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### RESEARCH ARTICLE

#### INFECTION CONTROL IN DENTAL PRACTICE: REVIEW LITETATURE.

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#### Abstract

Cross infection control is an essential aspect of dental practice. Assuming that all patients are carrier of disease, strict infection control should be done using universal standard precaution. This can be achieved by wholesome efforts of whole dental team. The purpose of this study is to upgrade our knowledge and highlight the preventive protocol to be followed in dental clinic and laboratory.

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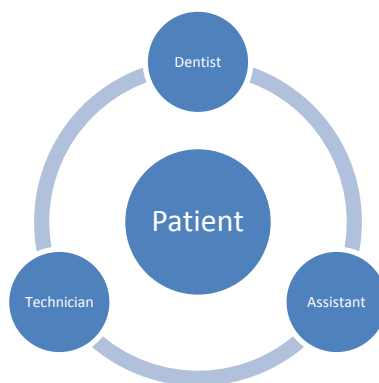
#### Introduction:-

Cross infection is defined as the transfer of micro-organism like bacteria and viruses between patient and health care professional (HCP) in working area. The infection can transfer between individuals, or through instruments.<sup>1,2</sup> Cross infection control has grabbed the attention of HCP since the human immunodeficiency virus (HIV) was discovered. In dental practice it is assumed that all patients are carrier of infectious diseases<sup>3</sup> and dental professionals are at constant risk of exposure to various blood borne and upper respiratory tract pathogens or infectious agents through blood, saliva, aerosol and various other body fluids.<sup>4-7</sup> Infections can spread in dental setup either through touch, spatter, flying debris or aerosol from the oral cavity.<sup>4-6, 8-10</sup> Accidental exposure to blood borne pathogens can be from the HIV, Hepatitis B virus (HBV), Hepatitis C virus, *Mycobacterium tuberculosis*, Herpes simplex virus type I and type II, staphylococci, and other potentially infectious agents.<sup>7</sup> The primary route of accidental exposure by "blood borne pathogens," is mainly due to unintentional percutaneous injuries. The incidence of these types of injuries are more prevalent in dental setups because of high number of patients, frequent patient movement on dental chair, small operating field and various sharp cutting edge instruments being used in dental practice. There are strict infection control guidelines to maintain aseptic condition in clinical and surgical working area recommended by World Health Organization (WHO),<sup>11</sup> British Medical Association,<sup>12</sup> British Dental Association.<sup>13</sup>

There are the following basic practices are needed to avoid in dental setups:

- |  |                                    |
|--|------------------------------------|
| 1. Immunization of health care workers | 6. Standard precautions            |
| 2. Evaluation of the patients          | 7. Laboratory asepsis              |
| 3. Personal protection                 | 8. Waste management                |
| 4. Sterilization                       | 9. Spillage management             |
| 5. Disinfection                        | 10. Precaution in dental radiology |

Above mention practices are elaborated below in detail.



### Immunization of health care workers.

Hepatitis B virus (HBV) is well recognized occupational risk for HCP. HBV is very highly infectious, far more than HIV. Any instrument or procedure that can convey minute traces of infected blood as little as 0.00001ml can be infectious.<sup>14</sup> Through Bloodborne pathogens (HBV, HCV) in dental setup, HCP can face some serious complication although the incidence are rare. Incidence of accidental exposure is related to the prevalence of virus in patients, nature and frequency of contact with blood and body fluids through percutaneous or per mucosal route of exposure.<sup>15</sup> Transmission of HBV can only be occur when either acute or chronic infected patient's blood or body fluid is exposed to HCP. Patient with HBsAg-positive are the carrier and can transmit the infection, {over 350 million people are carrier worldwide and about 45 million are in India which is second largest only next to china,<sup>14</sup>} and utmost attention should be given to prevent the transmission in HCP while performing patient care. Immunization against hepatitis can prevent infection to HCP specially in dental setup and it will substantially reduce the number of HCP susceptible to these diseases and potential for disease transmission to other HCP and patients.<sup>16</sup> Hence, immunization is the most important part of prevention and infection-control for HCP. The schedule for immunization are three doses of 0, 1 and 6 month and a booster dose after every 5 years. Of course standard precautions should not be neglected.

### Evaluation of patient

A thorough medical history should be recorded from every patient in OPD (outpatient department) and should be updated at every recall. While history taking, practitioner should diagnose the infectious disease of concern and relevant questions should be asked in detail and diagnose the patient who are either high susceptible to infection or who are potential carrier of the disease.<sup>1</sup> The most common routes of transmission of infection are as follow

1. Direct contact (e.g. blood)
2. Indirect contact (e.g. instrument, impression)
3. Contact of oral mucosa in infected person
4. Inhalation.

Effective application of infection-control strategies will interrupt the links in chain of transmission.

