

Challenges Facing Healthcare Management, Assistant, Public Health, Nursing And Dental Teams Towards Infection Prevention Measures

Abdulaziz Mahdi Alqarni¹, Saeed Mahdi Alqarni², Dr. Afnan Mohammed Saeed³, Dr. Sami Mohsen Mashraqi⁴, Abdulwahab Ali Khashab⁵, Abdullah Ahmad A Alzahrani⁶, Falah Qasam Abed Alzibali⁷

¹*Hospital administration specialist, Albashaer hospital*

²*Healthcare assistant, Alsalamh & Alzariah PHCC*

³*Dentist at PHCC*

⁴*Dentist, Alhonbokah PHCC*

⁵*BSc and MSc in laboratory, PhD in tropical Medicine*

⁶*Specialist Epidemiology, Public health department, jeddah*

⁷*Nursing technician, East jeddah hospital*

Abstract

A plethora of articles on the subject of adherence to infection prevention and control in oral health-care facilities can be found worldwide. The strategies employed by developing and industrialized nations exhibit significant divergence, however, the fundamental concepts of infection prevention and control remain consistent throughout. This literature review examines infection prevention and control in oral health-care institutions, focusing on the issues faced by healthcare administration, assistants, and nurses in implementing infection prevention strategies. The study examined nine specific areas related to compliance with infection-control measures. These areas included understanding of infectious occupational hazards, personal hygiene and hand care, proper use of personal protective equipment, use of environmental barriers and disposable items, sterilization of instruments and handpieces, disinfection of surfaces and housekeeping, management of waste disposal, quality control of dental unit waterlines, biofilms, and water, and other special considerations. Several worldwide research conducted in industrialized countries have presented rigorous evidence-based information.

Keywords: *infection-control, oral health-care.*

Introduction

Around the world, infectious diseases are responsible for a large amount of morbidity and mortality. Transmission of infectious agents can occur in the dental context through a variety of means, including inhalation, injection, ingestion, or contact with mucosa or skin. The transfer of pathogenic agents between patients, patients and dental healthcare staff, and vice

versa is the goal of infection prevention and control methods. These measures aim to prevent or decrease infections from occurring. Controlling infections also helps to prevent the spread of infections outside the confines of the dental practice. Standard precautions are required to be in place for all patients, and transmission-based precautions are required to be implemented when patients are at risk of

spreading infectious diseases, primarily airborne infections [1].

When dentists go about their everyday work, they come into contact with a number of sharp devices; as a result, they are always at danger of sustaining percutaneous injuries. In the event of a percutaneous injury, the dental professional is put in contact with the patient's blood as well as potentially infectious pathogens. The hepatitis B virus (HBV), the hepatitis C virus (HCV), and the human immunodeficiency virus (HIV) are all examples of bloodborne infections that dental professionals should be concerned about. However, the risk of bloodborne viruses in the workplace is contingent upon the presence of the virus in the community as well as the conditions in which workers are employed [2]. Due to the fact that patient profiles have undergone significant transformations over the course of more than three decades, treatment regimens have subsequently shifted towards early diagnosis and preventive methods. Today, there is a general improvement in the understanding of disease transmission and prevention in oral health care, which has resulted in a stronger emphasis on the practice of infection prevention and control [3].

By frequently incorporating hand hygiene and sterilization processes, oral health-care facilities have been at the forefront of the movement to establish infection-control techniques. Consequently, this has made a good contribution to the reduction of a variety of issues related to disease transmission [4].

Review:

Through direct contact through the exchange of blood, saliva, or secretions, or through indirect contact through the use of contaminated devices, equipment, or surfaces, pathogens can be transmitted from one person to another. In the dental setting, another potential route of infection is by the inhalation of microorganisms that are floating in the air, which is referred to as airborne transmission.

In the dentist office, direct contact with blood and other bodily fluids is a significant mode of

transmission involving the virus. Blood that has been shed from gingival bleeding is typically present in saliva; hence, all saliva must be treated as if it were potentially infectious material [5].

