IJHS
Interamerican Journal of Heath Sciences 4 (2024) - ISSN 2953-3724
DOI: 10.59471/ijhsc2024124

REVISIÓN

Literature Review on cross-infection control in dental care in time of Covid 19

Revisión bibliográfica sobre el control de infecciones cruzadas en la atención odontológica en tiempo de Covid 19

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Received: 13-12-2023 Revised: 14-03-2024 Accepted: 18-06-2024 Published: 19-06-2024
How to Cite: Lozada López FdR, Salame Ortiz VA, López Torres RG. Literature Review on cross-infection control in dental care in time of Covid 19. Interamerican Journal of Health Sciences. 2024; 4:124. https://doi.org/10.59471/ijhsc2024124

ABSTRACT

Currently the covid-19 virus, thousands of people are presenting a pathology that affects the respiratory tract, whose infections grew immeasurably with a high mortality rate, generating a pandemic, significantly affecting work in the different areas of health. The objective of this research was: Determine the importance of cross infection control in dental care in times of COVID -19 and its analysis from the actions applied from the positive and the negative in dental medical practice. For the development it self the methodology applied was a qualitative research, one of the elements in consideration was that the participants in the dental practice are exposed to a high risk of infection by SARS-CoV-2, in addition many references on this topic can be found in articles and information sources that express that dentists are the most exposed in dental practice to the contagion of covid-19, also highlighting the survey was carried out through the identification of scientific articles to find results. The studies on the subject concluded that the levels of contamination are high in the bucal area since an elementary factor of contagion is the secretion of saliva particles.

KEYWORDS

Covid-19, Cross Infections, Dentists.

RESUMEN

En la actualidad el virus del covid-19, ha traído como consecuencia que miles de personas presentaran una patología que afecta las vías respiratorias, cuyos contagios crecieron inmensurablemente con una tasa de mortalidad alta, desencadenando una pandemia, afectando de manera muy significativa el trabajo en las distintas áreas de salud. El objetivo de esta investigación fue: Determinar la importancia del control de infecciones cruzadas en la atención odontológica en tiempos de COVID -19 y su análisis desde las acciones aplicadas desde lo positivo y lo negativo en la práctica médica odontológica. Para el desarrollo del mismo la metodología aplicada fue una investigación de tipo cualitativa, uno de los elementos en consideración fue que los participantes en la práctica dental se exponen a un riesgo alto de infección por SARS-CoV-2, de igual forma muchas referencias sobre este tema se puede encontrar en artículos y fuentes de información que expresan que los odontólogos son los más expuestos en la práctica odontológica al contagio del covid-19, resaltando también que se realizaron análisis a través de la identificación de artículos científicos para encontrar resultados. Los estudios sobre el tema concluyeron que los niveles de contaminación son altos por zona bucal ya que un factor elemental de contagio es la secreción de partículas de saliva.

PALABRAS CLAVE

Covid-19, Infecciones Cruzadas, Odontólogos.