### Personal protection

Personal hygiene of the staff member who are either directly or indirectly comes in contact with patient should be carefully monitored. In any healthcare setting hand hygiene is the single most important activity for preventing the spread of infection. Hand hygiene must be performed before and after every episode of patient contact. Hand hygiene is the most cost effective and easy to perform practice which can reduce potential pathogens on the hands and is considered the critical measure for reducing the risk of transmitting organisms to patients and health care professionals.<sup>18-21</sup> Mild antiseptic like 3% PCMX (p-chloro, meta-nylenole), povidone iodine or chlorhexidine containing hand cleansers should be preferred. Fingers are the most common vehicle of infection transmission.<sup>22, 23</sup> A clean sink should be use for hand washing, tap should be foot elbow or sensor operated. Finger nails should be short, no jewellery should be worn at the time of operative procedure, cuts or bruises should be covered with bandage as it is serve as easy portal to the infections. Hand piece, three way syringe, and ultra-sonic scaler forms droplets of water, saliva, blood, microorganism and debris. Aerosol can be suspended in air and can be inhaled.<sup>24</sup> Use of rubber dams<sup>25</sup> and high velocity air evacuation should be encouraged as it minimizes the dissemination of droplets, spatter and aerosol.<sup>26</sup> Use of personal protective equipment mainly protect the skin and the mucous

membranes of the eyes, nose and mouth from exposure to blood or body fluids. Personal protective equipment used in oral health-care settings includes gloves, surgical masks, protective eyewear, face shields, and protective clothing (e.g. gowns and jackets).<sup>27, 28</sup> Reusable PPE (e.g. clinician or patient protective eyewear and face shields) should be disinfected regularly, according to the manufacturer's directions. OSHA (Occupational Safety and Health Administration) regulations clearly specify that, prior to all treatment procedure all clinical personal must wear gloves and gloves must meet Food and Drug Administration (FDA) regulations.

#### 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.

Avoid recapping of needle with both hand, while recapping needles a single handed 'bayonet technique' should be used or resheathing device should be used. Always either remove the burs from hand piece or face away from hand or body.

Instruments are categorized according to Spaulding classification system as critical, semi-critical, or noncritical, on the basis of potential risk for infection associated with their desired application.<sup>29, 30</sup> 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 chemicals methods of monitoring of sterilization cycles. Maintain the record of all these monitoring systems. Proper transportation and processing of contaminated critical and semi-critical instruments, proper receiving, cleaning, decontamination, proper packaging, selection of right sterilization method should be done in order to maintain the sterility and disinfection of various instruments.

#### Sterilization

**Methods For Sterilizing And Disinfecting Patient-Care Items And Environmental Surfaces 28**

Process	Result	Method	Examples	Patient Care Items
Sterilization	Destroys all micro-organisms, including bacterial spores.	Heat-automated, high temperature	Steam, dry heat, unsaturated chemical vapor	Heat-tolerant critical and semicritical
		Heat-automated, low temperature	Ethylene oxide gas, plasma sterilization	Heat-sensitive critical and semicritical
		Liquid immersion	Glutaraldehyde, glutaraldehydes with phenols, hydrogen peroxide, hydrogen peroxide with peracetic acid, peracetic acid	
High-level disinfection	Destroys all micro-organisms, but not necessarily high numbers of bacterial spores.	Heat-automated	Washer disinfectant	Heat-sensitive semicritical
		Liquid immersion	Glutaraldehyde, glutaraldehydes with phenols, hydrogen peroxide, hydrogen peroxide with peracetic acid, ortho-phthalaldehyde	
Intermediate-level disinfection	Destroys vegetative bacteria and most fungi and viruses. Inactivates <i>Mycobacterium bovis</i> †. Not necessarily capable of killing bacterial spores.	Liquid contact	EPA-registered hospital disinfectant with label claim of tuberculocidal activity	Noncritical with visible blood
Low-level disinfection	Destroys most vegetative bacteria and certain fungi and viruses. Does not inactivate <i>Mycobacterium bovis</i> .	Liquid contact	EPA-registered hospital disinfectant with no label claim regarding tuberculocidal activity. OSHA also requires label claim of HIV and HBV potency for use of low-level disinfectant for use on clinical contact surfaces (e.g., quaternary ammonium compounds, some phenolics, some iodophors)	Noncritical without visible blood

### Disinfection

In a dental setup, surface equipment that does not contact the patient directly can become contaminated during treatment. Frequently touched surfaces like light handle, unit switches and drawer knobs can serve as reservoirs of microbial contamination. Transmission of infection from contaminated surfaces to patient occurs mainly by the hands of HCP.<sup>31, 32</sup> Routinely formaldehyde fumigation of the dental setup will check such transmission.

