Infection Control Practices in Dental Settings - A Review

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Abstract
In the era of HIV/ AIDS it is essential to follow the infection prevention protocols in all health care settings including dental settings. The present review article highlighted the various preventive protocols to be followed in dental settings. It includes right from the simple hand hygiene to biomedical waste segregation.

Key words: Infection control, Dental settings, Hand hygiene, Biomedical waste management.

Introduction
In the era of Human Immunodeficiency Virus (HIV) and AIDS it is mandatory to assume that each and every patient who is attending the health care like oral care is infected with ‘infective carriers’ (e.g. DNA or HBeAg positive Hepatitis carriers). As day by day the oral care is also gaining importance in all sets of community. It is essential to prevent these potential pathogens transmission during patient care. All over the world the dental professionals are increasing day by day including India. These huge numbers of dental professional working in the oral care are prone to various infections like Hepatitis, Human Immunodeficiency Viruses (HIV) etc. while taking care of the patients. They also need to follow the basic infection prevention practices so as to avoid the infections amongst themselves and between the patients. Each and every dental examination and procedure should be defined step wise (SOP) and adhered to strictly guarding both dentist and patient.

In this review article recommendations are discussed for dental professionals who might be occupationally exposed to infectious materials including body fluids and contaminated equipment, environmental surfaces, water, or air. These recommendations will help to prevent or reduce potential for disease transmission from patient to dental professional, from dental professional to patient, and from patient to patient. Dental professionals and patients who are taking treatment for their oral health problems might be exposed to pathogenic microorganisms including Mycobacterium tuberculosis, Hepatitis B and C, herpes simplex viruses, HIV and bacteria that colonize or infect the oral cavity and respiratory tract.

The most common route of transmission of these pathogenic microorganisms is through:

a) Direct contact (e.g. blood)
b) Indirect contact (e.g. instruments)
c) Contact of oral mucosa with droplets generated from an infected person (e.g. by coughing, sneezing, or talking);
d) Inhalation1

For occurring infection through any of these routes mentioned above needs following conditions:
• Presence of pathogenic microorganism with sufficient virulence and in adequate numbers
• It must be present in reservoir or source that allows the pathogen to survive and multiply (e.g. blood)
• Mode of transmission from the source to the host
• Portal of entry through which the pathogen can enter the host; and
• A susceptible host (i.e. one who is not immune).

Occurrence of these events provides the chain of infection. Effective infection-control strategies prevent disease transmission by interrupting one or more links in the chain.2

In this present review article most common and simple preventive practices are elaborated so as to understand by the dental professional to follow in their day to day routine practices.

Following basic practices are needed to avoid the infections in dental settings:
1. Immunization for common diseases like Hepatitis B
2. Strict adherence to hand hygiene
3. Use of personal protective equipment and barrier nursing
4. Use of standard precautions
5. Use of properly sterilized and disinfected equipment
6. Prevention of injuries like needle stick injuries
7. Environmental cleanliness
8. Proper biomedical waste segregation and its disposal
9. Spillage management
10. Precautions in dental radiology

The above mentioned practices are elaborated below in detail:
1. Immunization
Blood borne pathogens (e.g., HBV, HCV) in dental health-care settings can have serious consequences, but such transmission is rare. The risk of occupational exposure is based on the prevalence of the viruses in patients, nature and frequency of contact with blood and body fluids through percutaneous or per mucosal routes of exposure. Hepatitis B Virus (HBV) is a well-recognized occupational risk for health care professional (HCP) including dental professionals. Transmission of HBV is mainly when exposed to blood or body fluids of a person with either acute or chronic HBV infection. Persons infected with HBV can transmit the virus for as long as they are HBsAg-positive. Hepatitis B and C are the most common infections which are transmitted during patient care and need utmost attention to prevent their transmission in dental professionals. Immunization is the choice to prevent HBV infections in dental settings. Immunizations substantially reduce both the number of dental professionals susceptible to these diseases and the potential for disease transmission to other dental professionals and patients. Thus, immunizations are an essential part of prevention and infection-control programs for dental professionals, and a comprehensive immunization policy should be implemented for all dental health-care facilities. The schedule for immunization is three doses of 0, 1 and 6 month and a booster dose after every 5 years. Of course one has to remember that standard precautions are also important.