INTRODUCTION

Currently, the COVID-19 virus has caused thousands of people to present a pathology that affects the respiratory tract, whose contagion is growing immensely with a high mortality rate, triggering a pandemic and significantly affecting the work in different health areas. The pandemic faced globally has had an important impact on dental practice since, due to the use of aerosols, it is a profession with a high risk of COVID-19 transmission. [1]
The emergence of SARS-CoV-2 infections in humans has triggered a series of health, economic and social conflicts worldwide. The dental area should have all the necessary knowledge about this pandemic because, as health professionals responsible for the oral condition of society, it is of vital importance to reduce the risk that this represents. [2]
Cross-infection is defined as the transmission of infectious agents between patients and healthcare personnel by direct contact or by fomites. Potential pathogens include cytomegalovirus, hepatitis B virus (HBV), hepatitis C virus, herpes simplex virus types 1 and 2, human immunodeficiency virus, Mycobacterium tuberculosis, and other agents that colonize or infect the human mouth and upper respiratory tract. [3] COVID-19 is transmitted from person to person through direct contact by means of fluids such as saliva, spread by different situations such as coughing or sneezing. [4]
The current situation, at the national and international levels, created by COVID-19, leads the entire dental community to search for scientific information in order to generate useful protocols for the prevention and control of this condition in dental practice. Taking into account that they are facing a virus, which at the beginning of the pandemic was not completely known, it is causing an important pandemic with many people affected worldwide and numerous deaths. [5]
Ecuador is no exception to this situation, and there is some uncertainty as to how the disease will evolve in the coming months. [4] On February 29, 2020, national government officials announced the first case of coronavirus in Ecuador. From that moment on, a National Sanitary Emergency was declared, with the adoption of multiple political and sanitary measures, confinements, curfews at extended hours, and continuous use of masks, along with other recommendations to the general population.
In this regard, it is important to emphasize that the dental team is responsible for maintaining a disinfected environment and controlling the transmission of this highly contagious disease. [6]
What is the relationship between COVID-19 and dentistry? This virus is highly contagious, more than twice that of the common flu (RO - power of infection - of 2.68 versus 1.28 for influenza). Its main proven routes of transmission include direct transmission (Flügge droplets (from 0.5 to 10 μm), direct contact with nasal, oral, and ocular mucosa), as well as indirect transmission or contact transmission (by touching contaminated surfaces with the hand and then taking it to the nasal, oral or ocular mucosa). Saliva has been confirmed as a route of transmission. [2-4]
This virus can persist on surfaces for a few hours or even several days, depending on the type of surface, temperature, or humidity of the environment. [7] Similarly, another risk situation is the case of asymptomatic patients who represent a vulnerability to the professional in the dental practice, as established by several authors. There is a dilemma with regard to dental treatment, mainly because of the risk of treating asymptomatic patients, potential transmitters of the disease. [8]
The dentist is a professional at risk because he/she is constantly working in the presence of aerosols and saliva and at a short working distance (less than 1 meter from the patient's mouth). [9] It is for all these reasons and the safety of the dental team personnel and with the aim of avoiding cross-infection that all the universal measures of personal barrier protection, hand hygiene, and those related to cleaning, disinfection, and sterilization should be adopted and reinforced. [10] Personal protective measures will work effectively if they are properly selected, used, and disposed of. For these reasons, dental activity in primary care has had to adapt to the pandemic. [11]
Only in this way will they fulfill their function, which is to reduce the risk of infection, not to eliminate it. This circumstance determines that there is a risk of infection of the technical and professional staff since the aerosols are impregnated with microorganisms, and they can be aspirated from the atmosphere that is generated. Likewise, there are a number of microorganisms that are spread through the droplets, which, due to their larger size and weight, are deposited on surfaces and can thus constitute a factor of contagion by cross-infection. [12]
Several entities have developed clinical cross-infection control protocols whose observance is periodically verified. Some of them include recommendations for the dental laboratory, and there are also specific guidelines for the laboratory. However, Sofou et al. have found contamination in more than 60 % of the records received in the

laboratory, and the literature also describes high percentages of contaminated prostheses sent from laboratories. [13] Suppose we add to this data on exposure to hepatitis B virus (HBV) among laboratory technicians, higher than in an equivalent population (2,7 % vs. 0,76 %). [14] In that case, the role of the laboratory as a potential source of cross-contamination is highlighted.
In this regard, studies from different countries show substandard practices in the control of cross-contamination and biological risks in dental laboratories. Since it is not possible to recover information on this subject in Spain, this study seeks to determine the practices for the control of cross-contamination in dental laboratories in Galicia. [15]
Emergency treatments in restorative dentistry can be a low risk: all those interventions that are not expected to generate aerosols, such as, for example, clinical examination, sedation, caries removal by manual methods, placement of cement, the performance of emergency esthetic restorations without the use of high-speed rotary instruments, and high risk: all interventions that generate aerosols.
The general objective of this research is to determine the importance of cross-infection control in dental care in times of COVID-19 through biosafety methods applied in different bibliographic studies in order to safeguard the integrity of both patients and dental professionals.

METHOD

This scientific article, **according to its methodology**, is described as qualitative research since it allows the review of primary sources to describe the different bibliographies in reference to patients and cross-infection control in dental care during COVID-19.

Type of research by design
This was based on a *bibliographic review* of a scientific article type that, without being original, compiles the most relevant information on a specific topic.

By its scope:
Descriptive: The research is descriptive since there is no manipulation of variables, and it describes a reality before a situation is presented, where it will be analyzed in order to process the results.

Research methods
Analytical - Synthetic: With this method, it was possible to collect a series of information based on the bibliographies about the scientific article and related to the central theme, which is to describe the different bibliographies in relation to the general objective.
Inductive - Deductive: This method was used to identify the results of the different bibliographies of dentists in reference to patients and the control of cross-infection in dental care during COVID-19 time.

Population
For this study, we considered a series of scientific research articles with current research periods of articles related to dentists in reference to patients and cross-infection control in dental care at the time of COVID-19, a total of 21 articles, which were chosen using certain criteria.

