FIELD MEDICINE

NEEDLE STICK INJURIES TO DENTAL HEALTH CARE PERSONNEL

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ABSTRACT

Background: The risk of acquiring blood-borne pathogens through needle sticks during dental care procedures is undisputed; many workers in hospital settings have contracted diseases in this manner. These injuries can be avoided by eliminating the unnecessary use of needles, using devices with safety features, and promoting education and safe work practices for handling needles and sharps.

Aim: The aim of this article is to create awareness of these risks and measures that dental healthcare personnel can use to prevent percutaneous exposures in oral health settings.

Methods: This narrative update is based on the overview of the medical literature on the needle stick injuries among dental health care personnel.

Conclusion: Awareness of the potential consequences associated with needle stick injuries is must for dental health care personnel. Greater collaborative efforts by all concerned persons are needed to prevent needle stick injuries and the tragic consequences that can result.

Keywords: Dental health care personnel (DHCP), needle stick injury (NSI), blood borne pathogens, prevention

INTRODUCTION

Needle stick injuries pose the single greatest risk of transmission of a blood borne infection to dental healthcare personnel in the oral health setting [1]. Percutaneous exposures result from injuries by contaminated needles, burs, scalpels, broken glass, exposed ends of dental wires, or other sharps that penetrate or break skin. These injuries can occur at any time when people use, disassemble, or dispose off needles [2]. Dental healthcare personnel (DHCP) include dentists, dental hygienists, dental assistants, dental laboratory technicians, students and trainees and other persons not directly involved in patient care but potentially exposed to infectious agents e.g., housekeeping and maintenance personnel [3].

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The dental metallic cartridge syringe was introduced into dentistry in 1921 and an aspirating plunger was added 36 years later. Dental syringe is such a part of the everyday life of dental practice that according to one estimate dentists use a syringe needle every 15 minutes [4]. The use of non-disposable syringes means that needles must be re-sheathed in order for the syringes to be dismantled and the appropriate parts autoclaved. It is during re-sheathing and disposal of the needles that the majority of needle stick injuries occur, especially when done frequently in an environment with trainees and students [5]. The injuries occur at a time when the syringes are most likely to be contaminated, having been in the patient's mouth. It is well known that needle stick injuries can result in transmission of blood borne viruses, including hepatitis B, C and HIV [6].

The risk of occupational exposure to blood borne viruses is largely determined by their prevalence in the patient population and the nature and frequency of contact with blood and body fluids through percutaneous exposure. According to an estimate, there are about 9 million and 14 million carriers of Hepatitis B and Hepatitis C respectively in Pakistan [7]. Similarly 70,000 to 80,000 persons are supposed to be infected with HIV [8]. In Pakistan, different studies have been carried out on different segments of the population regarding prevalence of HBV, HCV and HIV. A prevalence rate of 2.5-10% for HBsAg [9,10], 2.2-14% for Anti-HCV [11,12]. These figures suggest that a sizable number of individuals in Pakistan are potential risk for transmission of blood borne diseases to dental professionals.

Incidence:

Surveys carried out among US dentists showed that on average dental healthcare workers sustain 3 injuries a year and 32-33 % of them are related to needles [13]. In Scotland a survey showed that non-sterile inoculation injuries occurred at a yearly rate of 1.7 and of these 30% constituted a moderate or high risk of transmission of infection to the dentist [14]. The risks of exposure for dental students may be greater than the qualified practitioner. Their manual skills are under-developed and their clinical experience is limited. They frequently work without an assistant and continually practicing a variety of task which is new to them [15]. In reviewing reports from various dental schools, the rate of injuries from cavity preparation is 14.9%, 17% and 26% [16-18].

Chances of Transmission:

The risk of infection after exposure to a blood borne virus is influenced by inoculum size and susceptibility of the exposed DHCP [19].

