

OCCUPATIONAL HEALTH HAZARDS IN DENTAL PRACTICE- A BRIEF REVIEW

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Abstract

Dental professionals are susceptible to a number of occupational hazards. Occupational hazard refers to a risk or danger as a consequence of the nature or working conditions of a particular job. Type of occupational exposure that dentists may get exposed to may include Infectious hazards, Psycho-social hazards, Allergic reactions, Physical hazards, Mercury health hazard, Ionizing radiation, Non-ionizing radiation, Anesthetic gases in the dental office. Continuous educating and appropriate intervention studies are needed to reduce the complication of these hazards

Basically, for any infection control strategies, dentists should be aware of individual protective measures and appropriate sterilization or other high-level disinfection utilities. Concerning prevention, the global literature focuses strictly on control of infections and appropriate management of potentially infected materials, owing to the high profile of dentistry regarding infection transmission. The current review aims at discussing occupational health problems in dental practice as "the importance of avoiding accidents within infected material cannot be overemphasized!"

Keywords : Occupational hazard, infection control, occupational health problems

Introduction

Dentists are exposed to a number of occupational hazards during their professional life. These cause various ailments that are specific to the profession, which develop and intensify with years. In many cases they result in diseases and disease complexes, some of which are regarded as occupational illnesses. Prevention of these hazardous conditions in the workplace is of utmost importance in the practice of occupational health as a profession. Occupational health and dental waste management should be

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considered an integral part of the broader delivery of public health services. Potential dangers to increasingly hostile oral environment are a risk to the dental team and increased public and professional awareness is mandatory for protection.

The hazards can be:

Psychological hazards : stress is the most common psychological condition that occurs in the dental profession.

Physical hazards : musculoskeletal problems that have a direct relation to practising dentistry such as postural practices that may increase the risk of twisting and contorting the body.

Infectious hazards : needles and other sharp objects, spatter and aerosols can be sources of viral infections. Bacterial infections are also a potential risk. The major areas of concern are syphilis and tuberculosis.

Allergic reactions : latex gloves and few dental materials are responsible for most of the allergic skin reactions.

Mercury health hazard : it is known that high exposure to mercury vapour can cause biological and neurological damage.

Anaesthetic gases in the dental office : this is a specific hazard for those who use nitrous oxide gas regularly over an extended period of time.

Ionizing radiation : the use of X-ray machines in the dental office exposes dentists to ionizing radiation.

Non-ionizing radiation : this has recently become a concern since the introduction of composites and other resins, in addition to the introduction of lasers in dentistry, which has added another potential hazard to eye and other tissues.

This article reviews various occupational health hazards faced by dental professional in their practice that may predispose the dentist to risk of ailments that tend to intensify with age.

Psycho-social Hazard

The psychological aspects of dentist-patient co-operation are very important. In everyday clinical practice a dentist has to adapt an individual attitude towards a patient, depending on his/her mental state & personality. A stress situation is produced if the patient is not satisfied with the treatment rendered by the dentist. The knowledge of psychology and good communication skills are the most important factors that help in establishment of a proper relation between dentist and the patient thus deciding the outcome of the treatment.

Many clinical situations produce stress to a dentist¹⁻⁵ and these include, among others, procedures connected with anaesthetization of patients, overcoming of pain and fear, unanticipated emergency situations in which a patient's life is in danger, or procedures with hesitant prognosis. According to a study⁵, administration of anesthesia to patient is seldom discussed and it forms a major source of stress in this profession. Unskillful planning of a treatment may be source of disappointment and pain associated with failure both to a doctor and a patient. In many dentists an inseparable presence of stress situations may elicit painful thoughts, emotions or fears. It may also contribute to the development of such instantaneous reactions as increased tension, high blood pressure, fatigue, sleeplessness, touchiness and depression.⁶ The following factors, such as the necessity to keep a proper professional standard, aspiration to achieve technical perfection, causing pain or fear in patients, the necessity to cope with cancelled visits or late arrivals by patients, having to cope with different levels of cooperation with patients, were recognized as very important sources of stress in everyday dental practice.