Inclusion Criteria:
- Scientific articles based on the topic of study
- Doctoral theses
- Books with mention to the topic
- Publications relevant to the current topic

Exclusion Criteria:
- Monographs
- Undergraduate theses
- Articles outside of scientific interest

Research technique and instruments
Document Analysis: this section is decisive for the study since it allowed us to analyze all the articles and research papers submitted to the study for their description and analysis.

RESULTS

It is important to mention that the professional practice of the dentist and the staff that supports him/her determines that their practices are considered among those with the highest risk of infection contagion. For this reason, the strictest measures should be taken in all procedures carried out to avoid infection and contagion.
The implementation of biosafety policies for personnel and patients is the responsibility of the head or coordinator of the area. [16] It is also essential to be updated on the clinical characteristics of COVID-19 disease caused by SARS-CoV-2 to identify the possible disease and determine whether it could be a suspected or confirmed case of first instance. [17]
Other studies also mention that the viability of dental care during the period of social isolation has been impaired by both the increase in the conventional budget for providing the service and the additional expenses that are estimated to comply with the health guidelines for the return to work activities. [18]
Within the limitations offered by the scarce strong evidence in relation to COVID-19, this work aims to help the dentist carry out the emergency consultation in the framework of the health emergency. As studies of greater impact emerge, some practices that are currently considered adequate will probably have to be modified.
In those cases in which it is decided to carry out a high-risk intervention, maximum personal protection measures should be taken for the patient, the dentist, and the assistants. [19] The purpose of this article is to present a review of the literature on cross-infection control in dental care during COVID-19, information that should be considered in dental care protocols due to the current situation.
This increase in the level of biosecurity will likely be irreversibly integrated into the dental practice, which will be of enormous benefit for the protection of people during this and, although not desirable, future epidemics. [20]
Disinfection of all surfaces in the dental office and the use of personal protective equipment are suggested, as well as for SARS and Middle East respiratory syndromes. It is recommended to use disposable and impermeable latex or nitrile gloves, surgical masks, and eye protection in procedures that do not generate aerosols.
For care with aerosol-generating procedures, it is suggested to use disposable and impermeable latex or nitrile gloves, N95 masks or equivalent, eye protection, and impermeable and disposable long-sleeved aprons. [21]
The coronavirus disease, also known as COVID-19, has a great lethality and a high range of contagion in the country. The present problem experienced worldwide is the emergence of Coronavirus - COVID-19, which has become a pandemic, causing hundreds of thousands of people to be affected and die; it originated in China in late 2019 and is characterized as a series of viruses that can cause disease in both animals and humans. To WHO describes this action as a pandemic, which is the worldwide spread of a new disease and occurs when a new influenza virus emerges and spreads around the world and most people do not have immunity against it.
In this sense, the present scientific study is based on determining the importance of cross-infection control in dental care in the time of COVID-19 and its analysis of the actions applied from the positive and the negative in dental medical practice. That is to say, to be able to analyze through a series of studies as samples in the control of crossed infections in these times of pandemic and how the odontology area controls these actions and which are the obtained results.
The first article to specify the central theme is based on *The Knowledge and Preparation of Mexican Dentists Before the Pandemic COVID-19* ADM Magazine; the study was directed at how the dentists of the country were prepared with respect to the new pandemic covid-19 and were their actions to avoid contagions and to treat patients in the area of dentistry.
In the study, a survey was administered to 1286 dentists; 73,1 % reported having been recently trained about SARS-CoV-2, and most of them know about risk groups, transmission, clinical characteristics, and general recommendations. Most of them are exclusively attending emergencies and demonstrate knowledge about personal protective equipment and the protocol of care during the pandemic.
It is noteworthy that only 1,1 % of the surveyed physicians stated that they did not know about biosecurity protocols against COVID-19 or patient care and avoidance of cross-infection.
The demonstration of these dentists reflected correct training and knowledge that allows them to avoid contagion and cross-infection, the positive part of using the protocol correctly when caring for a patient in dentistry. This study concludes that Mexican dentists know the generalities of SARS-CoV-2, as well as the protocols of care.
Cross-infection studies are not only carried out in the face of the pandemic; it is important to cite other studies on the subject and understand the actions taken from the conclusions generated.
Another study refers to the control *of cross-infection in the laboratories of dental prosthesis in Galicia*; the general objective of the study and its conclusions are based on the study and application of instruments such as the survey that was applied to 149 dental practitioners, the conclusion of the study led to analyze the practices of cross-contamination control the same that are below the recommended standards, with a significant deficit of training and protocols.
That is, in other non-pandemic situations, the actions to avoid cross-infection were not taken with importance,