There is a possibility that any disease could be spread at a dental office; nevertheless, certain conditions are more pertinent to dental personnel than others. The hepatitis B and C viruses, as well as the human immunodeficiency virus (HIV), are among the infections that can be transmitted by blood. Percutaneous damage is the most prevalent way that HBV is transmitted in the field of dentistry. This type of injury carries an average risk of transmission of HBV that amount to thirty percent. It is possible for the Hepatitis B virus to remain infectious in dried blood for a week when it is kept at room temperature. Dentists are predicted to have a risk of having chronic hepatitis B (HBV) that is 10 times higher than the ordinary population, on the other hand, the risk of contracting HIV is considerably lower [6].

Percutaneous injuries pose the greatest risk of HIV transmission; nonetheless, the chance of HIV transmission following a needlestick exposure to blood that is contaminated with HIV is around 0.3% for each exposure. To put that into perspective, the risk of HBV transmission in a dentist practice can be as high as thirty percent. The chance of transmission is 1.8% when an individual is exposed to blood that is positive for the hepatitis C virus. Other viruses that are more prevalent can also be caught in a dentist office. These viruses include rubella, mumps, and measles; herpes viruses, human papillomaviruses; adenovirus; coxsackie viruses; and viruses that affect the upper respiratory tract, such as influenza A and B viruses and coronavirus (COVID-19). Numerous of these viruses have the potential to pose a significant challenge for immunocompromised people as well as pregnant women who do not possess immunity. In addition, bacterial illnesses such as tuberculosis (TB), infections with methicillin-resistant *Staphylococcus aureus*, and streptococci have the potential to be transmitted in the dental context [7].

Infection control is the process of preventing the spread of infections by taking action on one or more of these elements through the implementation of standard precautions and precautions depending on transmission. Every single patient is subjected to standard precautions, which are the fundamental measures that are utilized to avoid and decrease the risk of infection transmission. When patients are suspected or known to be contaminated with diseases that can be spread through contact, droplets, or air, additional measures known as "transmission-based precautions" are utilized [8].

When the use of normal precautions alone is not adequate to prevent the spread of some pathogenic microorganisms, transmission-based precautions are implemented. It is dependent on the mode of transmission of the particular agent as to which measures are utilized. Within the dental practice, transmission-based precautions are utilized most frequently for the purpose of preventing airborne infections [8]. The use of negatively pressured rooms and a P2 (N95) surgical respirator, which produces a better seal with the face, is recommended by the evidence as a means of preventing the spread of infectious agents that are airborne. When a patient is infected with a viral influenza virus, has active tuberculosis, chickenpox, or measles, dental treatment that is not considered an emergency must be delayed [8].

Additional infection control measures have been adopted at the dental office as a result of the advent of the coronavirus illness 2019 (COVID-19). It has been suggested in recent research that patients should be given a hydrogen peroxide rinse with 1% distilled water prior to therapy in order to reduce the amount of viral load in their saliva. Additionally, rubber dam isolation is required to be carried out whenever the technique permits it to lessen the distribution of aerosols across the environment. The vast majority of dental clinics are not built to implement all transmission-based measures, such as rooms with negative pressurization; therefore, it is necessary to have efficient mechanisms in place to identify and manage patients who may be infected with the virus [9].

When it comes to the spread of pathogens, the hands are the most prevalent route. Hand washing is one method that can be utilized to lessen the likelihood of antibiotic resistance spreading inside healthcare settings. There are four types of hand hygiene: 1) ordinary hand washing, 2) antiseptic hand washing, 3) antiseptic hand massage, and 4) surgical hand antisepsis [10]. Hand hygiene is an umbrella word that encompasses all of these practices.

Dental healthcare workers are at danger of contracting common illnesses that can be prevented with vaccinations. Getting immunized is done with the intention of lowering the likelihood of contracting a disease. Within ten days of having personal contact with a patient, every member of the clinical staff is required to acquire a hepatitis B vaccination. Additionally, they are permitted to visit patients whenever it is necessary to finish the vaccine program, which typically takes between two and six months. If the hepatitis B surface antibody (HbsAb) level is greater than 100 mIU/ml, then the individual has been successfully immunized. When antibody levels are between 10 and 100 mIU/ml, the patient is considered to be a poor responder, whereas a non-responder has levels that are lower than 10 mIU/ml [11].

