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Infection control practices and approaches in the dentistry field; a review

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Abstract

Patient safety is one of the vital disciplines in the medical field, in addition to that, the healthcare workers' safety and protection are also critical, preventing the dissemination and transmission of infectious diseases such as bacterial infections of *Staphylococci, Streptococci, Mycobacterium* spp, and other viruses such as Hepatitis B virus, is a critical thing that must be implemented in all healthcare settings, and dental settings specifically, so, achieving many methods to prevent infections and contamination from occurrence and dissemination is so crucial nowadays specifically with the spread of COVID-19 viral infections, several approaches such as Personal Protective Equipment, sterilization, disinfection, and immunization were done to prevent infections and keep patients and healthcare workers, such as dentists, health good. This review discusses the mean infection control approaches from healthcare professionals and dental settings as well as the ways to protect dentists and patients from any infectious diseases in the healthcare dental settings in an effective way.

Keywords: Infection control - infection prevention - personal Protective Equipment - dentistry – healthcare professionals

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Introduction

In dentistry, there exists a wide range of microorganisms that have the potential to cause harm to both patients and dental practitioners [1]. The microorganisms encompass *staphylococci, Enterococci* [2], *Mycobacterium tuberculosis* [3], *streptococci*, hepatitis viruses, herpes simplex virus types, rubella, influenza, human immunodeficiency virus, mumps, and several others [4]. Within a dental environment, diseases can be transmitted through direct exposure to infectious saliva, blood, or other bodily fluids, or indirectly through contaminated equipment, surfaces, and materials. Moreover, pathogens can spread by the inhalation of airborne diseases found in scattered droplets or aerosols that come from respiratory and saliva secretions [5-7].

Cross-contamination occurs when there is direct contact with infectious bodily fluids, such as saliva

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[1], secretions [8], blood, excretions, and airborne droplets. Indirect transmission can also happen via contact with contaminated objects [9,10], such as sharp instruments, dental waterlines, and the surrounding surroundings. In a dental environment, there is a potential for the transmission of pathogens between dental healthcare personnel (DHCP) and patients [11]. Hence, the efficacy of infection control relies on the competence and conduct of individuals who adhere to defined protocols to avert the transmission of illnesses among various sources [12].

Multiple studies suggest that the environment, encompassing elements such as water, air, and surfaces, can exert a substantial impact on the spread of diseases [13]. The growth of bacteria in dental unit water systems is facilitated by the presence of stagnant water, biofilms, and inadequate disinfection [14]. Furthermore, air-water infusion pumps and generators can disperse saliva and bacteria from the patient's lips into the surrounding atmosphere and surfaces, so contaminating them [15]. The initiation of disease occurs when pathogens infiltrate the body, locating a favorable environment to commence the process of reproduction. Individuals who have a medical background that includes rheumatic heart disease, valve prolapse, endocarditis mitral, and prosthetic joints may experience increased concern over aerobic bacteria [7].

Microorganisms have a substantial impact on the spread of infections in dental clinics. These pathogens can spread from patients to medical staff, from dental professionals to patients, from one patient to another, and even from the dental clinic to the general public [8]. The existence of antibiotic-resistant bacterial strains in dental clinic facilities presents a substantial public health hazard due to the possibility of infections. Therefore, effectively managing infections is essential for reducing the spread of diseases. Prior research has demonstrated a significant prevalence of microbial contamination in the water systems of dental clinics [14]. It has been established that this results in the formation of biofilm, which then pollutes the water in the dental unit [8].

Addressing infectious illnesses in dentistry is an ongoing and growing challenge. Dental patients are classified as high-risk persons because they have a heightened vulnerability to both transmit and acquire infectious illnesses [11]. Equal emphasis has been placed on both the prevention of cross-contamination and the transmission of diseases among patients. When considering these concerns, it is crucial to consider two specific factors: safeguarding the dentist and their staff from acquiring and spreading illnesses and implementing processes to minimize the likelihood of cross-contamination with dental instruments [16]. It has been emphasized the persistent risks of cross-contamination in dental practice, can arise among patients, practitioners, and auxiliary staff. The identified probable sources of contamination comprise absorbent cotton pledgets, air syringes [3], glass slabs, and hand towels. According to the infection control standards established by the Centers for Disease Control and Prevention (CDC), dental impressions can result in cross-contamination. Hence, it is imperative to manage them in a manner that safeguards patients, healthcare professionals, and the surroundings against potential exposure [17,18].

