

Review Article

Occupational Biohazards

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ABSTRACT:

The Dentist profession is dedicated to promoting and enhancing oral health of every individual leading to the overall wellbeing of an individual. While accomplishing this, dentists are likely to be exposed to various biological health hazards. A biohazard is an organism, or substance derived from an organism, that causes a threat to (primarily) human health.

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INTRODUCTION

Dental practitioners as other healthcare workers confront a identified risk of occupational exposure to blood-borne pathogens like the Human Immunodeficiency Virus (HIV), the hepatitis B virus (HBV), and the hepatitis C virus (HCV). In dentistry, sharp injuries occur because of a small operating field, frequent patient movement, and the variety of sharp instruments used in dental procedure. The risk of exposure to blood-borne infections during the clinical dental training, consequences of non-reporting, and lack of appropriate follow-up or even infection should constantly be evaluated by dental institutions.¹⁻³

The risk of HIV transmissions to healthcare workers approximately range from 0.2 to 0.3% for parenteral exposures and 0.1% or less for mucosal exposures. A report published by the Centers for disease control and prevention (CDC) studied the 208 dental exposures (percutaneous, mucous membrane, and prolonged skin exposures) reported to the CDC from 1995 to 2001, 13% had HIV-positive source patients and did not lead to a seroconversion (75% of exposed individuals took the three-drug PEP regimen for variable lengths of time). Percutaneous exposure to HBV containing transmission risk about 2% for HBeAg-negative and about 30% for HBeAg-positive blood. Despite reducing the risk for HBV transmission among healthcare workers by effective

HBV vaccination programs, measuring of anti-HBs antibody response after HBV vaccination is essential for all vaccinated individuals with high-risk professions. HCV transmission risk is 1.8% and is the most serious viral hepatitis infection because of its ability to produce chronic infection in as many as 85% of those infected.⁴⁻⁶

DENTAL AMALGAM

Mercury (Hg) as amalgam has been used as a dental filling material for more than 150 years. Mercury is a toxic and bioaccumulative metal. Mercury commonly occurs in nature as sulfides and in a number of minerals. Globally, between 20,000–30,000 tons of mercury are discharged into the environment each year as a result of human activities. It exists in elemental, inorganic and organic forms. The use of mercury by the dental profession represents approximately 6 percent of the total annual domestic consumption and is estimated to contribute significantly to the discharge of mercury (14 percent in one study) to waste-water streams.⁶⁻⁸

Although individual dentists generate only small amounts of environmentally unfriendly wastes, the accumulated waste produced by the profession may have a significant environmental impact. Of much concern in recent years has been the impact of heavy metal contamination of water systems by dentists,

particularly through the production of dental amalgam waste. Although dental amalgam is a durable, cost-effective and long-lasting restorative material, it contains mercury, silver and other metals that can enter the environment. Mercury is the heavy metal of primary concern, making up to 50% by weight of dental amalgam. Mercury is bioaccumulating and is known to have toxic effects in plants, animals and humans.⁶⁻⁸

LEAD

Lead is a hazardous metal that can contaminate soil and groundwater, if placed in regular garbage, and sent to a landfill. Lead waste is generated at dental offices in foil from intraoral film packets, and discarded lead aprons and collars. Lead foils and aprons/shields can be collected, and dropped off at a local recycler for free, or picked up by your recycling service. Lead aprons can be used for several years with good management. Biomedical waste encompasses materials capable of causing disease or suspected of harbouring pathogenic organisms; it includes blood-soaked gauze, tissues and syringes, although not extracted teeth. Dental staff can also implement a variety of other practices to make the dental office more environmentally friendly. Purchase of products with minimal packaging and use of reusable plastic containers (e.g., for cleaning and disinfecting solutions) can reduce general waste production. Products made from recycled or partly recycled materials can also be used (e.g., cotton or wool rolls, paper towels). Energy-efficient lighting and temperature regulation can limit office energy use.⁷⁻⁹

BLOOD-SOAKED/DRIPPING GAUZE

Is a biomedical hazardous waste. It should be enclosed in a yellow biomedical waste bag covered with a double bag, labeled with a biohazard symbol and refrigerated, if onsite for more than 4 days. Once accumulated, a CWC should be contacted for disposal.⁸⁻¹²

SHARPS

(Needles, scalpels, glass carpules, burs, acid etch tips, files, blades and other sharp objects): Their waste management includes collection in a red or yellow puncture resistant container with a lid that cannot be removed. The container should be properly labeled with biohazard symbol and once full, the CWC should be contacted for disposal.⁸⁻¹²

CHEMICALS, DISINFECTANTS, AND STERILIZING AGENTS

Staff handling these materials should be trained in Workplace Hazardous Materials Information System (WHMIS). Whenever possible, use steam or dry heat to sterilize dental instruments. Nonchlorinated plastic containers (not PVC) should be preferred to minimize environmental impacts and placed in the solid waste

stream. Halogenated sterilants have a detrimental effect on environment. Ignitable sterilants should not be poured down the drain as they have potency to explode. HCHO sterilants should also not be disposed down a drain. One should not pour sterilants into a septic system as this may significantly disrupt the bacteria which normally breakdown wastes.⁸⁻¹²