Splatters are prevented from reaching the nasal and buccal mucosa of the operator, as well as the skin of the face and neck, by wearing a mask. However, they do not offer protection against aerosols. In order for masks to perform their intended function, they need to be snugly fitted to the face. For each patient, a fresh mask must be used because masks are only intended for a single usage. Taking into consideration the filtration capacity of masks is essential. It is necessary to replace masks during lengthy procedures if they get significantly damp. This is because the effectiveness of the filtration process begins to decline after twenty minutes of wearing the mask owing to moisture. It is also possible to prevent the contamination of environmental surfaces with the respiratory secretions of the operator by wearing masks at all times. The act of washing one's hands takes precedence over the act of wearing gloves; it is necessary to wash one's hands both before and after removing gloves. If the gloves sustain any

kind of damage, such as a cut, puncture, or fracture, they need to be replaced. Keeping fingernails that are too long and wearing jewelry are also practices that are discouraged since they have the potential to puncture gloves [12].

In the event that the skin underlying the wedding bands is washed and dried, the rings can be preserved. After wearing the gloves for an extended period of time, sweat that contains skin germs and gathers underneath the glove has accumulated. For this reason, it is essential to wash one's hands after removing gloves and to keep one's hands as far away from clean instruments as physically possible. In order to prevent the spread of germs, it is necessary to cover any cuts or abrasions that may be present on the skin of the hands before putting on gloves [13].

Scrubs are typically worn as the standard uniform item at dentistry practices on a daily basis. For the purpose of administering dental treatment, scrubs are required to be worn with an appropriate layer, which is typically a gown that may be reused or thrown away. For treatments that do not involve surgery, this gown ought to have short sleeves, whereas for surgical operations, it ought to have long sleeves. At the same time that one is washing their hands, one can also wash their forearms if they wear short sleeves. When undergoing surgical operations, it is customary to wear long sleeves because the gown is sterile. When going from the clinical area to non-clinical regions, such as when taking a lunch break or leaving the clinic, the protective layer that was utilized in the clinical area must be removed. There is also the possibility of putting on street clothing underneath the scrubs and then taking off the scrubs before proceeding to areas that are not clinical [14].

Protective gowns are required to be worn whenever the process involves the possibility of contamination with considerable body fluids or blood, which are both examples of procedures that generate aerosols. Because these gowns have long sleeves, they will become contaminated during treatment, which will make it more difficult to maintain proper hand hygiene. As a result, they will need to be replaced after each patient. If you want to protect

yourself from sharp injuries in the event that you accidentally drop something, you need to wear footwear that is closed, non-slip, and easy to clean [15].

Injuries that penetrate the eye, missiles, splattering, or spraying with body fluids are all things that can be prevented by wearing eyewear. During scale, when using rotary equipment, when cleaning instruments, when cutting wire, or when working with wire, it is vital to use eye protection. It is required that protective eyewear have side shields. It is not possible to protect the orbit from injury and contamination using reading glasses since they do not provide adequate coverage.

In situations when it is anticipated that the procedure may produce a substantial amount of aerosols or splatters, face shields are recommended. On the other hand, because they do not offer protection against airborne diseases, they must not be used without a surgical mask at any time. Patients are cautioned to use dental safety glasses in order to reduce the likelihood of suffering a physical or chemical injury as a result of the materials used in the treatment process. Tinted glasses offer the benefit of shielding the wearer from the glare that is caused by the exposure to the operating light [16].

Any object that has the potential to cause damage, cut, or pick is considered to be a medical sharp. Needles and scalpel blades are the most common types of sharps; however, other objects, such as matrix bands, endodontic tools, and wires, have the potential to cause percutaneous injuries and must be treated in a suitable manner. Sharps that are disposable must be stored in a container that is difficult to puncture and is hard, and this container should be positioned as close as possible to the area where they are being used. Overfilling them is not something that should ever happen; they should be filled to a maximum of two-thirds of their capacity [17].

When it comes to cleaning instruments before sterilization, mechanical cleaning is favored over manual cleaning practices. This is due to the fact that mechanical cleaning is more effective and reduces the likelihood of

percutaneous injuries as well as exposure to blood. Thermal disinfectors, which are sometimes referred to as instrument washers or ultrasonic cleaners, are able to be utilized for the purpose of performing mechanical cleaning [18].