Ensuring infection prevention is of utmost importance for all dental institutions, regardless of the nature of their services [19]. They are required to possess the essential resources to adhere to Standard Precautions and other infection control standards specified in the CDC's 2017 recommendations for Infection Control in Dental healthcare settings [14].

Standard precautions

Hand hygiene

Within the field of dentistry, maintaining proper hand hygiene involves team members thoroughly washing their hands with water and soap or using an alcohol-based hand sanitizer during routine checkups and nonsurgical operations [15]. Regrettably, hand hygiene is often inadequately observed in the healthcare sector, including dentistry. To ensure adherence, the individual responsible for infection control should create and implement a comprehensive policy for hand hygiene [16]. This should include conducting regular training sessions for staff, prominently displaying instructive posters illustrating proper hand washing techniques, and ensuring that the facilities for hand hygiene are appropriate and well-supplied. Regular reminders and feedback are necessary for individuals to enhance and sustain high levels of adherence to basic hand hygiene [19]. Hands can be cleansed by using either soap and water or an alcohol-based hand sanitizer. By using soap and massaging the hands, the skin's impurities are effectively removed and then washed away with water [20]. The water temperature should be maintained at an ideal level since the water doesn't need to be very hot to eliminate bacteria on the hands, but rather to effectively eradicate them [21]. Moreover, it is recommended to use alcohol-based hand sanitizer for regular hand hygiene, unless certain circumstances need the use of soap and water [22]. The main rationale behind this is the convenience and the imperative to promote adherence to hand hygiene, which has been proven to be more effective when alcohol-based hand rubs are provided, rather than relying exclusively on handwashing. Their antibacterial action is extensive and effective. Rapid evaporation not only causes the hands to become dry before putting on gloves but also decreases paper waste [23-25].

Eyes, Nose, and Mouth

Dental operations entail the possibility of infection, as well as the potential for harm to the eyes due to mechanical and chemical variables [26]. Infections can be spread by the circulation of blood and the release of droplets containing saliva. During the drilling operation, tooth and dental materials scatter [27]. Chemicals such as etchant, which is used in dentistry, and disinfectants, which are used to sanitize solid surfaces in medical facilities, have the potential to create splashes [13].

The treatment of patients and the execution of decontamination methods carry a possible risk of causing ocular injury [28]. For optimal eye protection, it is recommended to utilize eyeglasses equipped with side shields that securely conform to the contours of the face. Moreover, face shields or visors might be employed as an alternative for safeguarding oneself [5]. Therefore, this review aims to define and assess the main infection control approaches used in dentistry settings and determine the main pathogens that can invade the dentistry field and how they can be controlled.

Ensuring the presence of suitable first aid protocols is vital in case of an ocular illness or injury. Material safety data sheets are essential for promptly addressing chemical splashes to the eye. Every dental clinic must have an eye wash kit or station, and the staff should be knowledgeable about its whereabouts [17]. Face masks are effective in protecting the nose and mouth by reducing the spread of droplets and airborne particles that are produced during regular dental operations [23]. Masks may provide a limited level of protection to individuals who wear them, although the data supporting this assertion is not strong. For the best protection against spatter that may come from below the shield, it is advisable to wear both a mask and a face shield.

Face masks include inherent limits and necessitate appropriate utilization to achieve effectiveness. These items are primarily intended for one-time usage and should be discarded after each patient [24]. Manipulating the mask by tugging it lower and

wearing it for long durations will reduce its effectiveness [25]. The mask's effectiveness as a barrier will be diminished and it will collapse as it absorbs moisture, enabling pollutants on the surface to come into direct contact with the wearer [27].

Efficient communication is crucial in the dentistry field, and the use of a face mask can impede this process. It is advisable to completely uncover the chin by removing the mask instead of partially covering it [28]. Additionally, it is important to avoid using infected hands. After talking with the patient, it is recommended to replace the mask with a new one. regrettably, the dental industry media has erroneously endorsed the incorrect practice of wearing masks by portraying dental professionals engaging in conversations with patients while wearing masks poorly, with the mask positioned below their chin [29,30].