unlike now that in a serious situation and the COVID-19 pandemic, the protocols of care in the area of dentistry are 90 % understood, as shown by the studies.
The authors of the study COVID-19 *and its transcendence in dental care: Review and update of the literature* state in their conclusion that the declaration of the COVID-19 pandemic by the WHO puts a scenario rarely imagined, and the dentist must know the characteristics of SARS-CoV-2, the routes of transmission, initial clinical manifestations that lead to identify infected patients and most importantly, the measures to be taken to interrupt the chain of transmission.
The studies analyzed and consulted show that the area of dentistry is vulnerable to COVID-19 infection and that if strict and reliable protocols are not applied, infection of the personnel in this area may occur. Therefore, it is considered that biosafety protocols should be established exclusively for this area, as well as those applied specifically in the area of pulmonary infections, for example, where there are safety systems including those for dental personnel.
A comparative table is presented below, where a series of studies were taken into account and which, through their results, give a vision in their conclusions on the topic addressed.

Table 1. Scientific studies consulted

Scientific studies and their conclusions		
Article	**Conclusion**	**Analysis**
Knowledge and preparedness of Mexican dentists in the face of the COVID-19 pandemic. from ADM Magazine	There is a broad intention of dentists to know the pandemic protocols in order to cut the line of contagion.	The health areas in all countries were prepared with very good protocols, which made it possible not only to combat the virus but also to cut the line of contagion. The preparation and training in care protocols were more extensive than with other pathologies.
Cross-infection control in dental laboratories in Galicia, Spain	Dental technicians are less prepared for these actions.	Preparedness in this non-pandemic case was not very significant, indicating that the severity of the covid-19 virus alarmed the dental sector and led it to prepare more.
COVID-19 and its relevance to dental care: literature review and update.	Very good preparation and effective care protocols.	These actions are the product of a global situation. It is believed that, otherwise, other contagious diseases would not be taken into account.
Arce SC, BRA, BFJC, & RMJJ. Biosafety and cross-infection prevention during the performance of pulmonary function studies. American journal of respiratory medicine (ramr). 2020 Mar; 20(41).	In this study, one of the important considerations is the existence of an Infection Committee, internal regulations of Biosafety, which ensures the safety of dentists, dental assistants and the entire team, in case of possible infections and prevention in case of care for patients with serious contagious respiratory diseases.	In the current pandemic situation, there is no committee to establish actions against contagion or to protect the health of those involved, so that the personnel is protected, only the biosecurity protocol established by the World Health Organization (WHO) for the covid-19 issue.

DISCUSSION

It is of current knowledge that, at this moment in history, the world is facing a pandemic that has caused more than 5 million deaths due to the COVID-19 virus, a virus that affected respiratory areas, compromising the respiratory system and attacking other areas of the human body, becoming a matter of concern for health authorities worldwide.
For the present study, a series of scientific articles and publications that have the same research topic were considered, which will help to give a clear vision regarding the results found and to consider taking an opinion; then, different opinions will be given regarding the results of each analyzed study.
The current medicine was compromised with more complex situations due to the COVID-19 coronavirus, which became a pandemic, and the situation was aggravated by the levels of contagion, being a highly contagious disease by saliva particles, among other factors; the situation of dentistry is complicated by the knowledge that the mouth is a source of production and expulsion of saliva in which it is necessary to perform the corresponding dental actions with more radical protocols for the care of patients with possible contagion.
Many of the situations that dentistry faces today with this new virus and that every day there are more variants with a high risk of infection, the area of dentistry should be more prepared being a high-risk area in asymptomatic patients as it is manifested even more in this sense it was brought to discussion what was stated by a study which expresses;

The routes of transmission of the SARS-CoV-2 virus (airborne and by direct contact with mucous membranes of the naso-oropharyngeal environment), the work area (oral cavity, with the professional-patient proximity involved), and the frequent generation of aerosols by the majority of dental procedures mean that professionals in Oral Health Units are considered to be at high risk of exposure to the virus. (23)

In some parts of the world, protocols have been established, but not specifically for dentists, which worries the guild due to the lack of understanding of the professional's risk in the actions to be practiced.

Other studies, in comparison to those analyzed, identify that a new preparation marks the actions of dentists at this stage of COVID-19 for this unknown virus. However, it is understood that the high levels of infection are by contact with saliva particles or other physical contact with the infected patient. (21)

The Revista Odontológica de la Facultad de Odontología, Universidad Central del Ecuador. In the study on the recommendations for prevention and control of SARS-CoV-2 infections in dentistry, they state that patients and dental professionals can be exposed to pathogenic microorganisms, including viruses and bacteria that infect the oral cavity and respiratory tract.