During epidemic of H1N1, immunization can also be taken into consideration due to recent pandemic all over the world and especially in Pune.

2. Hand hygiene
Hand hygiene is the most cost effective and easy to perform practice which can reduce potential pathogens on the hands and is considered the single most critical measure for reducing the risk of transmitting organisms to patients and health care professionals.

Hospital-based studies have demonstrated that noncompliance with hand hygiene practices is associated with health-care-associated infections and the spread of multi-resistant organisms. Noncompliance also has been a major contributor to outbreaks. The preferred method for hand hygiene depends on the type of procedure, the degree of contamination, and the desired persistence of antimicrobial action on the skin.

For any routine dental procedure hand washing and hand antisepsis can be achieved by using both plain and antimicrobial soap and water and if hands are not visibly contaminated with patient’s body fluids and then hand rub can be used. These are also called as 5 moments of hand hygiene. When hand hygiene is essential:
1. Before touching the patient
2. Before any procedure
3. After touching patients surrounding
4. After patient care
5. After exposure to blood and body fluids or visibly contaminated hands

How hand hygiene is achieved.
The steps are as follows and the entire duration of the procedure must be completed within 30-60 seconds.
1. Wet hands with water and apply enough soap
2. Rub hands palm to palm; all hand surfaces
3. Right palm over left dorsum with interlaced fingers and vice versa
4. Palm to palm with fingers interlaced; Backs of fingers to opposing palms with fingers interlocked;
5. Rotational rubbing of left thumb clasped in right palm and vice versa
6. Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa
7. Rinse hands with water
8. Dry hands thoroughly Use towel to turn off faucet; your hands are now safe

3. Use of personal protective equipment (PPE)
PPE generally protect the skin and the mucous membranes of the eyes, nose, and mouth from exposure to blood or body fluids. Use of dental instruments and air-water syringes creates droplets of water, saliva, blood, microorganisms, and other debris. This spatter travels only a short distance and settles out quickly, landing on the floor, nearby operatory surfaces, dental professionals, or the patient. Aerosols can remain suspended in air for long time for and can be inhaled. Appropriate work practices, including use of dental dams and high-velocity air evacuation, should minimize dissemination of droplets, spatter, and aerosols.

PPE used in oral health-care settings includes gloves, surgical masks, protective eyewear, face shields, and protective clothing (e.g. gowns and jackets). Reusable PPE (e.g. clinician or patient protective eyewear and face shields) should be cleaned with soap and water, and when visibly soiled, disinfected between patients, according to the manufacturer's directions. Appropriate work practices, including use of dental dams and high-velocity air evacuation, should minimize dissemination of droplets, spatter, and aerosols.
4. Standard precautions

Standard precautions are essential to reduce the risk of transmission of microorganisms from known and unknown sources of infection (blood, body fluids, excretions, secretions etc). These precautions apply to the care of all patients regardless of their diagnosis or presumed infection status.

The principles of standard precautions include:

a) Hand washing
b) Use of protective barriers i.e. the use, of personal protective clothing
c) Biomedical waste segregation at the time generation and not after completion of the procedure
d) No recapping of needles
e) Effective cleaning, decontamination and sterilization of equipment, instruments and environment
f) Timely management of spillages
g) Use of appropriate disinfectants at the correct working dilution

5. Sterilization and disinfection

Patient-care items (dental instruments, devices, and equipment) should be categorized as critical, semi-critical, or noncritical, depending on the potential risk for infection associated with their intended use. The biological indicators (spore strips of Bacillus stearothermophilus) must be checked for every sterilization cycle and if not then at least once in a week with physical and chemical methods of monitoring sterilization cycles. Maintain the record of all these monitoring systems.