HCP are responsible for cleaned and disinfected impression, appliance and materials prior to dispatch to the laboratory and should be disinfected according to the manufacturer's recommendation. In 1992, H.S. Harold et al<sup>33</sup> determined the efficacy of eight disinfectant solution: sodium hypochloride (undiluted), sodium hypochloride (diluted), Alcide L.D., OMC II, Biocide, Sporidicin, Lysol, Impresept and sterile water (control) when used for immersion and a spray against three microorganism (*S. aureus*, *M. Phlei* and *Bacillus subtilis*) and normal mixed oral flora on the surface of irreversible hydrocollide impressions. This study concluded that, undiluted sodium hypochloride was the most effective disinfectant with shortest contact time (1 minute). Impression or appliance should be immersed in disinfectant instead of spraying as it is less effective and carries the risk of inhalation.<sup>34</sup> Prosthesis, inter treatment materials and non sterilizable equipment's if get contaminated then it will clean with soap and water and disinfected with a hospital level disinfectant. Impression are preferred to disinfect as cast are most difficult to disinfect without causing damage.<sup>35-37</sup> It is better to prevent contamination rather to use chemical agents over delicate equipment.<sup>38</sup> Heat resistant items should be sterilized before use.

### Standard precautions

Standard Precautions are designed to both protect healthcare professionals (HCP) and prevent HCP from spreading infections among patients. These practices are based on the principle that all body fluids pose a risk for blood borne virus transmission or may contain transmissible infectious micro-organisms. Body fluids include blood and body fluid, secretions, excretions (except sweat), non-intact skin and mucus membranes.

### Laboratory asepsis

It is believed that infection control is not practice with full efficiency, some equipment need special attention even in clean laboratories. By this there may be less chance of laboratory contamination. Effective disinfectant solution should be added to the pumice solution.<sup>35</sup> This will prevent the airborne colonization of microorganisms. Laboratory should be disinfected daily. Bench top, machines and work area should be cleaned daily. Same cleaning protocols should follow as it is practice in dental clinic.<sup>34</sup>

### Waste management

#### BIOMEDICAL WASTE SEGREGATION:

*Categories of biomedical waste includes:*

- CATEGORY 1**-Human anatomical waste(human tissues, organs, body parts)-Incineration/deep burial
- CATEGORY 2** - Animal waste(animal tissues, organs, body parts carcasses, bleeding parts, fluids, blood) - Incineration/deep burial
- CATEGORY 3**-Microbiology & biotechnology waste(waste from lab cultures, research and infectious agents from research and industrial lab)- Incineration/deep burial
- CATEGORY 4** - Sharps (needles, syringes, scalpel, blades, glass) - Incineration/disinfection treatment/mutilation
- CATEGORY 5**-Medicines and cytotoxic drugs Incineration/ destruction and Disposal in secured landfill
- CATEGORY 6**-Solid waste(blood and body fluids)autoclave/ chemical treatment/burial
- CATEGORY 7**-Solid waste(disposable items)autoclave/ chemical treatment/burial
- CATEGORY 8**-liquid waste(waste generated from lab., and washing, cleaning, housekeeping & disinfecting activities)-disinfection/chemicals/ discharge into drains
- CATEGORY 9**-Incineration ash -disposal in municipal landfill
- CATEGORY 10**-Chemical waste -chemical treatment/ secure landfill

Bio medical waste segregation/ categories of biomedical waste includes

Biomedical waste is defined as any waste as the solid or liquid waste arising from health care or health related facilities. They are broadly categories as:

1. Non- infectious waste
2. Infectious waste

**Different colored plastic bags for different type of waste<sup>39, 40</sup>**

COLOUR CODING	TYPE OF CONTAINER	WASTE CATEGORY	TREATMENT OPTIONS
YELLOW	Plastic bag	Human anatomical wastes, animal waste, microbiology and bio - technology wastes and solid wastes	Incineration/deep burial
RED	Plastic bag/disinfected container	Microbiology and bio - technology wastes and solid wastes	Autoclaving/microwave/chemical treatment
BLUE/WHITE TRANSLUCENT	Plastic bag/puncture proof container	Waste sharps and solid wastes	Autoclaving/microwave/chemical treatment/shredding
BLACK	Plastic bag	Discarded medicines, incineration ash and chemicals used in production of biologicals	Disposal in secured landfill

**Spillage management**

Cleaning staff should respond quickly to spillage. Staff should wear personal protective equipment and immediately cover the area with paper and discard in yellow bag. Use 1% Sodium hypochlorite to mop the area followed by clean water.<sup>41</sup>

**Precaution in dental radiology**

At the time of taking radiographs for patients, HCP should ensure that protective plastic cover the radiographic films or RVG sensors in order to prevent transmission to other patients and to prevent the contamination of processing equipment's. Gloves are used to release film onto clean area, position of film, holder and tube, selecting and taking exposure. Bite-blocks and holders are sterilizable.

**Conclusion:-**

Cross infection control is an essential aspect of dental practice. Assuming that all patients are carrier of disease, strict infection control should be done using universal standard precautions. This can be achieved by wholesome efforts of whole dental team. Cleaning should always preceded high-level disinfection and sterilization. Current disinfection and sterilization guidelines must be strictly followed.

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