Because of this, manual cleaning is strongly discouraged. However, in the event that it is carried out, it must be done in a sink that has been specifically dedicated for cleaning instruments and is filled with water that is moderate in temperature. The use of hot water is not permitted because it encourages the coagulation of proteins, while the use of cold water causes lipids to solidify, which makes it more difficult to remove detritus from the instruments themselves. To properly clean the instruments, a brush with a long handle must be used, and the brush must be kept low and submerged in water in the sink. After being cleaned, instruments need to be washed with either warm or hot water, as hot water has the ability to speed up the drying process of instruments. Following this, the instruments should be examined using a magnifying equipment and the suitable light [19].

Sterilization should be performed on all of the dental unit's equipment that can be removed, including the handpieces. There is a requirement for the use of chemical agents to disinfect the X-ray equipment, the lights, and the dentist chair. Protecting digital radiography sensors with a barrier that has been cleaned away should be done in order to limit the risk of contamination during use. This should be followed by cleaning and either heat sterilization or high-level disinfection between patients. Devices that are deemed to be semi-critical include handpieces. It is recommended that they be sterilized with heat between patients. Due to the fact that it is difficult for chemical germicides to penetrate the internal components of the handpieces, it is recommended that they be sterilized while heated. To remove organic waste, ultrasonic scalers should be immersed in isopropyl alcohol at a concentration of seventy percent [20].

In order to disinfect surfaces such as door knobs, seats, desks, elevators, and bathrooms, disinfectants such as 0.1-0.5% sodium

hypochlorite, 62 to 71% ethanol, or 2% glutaraldehyde can be utilized. Barriers that provide protection must be placed above clinical contact surfaces, and these barriers must be replaced after each patient. An additional application for the immersion of instruments in sodium hypochlorite is for the purpose of disinfection prior to the sterilizing process. Sterilization is performed with the intention of eliminating any living germs, including bacterial spores, that are present among the devices. Steam under pressure and dry heat sterilization are the two methods of sterilization that are utilized most frequently in the field of dentistry. Unsaturated chemical vapor pressure sterilization and ethylene oxide sterilization are two examples of the additional procedures that are available, although they are employed less frequently [20].

Conclusion:

Numerous articles exist regarding the adherence to infection prevention and control measures in oral health-care facilities worldwide. The strategies employed in underdeveloped and industrialized nations differ significantly, yet the fundamental principles of infection prevention and control remain consistent throughout. The accessibility of resources poses a perpetual challenge, particularly in emerging nations. This analysis has identified significant differences in the adherence to infection-control rules and recommendations on a global scale. While infection-control recommendations are generally well understood and followed in wealthy countries, the level of understanding and compliance with these guidelines is significantly lower and concerning in developing countries.

Given the nature of their job, dental staff are regularly exposed to potentially infectious organisms, which poses an occupational hazard. To reduce the spread of illnesses, it is crucial to adhere strictly to vaccination protocols, utilize personal protective equipment (PPE) correctly, and diligently observe disinfection and sterilization guidelines. It is necessary to establish protocols in the dental office to

minimize percutaneous injuries. These protocols should be clearly communicated to new personnel and frequently reviewed and evaluated. It is essential to adhere to an exposure protocol and conduct a risk assessment in the event of an accident. Dental healthcare personnel and their patients are susceptible to infections and the spread of diseases, so it is crucial to emphasize the importance of infection control methods, ongoing education, and vaccination. It is essential to employ appropriate sterilizing measures to avoid the spread of infection between patients.