Personal Protective Equipment

All dental team members must operate in a safe and risk-free setting. Risk management is the methodical process of minimizing or decreasing potential hazards to guarantee safety [17]. The current approach to evaluating risk management involves employing a tiered structure of hazard controls. Adopting strategies to mitigate a safety hazard is the optimal method to manage it, however, it may not always be feasible [31].

The dental team faces a potential danger of contracting various diseases through the transfer of blood and saliva, as they frequently come into touch with significant quantities of these bodily fluids during their job. By physically inserting our fingers into the oral cavities of patients, utilizing and sterilizing sharp instruments, and producing aerosol particles through the use of high-speed handpieces and ultrasonic devices, we are exposing ourselves to potential hazards [32-34].

The face and hands are especially susceptible to potential dangers during the execution of dental procedures [35]. The eyes, nose, and mouth serve as potential entry points for pathogens to invade our bodies. Hence, employing physical barriers is a logical approach to decrease the likelihood of this occurrence. These obstacles are commonly known as personal protective equipment (PPE) [36], which is a component of the fundamental precautionary measures. Various nations enforce regulations and enact legislation concerning the utilization of Personal Protective Equipment [37], and it is the responsibility of employers to provide it. PPE is a crucial element of risk management; however, users should acknowledge that it is the least efficient method for controlling a risk [38].

Safe injection practices

The objective of establishing secure injection protocols is to impede the transmission of contagious diseases among patients [39], as well as between patients and dentists, during the process of drug preparation and administration. DHCP typically administers parenteral medications together with local anesthetic [40]. This procedure entails the utilization of needles and anesthetic cartridges that are specifically tailored for individual patients. The dental cartridge syringe undergoes a thorough cleaning and subsequent heat sterilization after each patient [41]. Extra precautions should be taken when providing injectable medications along with intravenous fluids, especially for patients undergoing conscious sedation. Ensuring the safe administration of an injection is crucial for the well-being of the receiver and helps to minimize any preventable dangers for the healthcare provider [12]. Dentists implement the following protocols to ensure the safety of patients during injections [11,33,43-46]:

- Administer injections using aseptic techniques in a completely sterile setting.
- Before piercing, sanitize the rubber septum of a medicinal bottle by using alcohol.

- It is crucial to minimize the utilization of needles or syringes on a large number of patients, employing pre-filled syringes and technologies like insulin pens.
- When acquiring further doses for the same patient, it is imperative to utilize a fresh needle and a fresh syringe to gain access to pharmaceutical containers, such as ampules, single and multidose vials, and bags.
- Whenever possible, use single-dose bottles to give parenteral medications.
- Refrain from using single-dose pharmaceutical vials, ampules, and bottles of intravenous fluid for multiple patients.
- Refrain from consolidating the residual contents of disposable vials for future use.
- When using multidose vials, it is crucial to comply with the following requirements: Whenever possible, assign multidose vials only to one patient.
- To avoid unintentional contamination, it is imperative to restrict the utilization of multidose vials to a centralized medicine facility. If these vials are designated for use by numerous patients, they must not be taken into the immediate patient treatment area, such as a dental operation.
- When a multidose vial is introduced into the patient treatment area, it is imperative that it is exclusively utilized for a single patient and promptly discarded.
- When first opened, it is crucial to mark multidose vials with the date and discard them within 28 days, unless the manufacturer specifies a different time frame.
- Refrain from utilizing fluid infusion or administration sets, such as IV bags, tubings, and connectors, on several patients.

Aseptic techniques Achievement, Sterilization, and Disinfection

Instrument processing requires a series of consecutive steps using specialized equipment. Every dental practice must establish and enforce policies and procedures for the transportation, containment [31], and handling of tools and equipment that have been contaminated with blood or human fluids. The manufacturer's instructions for sterilizing reusable dental instruments and equipment should be readily available, preferably situated in or close to the sterilization area. Most throwaway gadgets are explicitly engineered by the manufacturer for one-time use and do not include instructions for reprocessing [22]. Employ disposable devices exclusively for specific patients and conscientiously dispose of them [15].

