the pandemic; whether they had sufficient knowledge about the disease; and the self-perception of the risk associated with dental care in front of COVID-19. In addition to assessing what precautionary measures the professionals were taking; the PPE they used; and what is the attitude towards a suspicious patient. Due to the scarcity of these researches, more publications are needed in order to know the reality of dentists at that time.

CONCLUSIONS

In this study, we sought to systematize the main strategies described in the literature to prevent cross-contamination during the COVID-19 pandemic. The evaluated studies, although published in different countries, showed a certain consensus regarding preventive measures to control the spread of COVID-19. These measures consist of care in the waiting room, protection for the patient, care in the dental environment and with dental procedures, use of PPE, and, finally, attention to disinfection and care after the service.

The protocols generated after the onset of the disease are in accordance with the selected articles, bringing preventive measures as a way to prevent cross-infection before, during, and after dental care. These publications are extremely important to guide dental surgeons, bringing certain security through so many uncertainties experienced today.

It is important to note that most of the studies analyzed here are classified as literature reviews, so there is a lack of publications on the subject that analyze the effectiveness of these preventive measures, as well as the professionals' adherence to such strategies. Therefore, it is necessary to develop new research that evaluates the perception of professionals about coping with the pandemic and the impact of preventive measures on dental services.



There is a constant update of published protocols, since new strategies are being adopted according to the evolution of knowledge on the subject. This is also a limitation of this research,

since it is restricted to the period in which the data were collected and new discoveries can confirm or refute the strategies described here.

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Author's Contributions

Baldan LC, Zermiani TC - Conception, planning (study design), acquisition, analysis, data interpretation, and writing of the work. Teixeira FF - Analysis, data interpretation, and writing of the work. All authors approved the final version of the work.

Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.



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