In view to maintain the sterility and disinfection of various instruments following steps are essential:

a. Proper transportation and processing of contaminated critical and semi-critical patient-care items
b. Dedicated instrument processing area
c. Proper receiving, cleaning, and decontamination
d. Proper packaging
e. Right selection of sterilization methods
f. Proper storage of Sterilized Items

6. Needle Stick injuries

The risk of infection may be due to percutaneous injury (e.g. a needle stick or cut with a sharp object) or contact of mucous membrane or non-intact skin e.g., abraded skin with blood or other body fluids that are potentially infectious. The risk of sero-conversion post sharps injury, blood or body fluid exposure from a source will depend on 1) the status of the source 2) type of injury and 3) the status of the victim.

To prevent these needle stick injuries one should stick to following measures:

a. Wear personal protective equipment
b. Avoid recapping of the needles
c. Safely dispose off immediately
d. Immunization for Hepatitis B
e. Ensure you take responsibility for your own sharps
f. The staff member affected (the victim) should report the incident immediately
g. Wash the area immediately under running water
h. Make the wound bleed on its own. Do not squeeze the area
i. Seek appropriate medical advice
j. Identify the source patient sero-status for HIV, HBV, HCV
k. Obtain blood sample for injured health care worker and patients immediately to know the sero-status
l. Take primary treatment from the physician
m. Follow the instructions given by the physician for further follow up

7. General environmental cleanliness

In the dental settings, environmental surfaces (i.e. a surface or equipment that does not contact patients directly) can become contaminated during patient care. Certain surfaces, especially ones touched frequently (e.g. light handles, unit switches, and drawer knobs) can serve as reservoirs of microbial contamination, although they have not been associated directly with transmission of infection to either dental professionals or patients. Transfer of microorganisms from contaminated environmental surfaces to patients occurs primarily through dental professionals hand contact.

When selecting equipment, consideration should be given to the ease with which it can be cleaned and disinfected. A thorough cleaning and disinfection of surfaces which might get contaminated with blood and body fluids must be done with appropriate and recommended solutions. Water testing from the dental chair should be integral part for microbiological surveillance. Studies have demonstrated that dental unit waterlines (i.e. narrow-bore plastic tubing that carries water to the high-speed hand piece, air/water syringe, and ultrasonic scaler) can become colonized with microorganisms, including bacteria, fungi, and protozoa. CDC recommended that dental waterlines be flushed at the beginning of the clinic day to reduce the microbial load, but it is not sufficient for removal of biofilms. To improve the water quality self- contained water systems with chemical treatment, in line micro-filters and combination of these treatments can be applied. Dental devices that are connected to the dental water system and that enter the patient’s mouth (e.g. handpieces, ultrasonic scalers, or air/water syringes)
should be operated to discharge water and air for a minimum of 20-30 seconds after each patient.  

8. Biomedical waste segregation

Biomedical waste is defined as any waste as the solid or liquid waste arising from health care or health related facilities. Categories biomedical waste includes:

a. Non-infectious (waste not contaminated with body fluids)
b. Infectious waste: (waste contaminated with body fluids and hazardous to others).

All waste generated in dental practice must be segregated into one or other of these categories and disposed of appropriately. Following is the method of choice of disposal:

Yellow bag: In which all biodegradable waste is disposed off (e.g. human anatomical waste, cotton, expired medicine without wrappers)

Red bag: Non-biodegradable waste such as plastics (gloves, catheters, syringes etc)

White puncture proof container: The container is filled with 1% Hypochlorite solution and sharps are generally discarded in these containers.  

9. Spillage management

• Wear PPE
• Cover the area with paper
• Collect the paper and discard in yellow bag
• Mop the area with 1% Hypochlorite solution
• Then clean area with clean water
• Dispose off PPE as per its categories

10. Dental radiology

When taking radiographs for patients, ensure that;

• Protective plastic covered I/O films (barrier pouches) are used
• Prevent contamination of the processing equipment
• Film is released onto clean area
• Gloves are used to position film, holder and tube
• Gloves are used prior to selecting and taking exposure
• Tube head and surfaces are disinfected
• Biteblocks and holders are sterilisable

To conclude each and every dental examination & procedure should be defined step wise (SOP) and adhered to strictly guarding both dentist and patient.

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