Dental Healthcare Personnel (DHCP) who have been trained in the basic steps of reprocessing should be designated with the task of washing, disinfecting, and sterilizing dental equipment [41]. This guarantees that the reprocessing technique yields a device that can be securely utilized for patient treatment. Training should include the effective use of PPE [31], which is crucial for safely handling dangerous equipment. Medical supplies utilized in patient care, including dental instruments, apparatus, and machinery, are categorized into three distinct groups: critical, semicritical, or noncritical [18]. The categorization is determined by the degree of susceptibility to infection that is linked to its intended utilization [39].

Critical Items, such as surgical equipment and periodontal scalers, are specifically designed to penetrate soft tissue or bone. Individuals who are most susceptible to spreading infection should undergo regular sterilization using heat [41].

Semicritical items are devices that directly touch mucous membranes or damaged skin, such as skin that is chapped, abraded, or affected by dermatitis. Examples of these devices are amalgam condensers, mouth mirrors, and reusable dental imprint trays. Given the high-temperature tolerance of the majority

of semicritical materials used in dentistry, it is advisable to utilize heat for their disinfection [21,42]. If a semicritical item is vulnerable to heat, DHCP should substitute it with a heat-resistant or disposable alternative. If no other options are available, it must undergo, at the very least, high-level disinfection. Digital radiography sensors are classified as semicritical medical devices and need the use of a barrier that has been approved by the Food and Drug Administration (FDA) [43]. This barrier is crucial for reducing contamination during usage. After each use, it is essential to clean the sensors and then subject them to either heat sterilization or high-level disinfection before using them on another patient. If the object cannot withstand these actions, it is crucial to shield it with a barrier that has obtained FDA approval [44], at the very least. Furthermore, it is essential to meticulously sanitize and disinfect the area between patients using a disinfectant that meets the standards set by the Environmental Protection Agency (EPA) and has proven effective against tuberculosis [11]. To determine the appropriate method for sterilizing or disinfecting these products effectively, it is essential to consult the instructions provided by the manufacturer. This is because different manufacturers may provide unique recommendations [45,46].

Noncritical items, such as a blood pressure cuff, and radiograph head/cone, only make touch with intact skin [47]. These objects have a minimal ability to transmit diseases. In general, cleaning is sufficient, but if an object is soiled, it should be cleaned before being disinfected using a hospital-grade disinfectant that is EPA-certified. Choosing disposable barriers to safeguard these surfaces may be a more advantageous decision [48].

Before disinfection or sterilization, it is imperative to carry out a comprehensive cleaning operation to eliminate any dirt or organic impurities that may be present on the equipment [27]. Failure to remove saliva, blood, and other pollutants can create a barrier that protects germs, so reducing the effectiveness of the disinfection or sterilization process. For optimal removal of waste and to reduce worker exposure to blood, it is recommended to utilize automated cleaning equipment [12], such as ultrasonic cleaners and washer-disinfectors. Before putting instruments to heat sterilization, it is crucial to examine, enclose, wrap, or place them in container systems following the cleaning procedure [34].

Packages must be marked with information including the sterilization method used, the cycle or load identity, the sterilization date [41], and, if relevant, the expiration date. This information can assist in the recovery of processed or sterilized objects in case of instrument malfunction during the processing or sterilization phase [42].

Evaluating the sterilizer's capacity to fulfill the essential sterilization requirements should entail employing a blend of biological, mechanical, and chemical indicators. Biological indicators, often known as spore tests [6], are largely acknowledged as the most reliable means of monitoring the sterilization process [25]. This is because they quickly determine the efficacy of sterilization by eliminating highly resistant microorganisms, such as *Geobacillus* or *Bacillus* species, which are widely recognized. Consistent spore testing is crucial for monitoring sterilizers [12,32]. Nevertheless, if occasional spore testing is conducted, such as on a monthly or daily frequency, and the outcomes are not promptly accessible, it is advisable to supplement it with supplementary mechanical and chemical monitoring [24].

Mechanical and chemical indications do not provide an absolute assurance of sterilization, but they serve to identify procedural errors and equipment malfunctions.

Mechanical monitoring entails examining sterilizer gauges, computer displays, or printouts, and recording temperature, sterilization pressure, and exposure duration in sterilization records [43]. These measurable characteristics, which can be observed during the sterilization process, can serve as an early signal of a potential issue [44].