Persons infected with HBV can transmit the virus for as long as they are HBsAg-positive [20]. The risk of HBV transmission is highly related to the HBeAg status of the source person. In studies of health care workers (HCW) who sustained injuries from needles contaminated with blood containing HBV, the risk of developing clinical hepatitis from a needle contaminated with HBsAg-positive, HBeAg-negative blood was 1%-6%, and the risk of developing serologic evidence of HBV infection, 23%-37% By comparison, the risk of developing clinical hepatitis if the blood was positive for both HBsAg and HBeAg was 22%-31%; the risk of developing serologic evidence of HBV infection was 37%-62% [21,22].

Data is insufficient to estimate the occupational risk of HCV infection among health care workers, but the majority of studies indicate the prevalence of HCV infection among dentists, surgeons, and hospital-based health care personnel is similar to that among the general population, approximately 1%-2% [23,24]. Follow-up studies of health care personnel exposed to HCV-infected blood through percutaneous or other sharps injuries have determined a low incidence of seroconversion (mean: 1.8%; range, 0%-7%) [25,26]. Prospective studies worldwide indicate the average risk of HIV infection after a single percutaneous exposure to HIV-infected blood is 0.3% (range: 0.2%-0.5%) [27,28]. Certain factors affect the risk of HIV transmission after an occupational exposure. Laboratory studies have determined if needles that pass through latex gloves are solid rather than hollow-bore, or are of small gauge (e.g., anesthetic needles commonly used in dentistry), they transfer less blood. In a retrospective case-control study of HCW, an increased risk for HIV infection was associated with exposure to a relatively large volume of blood, as indicated by a deep injury with a device that was visibly contaminated with the patient's blood, or a procedure that involved a needle placed in a vein or artery.

The risk was also increased if the exposure was to blood from patients with terminal illnesses, possibly reflecting the higher titer of HIV in late-stage AIDS [29].

Exposure Prevention Methods:

Preventing needle stick injuries is the most effective way to protect DHCP from the infectious diseases that needle stick accidents transmit. A comprehensive needle stick injury prevention program should include:

Education and Training

Workers need to understand the risks associated with needle stick injuries and know the proper means to prevent them. To reduce needle stick injuries, an effective program must include workers training. Clearly written policies, procedures, and guidelines can help ensure consistency, efficiency, and effective coordination of activities [30].

Standard Precautions

Standard precautions include use of Personal Protective Equipment (e.g., gloves, masks, protective eyewear or face shield, and gowns) intended to prevent skin and mucous membrane exposures [30]. Other protective equipment (e.g., finger guards while suturing) might also reduce injuries during dental procedures [32].

Work Practice Controls

Workers need to know how to properly use, assemble, disassemble, and process sharp devices (e.g., needles, scalars, laboratory utility knives, burs, explorers, and endodontic files). DHCP should be trained about removing burs before disassembling the hand piece from the dental unit, restricting use of fingers in tissue retraction or palpation during suturing and administration of anaesthesia, and minimizing potentially uncontrolled movements of such instruments as scalers or laboratory knives [33,34].

DHCP should never bend or break needles before disposal because this practice requires unnecessary manipulation. Used needles should never be recapped or otherwise manipulated by using both hands, or any other technique that involves directing the point of a needle toward any part of the body In situations where recapping is considered necessary, DHCP should never move an exposed needle tip towards an unprotected hand. Recapping can be safe when workers lay the cap on a flat surface and scoop it onto the tip of a syringe held in one hand. They must keep the free hand away from the sheath and well behind the exposed needle. This is known as single-handed scoop [35].

An effective system for disposing of used needles is crucial to preventing needle stick injuries. Having disposal containers readily available can greatly reduce the concern for recapping needles. Workers should place needles in wide-mouth, puncture-proof containers. Locate disposal containers specifically where needles are used to make safe disposal possible without recapping. Replace the containers before they are completely filled [36].

Disposable Syringes

Until the last few years, there were no suitable disposable dental syringes available to dentists. Manufacturers have been aware of this problem for a long time and there are now several different types of safety syringe on the market. Now self-sheathing anesthetic needles and dental units designed to shield burs in hand pieces are available to reduce percutaneous injuries. It is, therefore, time for dental schools and practices to reconsider their practice concerning syringes. This involves a major change in any clinical practice and needs to be considered with care [37,38].