Reference

- [1] Sebastiani FR, Dym H, Kirpalani T. Infection Control in the Dental Office. *Dent Clin North Am.* 2017 Apr;61(2):435-457.
- [2] Thomas MV, Jarboe G, Frazer RQ. Infection control in the dental office. *Dent Clin North Am.* 2008 Jul;52(3):609-28, x.
- [3] Araujo MW, Andreana S. Risk and prevention of transmission of infectious diseases in dentistry. *Quintessence Int.* 2002 May;33(5):376-82.
- [4] Denault D, Gardner H. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Jul 20, 2023. OSHA Bloodborne Pathogen Standards.
- [5] McCarthy GM. Risk of transmission of viruses in the dental office. *J Can Dent Assoc.* 2000 Nov;66(10):554-5, 557.
- [6] Amato A, Caggiano M, Amato M, Moccia G, Capunzo M, De Caro F. Infection Control in Dental Practice During the COVID-19 Pandemic. *Int J Environ Res Public Health.* 2020 Jul 02;17(13)
- [7] Cabrera-Tasayco FDP, Rivera-Carhuavilca JM, Atoche-Socola KJ, Peña-Soto C, Arriola-Guillén LE. Biosafety Measures at the Dental Office After the Appearance of COVID-19: A Systematic Review. *Disaster Med Public Health Prep.* 2021 Dec;15(6):e34-e38.
- [8] Sotomayor-Castillo C, Li C, Kaufman-Francis K, Nahidi S, Walsh LJ, Liberali SA, Irving E, Holden AC, Shaban RZ. Australian dentists' knowledge, preparedness, and experiences during the COVID-19 pandemic. *Infect Dis Health.* 2022 Feb;27(1):49-57.
- [9] Mahdi SS, Ahmed Z, Allana R, Amenta F, Agha D, Latif MW, Daood U, Mehanna C. Knowledge, Attitudes, and Perceptions of Dental Assistants regarding Dental Asepsis and Sterilization in the Dental Workplace. *Int J Dent.* 2021;2021:5574536.
- [10] Lo Giudice R. The Severe Acute Respiratory Syndrome Coronavirus-2 (SARS CoV-2) in Dentistry. Management of Biological Risk in Dental Practice. *Int J Environ Res Public Health.* 2020 Apr 28;17(9)
- [11] Cleveland JL, Barker LK, Cuny EJ, Panlilio AL., National Surveillance System for Health Care Workers Group. Preventing percutaneous injuries among dental health care personnel. *J Am Dent Assoc.* 2007 Feb;138(2):169-78; quiz 247-8.
- [12] Miller CH, Tan CM, Beiswanger MA, Gaines DJ, Setcos JC, Palenik CJ. Cleaning dental instruments: measuring the effectiveness of an instrument washer/disinfector. *Am J Dent.* 2000 Feb;13(1):39-43.
- [13] McCarthy GM, Ssali CS, Bednarsh H, Jorge J, Wangrangsimakul K, Page-Shafer K. Transmission of HIV in the dental clinic and elsewhere. *Oral Dis.* 2002;8 Suppl 2:126-35.
- [14] Ayatollahi J, Ayatollahi F, Ardekani AM, Bahrololoomi R, Ayatollahi J, Ayatollahi A, Owlia MB. Occupational hazards to dental staff. *Dent Res J (Isfahan).* 2012 Jan;9(1):2-7.
- [15] Habib S, Shaikh OS. Hepatitis B immune globulin. *Drugs Today (Barc).* 2007 Jun;43(6):379-94.
- [16] Villani FA, Aiuto R, Paglia L, Re D. COVID-19 and Dentistry: Prevention in Dental Practice, a Literature Review. *Int J Environ Res Public Health.* 2020 Jun 26;17(12)
- [17] Kanjirath PP, Coplen AE, Chapman JC, et al. Effectiveness of gloves and infection control in dentistry: student and provider perspectives. *J Dent Educ.* 2009;73:571-580.
- [18] World Health Organization . WHO Press; Geneva, Switzerland: 2009. Guide to

- Implementation: A Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy. Save Lives Clean Your Hands. [cited 2012 3 August]; Available from: WHO_IER_PSP_2009.02_eng.pdf.
- [19] De Amorim-Finzi MB, Cury MVC, Costa CRR, et al. Rate of compliance with hand hygiene by dental healthcare personnel (DHCP) within a dentistry healthcare first aid facility. *Eur J Dent.* 2010;4:233–237.
- [20] Weber DJ, Rutala WA, Miller MB, et al. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: norovirus, *Clostridium difficile*, and *Acinetobacter* species. *Am J Infect Control.* 2010;35(5 supplement 1):S25–S33.