Chemical monitoring involves the use of highly sensitive substances that undergo a color change when exposed to elevated temperatures or specific combinations of time and temperature. Chemical indicator tapes [45], strips, or tabs, together with distinguishing marks on packaging materials, are utilized as visual aids [46]. The chemical monitoring findings are promptly acquired after the sterilization cycle, offering more timely information on the cycle in comparison to a spore test [47]. It is essential to include a chemical indicator in each package to confirm the penetration of the sterilizing agent (such as steam) into the package and its interaction with the equipment inside [48]. If the chemical indicator inside the container is not discernible from the exterior, it is advisable to employ an additional external indicator. Upon removing packages from the sterilizer, it is recommended to promptly inspect the external signs. Should the anticipated alteration in hue fail to occur, refrain from utilizing the devices [11,49]. Chemical indications aid in distinguishing between processed and unprocessed goods, so preventing the utilization of equipment that has not undergone sterilization [50].

Noteworthy: A chemical indicator with a single parameter can provide information specifically about a particular sterilizing factor, such as either time or temperature [51]. Multiparameter internal chemical indicators are intricately engineered to accurately identify and respond to several conditions, such as time [7], temperature [52], and the presence of steam. These signals offer a more dependable indication that the sterilizing conditions have been effectively fulfilled [53].

Through rigorous documentation of our procedures, it can be guaranteed that adherence to all cycle requirements, thereby building a robust sense of duty and accountability [24]. Furthermore, in the event of a sterilizer malfunction (such as a chemical indicator that does not change or a positive spore test), the presence of accurate documentation aids in determining whether an instrument recall is required [15].

It is recommended to store disinfected tools and supplies in cabinets that are either covered or well-sealed [3]. Before unsealing and utilizing hermetically sealed receptacles housing sterilized implements, it is imperative to meticulously inspect them to verify the integrity of the packaging, ensuring it has not incurred any impairment [22], such as moisture exposure, tearing, or puncturing, during storage. Before usage on a patient, any packs that have incurred damage must undergo reprocessing, which entails cleaning, packing, and subjecting them to heat sterilization once again [17,26,31].

Personnel education and training

Continual education and training of DHCP are crucial to guarantee comprehension and adherence to infection prevention procedures and policies [22]. All DHCP personnel should undergo training on fundamental concepts and processes of infection prevention. The training program should encompass both DHCP safety, such as OSHA bloodborne pathogens training, and patient safety, by highlighting the particular requirements linked with job or task responsibilities. Training and education should be imparted during the orientation process when new tasks or procedures are introduced, and every year. Adherence to both state and federal regulations is essential while overseeing training records [4,54].

OSHA Infection Control Training

OSHA provides instruction on the prevention of infections. The organization also establishes the benchmark for online courses in infection control training [55]. Many individuals experience infections that require medical intervention. The infection control courses facilitate the broad dissemination of knowledge on infection control and the reduction of infections in various work environments [19]. The training should cover themes such as prevalent diseases, established processes for infection control, various routes of transmission, and the identification and reporting of situations that provide a risk of infection, among other pertinent subjects. This awareness course is highly appropriate for volunteers, contractors, and workers. An extensive evaluation can be carried out at the end of the course. Upon successful completion, participants will get a certificate [20,55].

The disease prevention systems may encompass occupational health interventions, such as administering immunizations to oral healthcare providers, managing instances of exposure or disease in individuals requiring work limitations [17], implementing post-exposure prophylaxis, and maintaining compliance with the OSHA bloodborne pathogens standard. One can contact skilled healthcare specialists in an occupational health program at a hospital, educational institutions, or healthcare facilities that provide personnel health services to arrange referrals for medical treatments [32].