Throughout the research, it is evident that the area of dentistry is the most vulnerable to infection due to the handling of the oral area, which is the focus of infection due to the characteristics of the disease, which implies action through biosafety protocols for dentists and staff working in this area. However, the reality is that there are no defined protocols but general actions that the WHO has distributed worldwide.

As has been analyzed in the studies above, this article tries to identify that the probability of infection by a dentist is high because he/she treats the oral area, where the virus manifests itself and is a source of infection through saliva and respiratory tract, This, in turn, allows mentioning that the protocols of patient care and biosecurity are so important in this pandemic situation since this covid-19 disease is new. Its treatments are not yet 100 % defined. Likewise, it is suggested that not only in this pandemic situation but in the biosecurity protocols should be implemented in other pathologies and be given the interest as it is done at present.

Mija Gomez JL. COVID-19 and its transcendence in dental care: review and update of the literature. Sanmarquina dentists state that dentists, due to the unique nature of the procedures they perform, have a high risk of cross-infection of COVID-19 since when working in the patient's mouth, they are exposed to a large number of saliva droplets and aerosols produced during dental care.

Other studies have considered the same actions that should be taken in the dental area, such as the implementation of biosafety policies for personnel and patients, which is the responsibility of the chief or coordinator of the area where pulmonary function tests are performed, as well as covid-19 being a high-risk infection with new variants manifested.

Its implementation should be articulated with institutional policies (Infection Committee, internal biosafety regulations, etc.) and should be known by all personnel involved (technicians, administrative physicians, cleaning staff). Their compliance must be supervised by the person in charge in order to guarantee the safety of the people in charge. (16)

The dentistry area must be attentive in this phase of the pandemic due to the new aggressive and contagious variants such as omicron, which the dentist is aware that the biosafety protective measures adopted on a daily basis are not sufficient for the prevention of infection by COVID-19, mainly in terms of asymptomatic patients, in incubation period or who do not report their infection.

The return to the new normality makes it necessary to raise the level of Infection Control and Biosafety in the dental office in order to provide safety not only to the patients but also to the staff and work team, external providers and collaborators, and families of all of them. For detailed information in this regard, it is recommended to consult the Care Pathway for Pediatric Dentistry Procedures during the confinement or quarantine stage of the COVID-19 pandemic. (6)

It is stated that 'Infection control is a dynamic and constantly changing topic, and all dental personnel should be aware of the most up-to-date procedures necessary to prevent the transmission of infections. It is clearly the responsibility of all members of the dental team, including laboratory personnel, to strive to ensure that all devices are properly disinfected before they reach patients. This is of particular concern given that previous studies have shown low levels of compliance with cross-infection control protocols for appliances at the clinic/patient level. (12)

Based on all the articles and studies analyzed, it can be seen that they all maintain a single consideration, which is the risk faced by personnel working in dental areas due to the susceptibility to contagion by the manipulation of the oral area; similarly, considering that in the current pandemic, more variants have emerged due to the mutation of the virus, with more resistance and a higher level of contagion, with almost non-visible systems, which confuse the physician in the diagnosis of the infection or create confusion in certain cases. Therefore, this can be a focus of infection and massive contagion.

The results, as well as the opinions of the studies analyzed, show that the levels of contagion are higher in the area of dental health, as well as the need to know about the progress of this disease and the biosecurity protocols in patient care.

CONCLUSIONS

A review of the literature on the control of cross-infection in dental care in times of COVID-19 revealed that the studies consulted reached results and conclusions that show that dentists and those who collaborate in this area are more vulnerable to the spread of COVID-19 due to the area in which they treat the patient, which is a contagious environment.
Even when there are biosecurity protocols worldwide in the dental area, the protocols are empirical, and only one universal protocol is maintained, as considered by the WHO.
In this sense, an analysis was carried out through a bibliographic review on the control of cross-infection in dental care during the time of COVID-19, which involves inquiring about the possibilities of infection in dental personnel when dealing with patients infected with the COVID-19 virus. Studies on the subject concluded that the levels of contagion are high in the oral area, which is one of the elementary factors of infection due to the secretion of saliva particles, which is the cause of virus dissemination.
It is to be understood that the reality depends on the protection capacity of the dental team and to establish programs or prevention committees that propose actions against risks and prevention in assistance with infected patients, even more, if they are asymptomatic patients who have become common in the last phase presented by the virus and according to each sequela or variant manifested.
All the articles mention that the risks are higher in dentists; there is a coincidence in that there are no specific protocols for care even when there is basic protection in dentists.

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FINANCING

No funding was received for the development of this article.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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