Vaccination

Vaccination can protect DHCP from HBV infection and, whenever possible, should be completed when dentists or other DHCP are in training and before they have contact with blood [39].

DHCP should be tested for anti-HBs 1--2 months after completion of the 3-dose vaccination series. DHCP who do not develop an adequate antibody response (i.e., anti-HBs < 10 mIU/mL) to the primary vaccine series should complete a second 3-dose vaccine

series or be evaluated to determine if they are HBsAg-positive. Revaccinated persons should be retested for anti-HBs at the completion of the second vaccine series. Approximately half of no responders to the primary series will respond to a second 3-dose series. If no antibody response occurs after the second series, testing for HBsAg should be performed. No responders to vaccination who are HBsAg-negative should be considered susceptible to HBV infection and should be counselled regarding precautions to prevent HBV infection and the need to obtain HBIG (hepatitis B immunoglobulin) prophylaxis for any known or probable parenteral exposure to HBsAg-positive blood. Vaccine-induced antibodies decline gradually over time, and 60% of persons who initially respond to vaccination will lose detectable antibodies over 12 years. Even so, immunity continues to prevent clinical disease or detectable viral infection. Booster doses of vaccine and periodic serologic testing to monitor antibody concentrations after completion of the vaccine series are not necessary for vaccine responders [40].

Postexposure Management:

Post exposure management is an integral component of a complete program to prevent infection after an occupational exposure to blood. After an occupational blood exposure, first aid should be administered as necessary. Puncture wounds and other injuries to the skin should be washed with soap and water. No evidence exists that using antiseptics for wound care or expressing fluid by squeezing the wound further reduces the risk of blood borne pathogen transmission; however, use of antiseptics is not contraindicated. The application of caustic agents (e.g., bleach) or the injection of antiseptics or disinfectants into the wound is not recommended [41].

Dental practices and laboratories should establish written, comprehensive procedures for promptly reporting and evaluating such exposures. A qualified health-care professional should evaluate any occupational exposure incident of needle stick injury in dental settings. Because multiple factors contribute to the risk of infection after an occupational exposure to blood, the following information should be included in the exposure report, recorded in the exposed person's confidential medical record, and provided to the qualified health-care professional [42]:

- Date and time of exposure.
- Details of the procedure being performed, including where and how the exposure occurred and whether the exposure involved a sharp device, the type and brand of device, and how and when during its handling the exposure occurred.
- Details of the exposure, including its severity and the type and amount of fluid or material. For a percutaneous injury, severity might be measured by the depth of the wound, gauge of the needle, and whether fluid was injected; for a skin or mucous membrane exposure, the estimated volume of material, duration of contact, and the condition of the skin (e.g., chapped, abraded, or intact) should be noted.
- Details regarding whether the patient was known to contain HIV or other blood borne pathogens.
- Details regarding the exposed person (e.g., hepatitis B vaccination and vaccine-response status).
- Details regarding counselling, post exposure management, and follow-up.

Each occupational exposure should be evaluated individually for its potential to transmit HBV, HCV, and HIV, based on the following:

- The type and amount of body substance involved.
- The type of exposure (e.g., percutaneous injury, mucous membrane or no intact skin exposure, or bites resulting in blood exposure to either person involved).

- The infection status of the source.
- The susceptibility of the exposed person.

All of these factors should be considered in assessing the risk for infection and the need for further follow-up by the expert.

CONCLUSION

The prevention of needle stick injuries remains key to minimizing the risk of blood borne disease transmission. It is the responsibility of the educators to

- Teach the principles and practices of infection control, bringing theoretical information into the context of clinical settings to trainees;
- Create awareness about seriousness of needle stick injuries and teach avoidance strategies;
- Train employees in the safe handling of instruments and devices;
- Review procedures and consider devices (as they become commercially available) that may reduce the risk of needle stick injuries;

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