According to OSHA rules, the first or updated training for healthcare professionals must encompass the following elements [7,13,22,31,43]:

- This document provides a comprehensive explanation of the regulatory terminology used in the standard, as well as a detailed description of its contents.
- An extensive analysis of the frequency and symptoms of bloodborne illnesses.
- An elucidation of the methods via which bloodborne illnesses are transmitted.
- A clarification of the employer's protocol for handling and reducing potential hazards, together with the process for employees to acquire a documented copy of the protocol.
- A comprehensive guide outlining suitable approaches for identifying tasks and other activities that may entail contact with blood and other substances that have the potential to cause infection.
- A comprehensive analysis of the implementation and constraints of techniques developed to hinder or minimize contact, encompassing suitable engineering measures, operational procedures, and personal safety gear.
- Comprehensive information regarding different categories, correct utilization, placement, disposal, purification, control, and eradication of personal protective equipment.
- A rationale for the choice of personal protection equipment.
- This book offers a comprehensive examination of the hepatitis B vaccination, encompassing details regarding its effectiveness, safety, recommended procedure for administration, the advantages of receiving the vaccine, and the accessibility of free immunization.
- Guidelines about the proper protocols and designated personnel to be notified in the event of an emergency concerning blood or substances potentially harboring infectious germs.
- Providing a concise and clear description of the required steps to take in the event of an exposure incident. It covers the processes for reporting the occurrence and the subsequent medical assessment and treatment that will be provided.

- Details about the mandatory evaluation and subsequent supervision that the employer is required to offer the employee after an instance of exposure.
- A comprehensive elucidation of the prescribed signage, labeling, and/or color coding that is obligatory for biohazardous chemicals.
- An occasion for participants to engage actively in a dynamic dialogue with the instructor of the training session.

The annual training updates should encompass details regarding newly implemented protocols or rules, up-to-date insights on bloodborne pathogens [35], and additional components about employee safety within the realm of infection prevention. Employers are mandated by OSHA to record training sessions, which must encompass the date, subjects covered, individuals present [41], and the trainer's name and qualifications. Per OSHA requirements, it is mandatory to retain these papers for three years. It is advisable to retain all training documents in the event of any complaints regarding the provision of safety training to healthcare personnel [12].

Training of Infection Control

Dental Healthcare Providers

Healthcare personnel serve as the primary line of defense against healthcare-associated infections (HAI). Healthcare practitioners play a crucial role in limiting the spread of germs in healthcare settings [30]. The Infection Control Training for Healthcare Workers educates healthcare professionals on assessing and mitigating potential infection hazards in their work environment. Employers are required to provide this training to physicians, dental hygienists, physician assistants, podiatrists, licensed vocational nurses, registered nurses, medical residents, and other relevant staff members [41]. The CDC offers recommendations for this training, and this web-based course is developed using authoritative government data. Upon successful completion, participants will receive a certificate in Infection Control Training [27,44].

Nurses who work in dental settings

In nursing schools, the topic of infection prevention and control is usually taught as one of the first subjects [15]. Furthermore, the World Health Organization (WHO) has emphasized infection prevention and control (IPC) as one of the foremost 10 global health hazards [29]. The training on infection control varies among different countries for nurses and physicians. Different programs may offer unique educational options, clinical experiences, and standardized curricula. The period of the course's accreditation may vary [37].

Nurses might choose to participate in an online course to acquire certification in Infection Control. Nurses are required to engage in ongoing training in infection control as a result of their regular contact with diverse pathogens throughout their responsibilities [24]. Nurses must possess extensive knowledge and exhibit a strict commitment to infection control policies, strategies, and precautions [51].

When selecting an Infection Control Nurse Course, it is essential to ensure that the course includes the latest evidence-based infection control best practices [45]. As a result, this course has been modified to include the latest content [15].

Dental Healthcare Practitioners

Similar to nurses, dental practitioners are susceptible to many infections. Hence, dental practitioners and other professionals must enroll in dental infection control courses to successfully decrease the hazards linked with infections [7]. In addition, students must choose a course that complies with the most recent infection control criteria outlined by the CDC for dental healthcare

settings, infection control recommendations supplied by the ADA, and bloodborne pathogens restrictions mandated by OSHA [13]. This course provides healthcare personnel with up-to-date scientific information and offers them extensive guidance on the most efficient infection control strategies. By integrating state-of-the-art infection control techniques and concepts into dental practices, the likelihood of disease transmission and infections can be greatly reduced [42].

Immunization to combat and control infections in dental settings.

The enactment of the Vaccination Act of 1853 in the United Kingdom ignited a protracted discourse on compulsory vaccination for all dentists to protect themselves, It is advisable to possess a minimum level of effective security measures against various types of vaccines that must be administered to dentists in all dental settings (Figure 1) with a scheduled program (Table 1).