NONHAZARDOUS WASTES

(Paper, cardboard, aluminum, plastics, etc.): Their use should be minimized. Containers or packaging made of PVC plastic should be avoided where feasible, as this is difficult to recycle and can produce acid gases if incinerated. Paper waste, cardboard, and plastic containers (clean or rinsed) should be recycled where the service exists.⁸⁻¹²

Personal protective equipment should include gloves, gown, and protective eye and face shield, mask, boots, shoe covers and CPR shield. Engineering controls are the methods used to reduce employees' exposure by either removing the hazard or isolating the hazard including sharps, disposable containers, self sheathing needles, safer medical devices - needle less systems, or sharps with engineered injury protection. Disinfect all the surfaces of the dental care surfaces or equipment by removing all debris and organic matter by cleaning with disinfectant preferably approved by Dental Association and follow the manufacturer's directions.⁸⁻¹³

Biomedical wastes or non-anatomical wastes including blood soaked material and sharps, needles, or scalpels should be placed in separate yellow liner bags. Anatomical wastes including human tissues should be placed in red liner bags and should be handed over to certified professional waste disposal personnel. All biohazard materials should be placed in biohazard labeled bag and in turn into a biohazard labeled box. Ensure that excess air is removed from the bag. Twist excess of bag from the top of the waste end of the bag. Tape the twisted end of the bag. Loop the twisted end of the bag over itself and tape again. Close and tape the flaps of the box in 'H' design.⁸⁻¹³

NEEDLE-STICK INJURY: A RISING BIOHAZARD

Needle Stick Injury (NSI) has been identified as the foremost health allied concern around the globe. The consequences of an injury with a contaminated sharp object are related to various blood borne infection, e.g., Hepatitis-B virus (HBV), Hepatitis-C virus (HCV), and Human Immuno-Deficiency Virus (HIV). The healthcare professionals are at high risk if appropriate and recommended instrument handling is not carried out. The specialty of dentistry is highly susceptible to sharp injuries as most of the instruments used are sharp and there is a limited working area with heavy patient burdened outpatient departments.¹⁰⁻¹⁴

OTHERS

Gloves and a mask form an integral part of dentist's protective equipment. Latex gloves dusted with cornstarch powder are most often used. The gloves and the mask form an efficient barrier against most pathogens, and as recently proven – they also constitute a very good barrier against viruses, provided the gloves and the mask are intact. Musculoskeletal complications among dentists are prevalent like other healthcare workers. Most dentists (87.2%) indicated at least one symptom of musculoskeletal diseases in the past year.¹²⁻¹⁵

CONCLUSION

A dental office generates a number of hazardous wastes that can be detrimental to the environment if not properly managed, as a result of which dental practitioners have been increasingly prone to be exposed to these biohazardous waste materials. So it is important for the dentist to know how to manage and prevent this exposure by securing basic knowledge of biohazards components.

REFERENCES

1. Winwood PC, Winefield AH, Lushington K. The role of occupational stress in the maladaptive use of alcohol by dentists: A study of South Australian general dental practitioners. *Aust Dent J.* 2003;48:102–9.
2. Shuhaiber S, Einarson A, Radde IC, Sarkar M, Koren G. A prospective controlled study of pregnant veterinary staff exposed to inhaled anesthetics and X-rays. *Int J Occup Med Environ Health.* 2002;15:363–73.
3. Henderson KA, Matthews IP. Environmental monitoring of nitrous oxide during dental anaesthesia. *Br Dent J.* 2000;188:617–9.
4. Kumar RS, Manish GN, Ferreira AM. Occupational hazards among dental surgeons. *Indian J Occup Environ Med.* 2000;4:139–41
5. Rubel DM, Watchorn RB. Allergic contact dermatitis in dentistry. *Aust J Dermatol.* 2000;41:63–9.
6. Rundcrantz BL, Johnsson B, Moritz U. Pain and discomfort in the musculoskeletal system among dentists. A prospective study. *Swed Dent J.* 1991;15:219–28.
7. Al-Khatib IA, Darwish R. Assessment of waste amalgam management in dental clinics in Ramallah and Al-Bireh cities in Palestine. *Int J Environ Health Res.* 2004;14:179–83.
8. Szymanska J. Occupational hazards of dentistry. *Ann Agric Environ Med.* 1999;6:13–9.
9. McManus KR, Fan PL. Purchasing, installing and operating dental amalgam separators: practical issues. *J Am Dent Assoc.* 2003; 134(8): 1054-65
10. Albert SB. Taking the lead in amalgam waste recycling. *N y State Dent J.* 2000; 66(8): 4-5
11. Swanson RL, Roethel FJ, Bauer H. Reuse of lead from dental X-rays. *N y State Dent J,* 1999; 65(3): 34-6
12. Stark AM. Disposal options for infectious medical waste generated during home-based dental care. *Spec Care Dentist,* 1998; 18(5): 207-13
13. Singh H, Rehman R, Bumb SS. Management of biomedical waste: a review. *Int J Dent Med Res* 2014;1(1):14-20.
14. Dienstag JL, Ryan DM. Occupational exposure to hepatitis B virus in hospital personnel: infection or immunization? *Am J Epidemiol.* 1982 Jan;115(1): 26-39.
15. B Lynn Johnston, John M Conly. Nosocomial transmission of bloodborne viruses from Infected health care workers to patients. *Can J Infect Dis* 2003 Jul-Aug;14(4):147-151.