Allergic Reaction

Dentist's protective equipment definitely includes gloves and mask. Dentists have been routinely using Latex gloves for more than two decades as a part of their good infection control strategies. Potential health hazard to some dental staff and patients have been reported due to the residual or integral chemical components pose. Allergy to latex gloves is the most frequently reported cause of dermatitis in dental personnel in various studies around the world^{7,8,9-11} A study in America found a 15% prevalence of adverse reactions to latex gloves in a major dental facility¹¹

The clinical symptoms of latex allergies include: urticaria, conjunctivitis accompanied by lacrimation and swelling of eyelids, mucous rhinitis, bronchial asthma and anaphylactic shock.^{12,13} Corn-starch or the so called absorbable dusting powder also plays an important role in latex allergies, manifesting itself in the reaction on the part of airways. is allergenic and takes part in immediate allergic reactions. Starch particles combined with latex protein allergens become airborne, and consequently they are inhaled, or absorbed by our skin.^{7, 14, 15} The intensity of aerosol effect grows with the increased use of rubber gloves.¹²

Dermatitis may also result from exposure to various chemicals and dental materials, such as methyl methacrylate and cyanoacrylate, both of which have been reviewed elsewhere.^{16,17} Respiratory hypersensitivity represents another occupational health issue for dentists. The cause include MMA, latex, and chloramine-T(sodium-N-chlorine-p-toluene sulphonamide)¹¹. Trace toxic metals such as beryllium, may also be generated from dental materials which contain alloys of beryllium.⁸

Biological Hazards

Dentists constitute a group of professionals who are likely to become exposed to biological health hazards. These hazards are constituted by infectious agents of human origin and include prions, viruses, bacteria and fungi. A dentist can become infected either directly or indirectly. In the first case, microorganisms can pass into organism, through a cut on the skin of his/her hand while performing a medical examination, as a result of an accidental bite by the patient during a dental procedure, or through a needle wound during an anaesthetic procedure. An indirect infection occurs when an infectious agent is transmitted into organism through the so-called carrier. The following are the main sources of indirect infection: aerosols of saliva, gingival fluid, natural organic dust particles (dental caries tissue) mixed with air and water, and breaking free from dental instruments and devices. The following are the main entry points of infection for a dentist: epidermis of hands, oral epithelium, nasal epithelium, epithelium of upper airways, epithelium of bronchial tubes, epithelium of alveoli, and conjunctival epithelium.

In dental procedures such as processing of tooth tissues (carietic defects, denture abutments), filling procedures, removal of dental concretions, dentists use tools with a slow-speed, turbine, or ultrasound burs which spray around the bacterial flora included in the oral cavity.^{18,19} Dental procedures causes major changes in the microbiological environment of a dentist's surgery. Legnani et al.²⁰ made an assessment of the aerosol contamination resulting from dental procedures. Air contamination was measured by means of the Surface Air System method and the "plate" method (Air Microbial Index). It was proved that during working hours the average air bacterial load increased over three times, and the air load levels were 1.5 times (aerobic bacteria) and 2 times (anaerobes) greater as compared to the initial load.

A patient attending the surgery for treatment can be source of harmful micro-organisms for dental personnel and various studies have shown that the risk of hepatitis B infection is very high among the dental profession²¹ and some dentists have been infected with HIV virus.²² The pathogenic micro-organisms present in saliva, blood, gingival exudate and tooth debris from the mouth of a patient can be disseminated by:

- Direct contact with the dentist's fingers and instruments.
- Aerosols
- Droplet splatter
- Impressions

Aerosols can arise from coughs and sneezes, brushes and ultrasonic equipments as demonstrated by Miller et al²³. Appropriate clinical procedures to prevent cross-infection is of utmost requirement as many types of micro-organisms can be transmitted to the dental personnel and their attendant diseases from the patient's mouth.