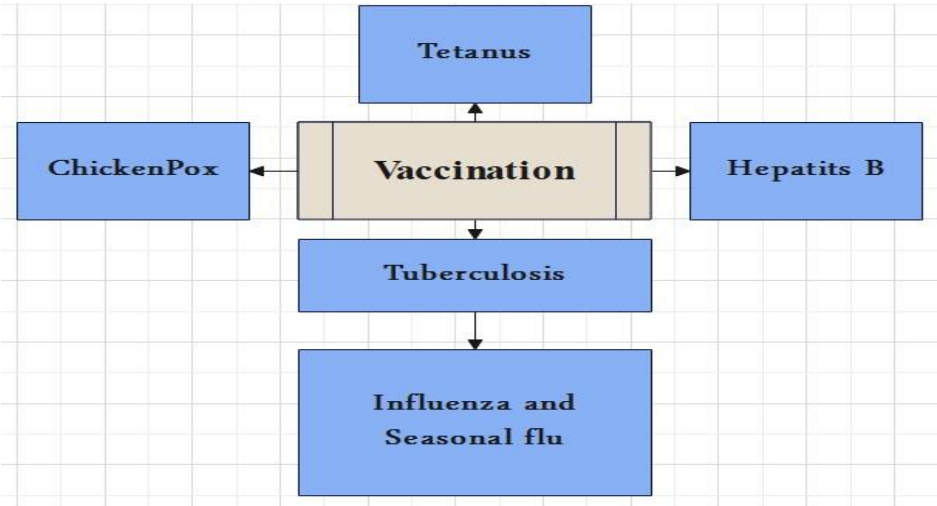

Figure 1 The most popular vaccines used in dentistry for immunization against widely spread infectious diseases [60]

Table 1 The most popular and crucial vaccines must be obtained for dentists with recommended doses (CDC, 2021)

Vaccine	Recommended dose(s)	Instructions
MMR (Mumps, Measles, and Rubella)	For most dentists as adults, a single dose of the MMR vaccine, or other reliable proof of protection, is enough [19].	MMR vaccine is obligatory given to children under 12 years in two divided doses [28].
Hepatitis B vaccine	It is typically provided in three doses, with an interval of at least 4 weeks between each dose [17].	Increasing the time interval between doses may result in a higher level of antibodies at the end, but it will not enhance the process of seroconversion [58].
Chickenpox	Dentists lacking proof of immunity should be administered two doses of varicella vaccine, with a time interval of 4 to 8 weeks between doses [59].	If Dentists already received one dose, the second dosage should be given at least 4 weeks following the initial dose [60].
Tdap (Tetanus, Diphtheria, and Pertussis)	A complete regimen comprises 5 administrations of the tetanus vaccine. This will provide sufficient long-term immunity against tetanus [8].	In case of uncertainty over the number of doses received, it may be necessary to administer an additional dose as a booster following an injury that results in a break in the skin [14].
Seasonal Influenza	One dose at each season [60].	Dentists who are receiving the flu vaccine for the first time or have only received one dosage of the vaccine before July would be administered two doses, with a minimum interval of one month between them [12].
BCG (Bacillus Calmette-Guérin)	Only one dose of this vaccine can be administrated to give effective and complete protection [51].	It is prudent for the dental team to receive it as a precautionary measure. An administration of the BCG vaccine is necessary to confer lifelong immunity [12]. The World Health Organization does not suggest administering further doses of the BCG vaccine [61].

Hepatitis B vaccine

It is crucial to give priority to hepatitis B immunization, even if it is not mandatory for dental practitioners [57]. Hepatitis B has an exceptionally low infectious dose, meaning that even a small exposure to the virus is enough to cause an infection. The virus is usually present in the bloodstream and can also be detected in the saliva of infected patients, which could potentially pose a risk for dental care workers in their line of work. Unfortunately, the dental team's implementation of the hepatitis B vaccine in many underdeveloped areas is unsatisfactorily insufficient [12]. This is concerning because these places are frequently characterized by a high prevalence of the virus. The Hepatitis B vaccine has been available since 1982 and is acknowledged as the first immunization to reduce the likelihood of hepatocellular carcinoma, a type of cancer [34]. The hepatitis B vaccination consists of the hepatitis B surface antigen (HBsAg) protein [7].

Tuberculosis

The dental team faces a substantial risk from the airborne spread of pulmonary tuberculosis (TB) [14]. Patients in the acute phase of infection, as opposed to those with prolonged latent infections, possess the capacity to spread the virus. The BCG vaccination, derived from Mycobacterium bovis, was initially introduced in 1921 as a prophylactic measure against tuberculosis. It provides a restricted level of defense against pulmonary tuberculosis, which interestingly diminishes as the distance from the equator increases. While the prevalence of tuberculosis may be reduced in many countries [23], it remains an undeniable global problem. Migration and changes in population demography can lead to particular areas within countries that typically have low disease prevalence experiencing an elevated risk, as evidenced in London, United Kingdom. While the BCG vaccine may not offer absolute protection, it is recommended for the dental team to have it as a preventive measure [15].

Influenza/ Seasonal Flu

Influenza A and B viruses are the primary cause of the flu, a common illness that affects a significant number of people each year, especially during the winter season [21]. The continuous mutation of the viruses that cause seasonal influenza poses a substantial challenge for experts in the field of vaccine development [59]. Therefore, it is essential to develop vaccines every year that target the anticipated strain that may arise during the winter season, considering the activities happening in the opposite hemisphere. Hence, the effectiveness of the immunization relies on precise strain prediction and is restricted to the particular season. Annual vaccination is highly advised for healthcare staff, including the dental team [60]. Implementing this approach can effectively reduce the spread of illnesses from the dental staff to vulnerable patients, including youngsters, those with weakened immune systems, and the elderly. Healthcare professionals have historically shown low rates of acceptance for the flu vaccine; the infection control lead could assume responsibility for promoting seasonal flu immunization within the practice [7,13-21].

Tetanus

Tetanus is a medical illness that arises from the exotoxin generated by the bacteria *Clostridium tetani*. This bacterium is found everywhere and is extremely resistant due to its ability to produce spores [41]. It is commonly found in the soil and feces of livestock. Starting in 1961, a large-scale vaccination campaign was launched to address this rare but potentially deadly disease. It is rare for a team member to lack protection, although there may be colleagues from economically challenged nations with inadequate immunization systems [17]. There is a small number of recorded cases where tetanus has been observed following tooth extraction or as a

consequence of bites, whether inflicted by people or animals [28]. Following oral trauma, the clinician must confirm the tetanus vaccination status considering the possibility of infected wounds. The tetanus vaccination is intriguing because of its ability to trigger an immune response targeted particularly against the tetanus toxoid, rather than the actual virus [34].

Chickenpox

The etiology of chickenpox is attributed to the varicella zoster virus [18]. This virus exhibits a high level of contagiousness and can be spread via airborne particles, as well as through direct contact with surfaces and by physical contact with hands. Many members of the dental team may have developed immunity to the virus through childhood sickness, which can remain in nerve ganglia and reappear as shingles later in life [24]. Individuals without immunity are vulnerable to infection from both individuals with chickenpox and individuals with shingles [25]. In addition, they pose a potential hazard to pregnant patients, newborn infants who may come to the facility, and elderly or immunocompromised individuals under our care. If these vulnerable populations become infected, they may suffer from severe sickness and potentially even death. Therefore, it is recommended to immunize any dental staff members who have not previously contracted chickenpox [48].

Conclusion

Patients in dental clinics present a substantial risk in terms of their capacity to transmit and contract infectious illnesses. There is a strong emphasis on minimizing cross-contamination and the spread of illnesses among patients. Previously utilized dental pumice is widely recognized as a significant origin of bacterial contamination in the prosthodontic laboratory. The oral cavity can be invaded by many types of bacteria and viruses, including *Streptococci* spp, *Lactobacilli* spp, and *Enterococci* spp. Diverse approaches are used to avert infections in dental environments for patients, technicians, nurses, and dentists. The processes encompass the implementation of standard measures, the maintenance of personnel cleanliness, adherence to hand hygiene standards, the assurance of sharps safety, and the utilization of personal protective equipment. Furthermore, sterilization and disinfection play a vital role in upholding cleanliness and reducing the spread of germs in dental environments and equipment. In addition, the well-being of dentists and other healthcare professionals can be protected by administering a range of immunizations.

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