The spread of infection in prosthetics may occur via contaminated impressions and prostheses. Large number of micro-organisms have been isolated from impression materials contaminated impressions and prostheses. Large number of microorganisms has been isolated from impression materials contaminated with saliva from healthy patients.²⁴

Mercury health hazard

There are many potentially toxic materials that are used in dentistry that may pose a health hazard in the absence of appropriate precautionary measures. Most of the dental materials undergo an extensive range of tests both before and after use. Even so, some dental materials are aerosolized during high speed cutting and finishing and may thereby be inhaled by dental staff. Other dental materials are volatile and may give rise to dermatological and respiratory effects. The dangers of chronic exposure to mercury are well documented. On the contrary, it is now recognized that the health hazards of amalgam restorations is negligible, with the exception of rare allergic reactions. The greatest exposure to mercury from dentists comes from handling amalgam and amalgam capsules for restorations and storage and disposal of amalgam also represent important sources of exposure²⁵. While concerns regarding its systemic toxicity have reduced with decreasing urinary mercury levels detected in dentists over the recent years, continuing attention to mercury hygiene, particularly proper amalgam storage, handling and disposal, is essential²⁶. New filling materials have been developed to help reduce the dependence on mercury based substances, such as composite resins, although these may be less durable and clinically effective than mercury amalgam.

Anaesthetic gases in the dental office

Among the best known of these is the risk of waste anesthetic gases, such as nitrous oxide, have been measured in the dental clinic during dental procedures.²⁷ Concerns have also been raised that high levels of ambient gases may impair performance and the well-being of those exposed.²⁸

The national institute for occupational safety and health (NIOSH) in 1994 issued a warning that even with preventive measures such as scavenging systems in place where workers may be at risk for serious health effects due to their exposure.²⁹ Several human studies have shown that occupational exposure to N₂O, may cause reduced fertility, spontaneous abortions, and neurologic, renal, and liver disease as well as documented decrease in mental performance, audiovisual ability, and mental dexterity in susceptible individuals.^{29, 30}

Physical hazards

Dental personnel are exposed to both ionizing and nonionizing type of radiations. Ionizing radiation is a well-established risk factor for cancer. However, despite the fact that most dental offices and clinics have x-ray machines that are in frequent use, the exposure of dental workers to ionizing radiation and the associated potential cancer risk have been assessed in only a few studies. Dental staff should stand behind protective barriers and also use radiation monitoring badges to protect themselves.³¹ Non-ionizing

radiation has become an important concern with the use of blue light and ultra-violet light to cure various dental materials. Exposure to the radiations emitted by these can cause damage to the various structures of the eye including the retina and the cornea.²⁶ Use of safety glasses and appropriate shields can minimize or eliminate the radiations in this regard.³²

Noise Generated by Dental Equipments

Dental personnel are exposed to noise of different sound levels while working in dental clinics or laboratories. Dental laboratory machine, dental handpiece, ultrasonic scalers, amalgamators, high speed evacuation devices and other items produce sound at different levels which is appreciable. As reported in an earlier study conducted among dentists and dental auxiliaries, 16.6% of subjects reported of tinnitus, 30% had difficulty in speech discrimination and 30.8% had speech discrimination in a background noise.³³ The noise levels of modern dental equipment is below 85 db and up to this point the risk of hearing loss is negligible.^{34,35} But the risk is amplified while using older or faulty equipment. To avoid any danger ear protection should be worn during these procedures and hearing tests at least once a year are recommended.^{36,37}

Ergonomics

Musculo-Skeletal Disorders

Dental professionals often develop musculoskeletal problems, which are related to suboptimal work-environment ergonomics that might be responsible for improper sitting postures and movements causing unnecessary musculoskeletal loading, discomfort, and fatigue. Insufficient or inappropriate equipment, inappropriate work-area design, direct injuries, repetitive movements from working with dental instruments, or sitting for extended times with a flexed and twisted back are contributing factors to neck and low-back ailments.^{38,39-41} Various structures can be affected— muscles, ligaments, tendons, nerves, joints, and supporting structures (intervertebral discs). A number of disorders are included under this category: upper and lower back pain, herniated disc, neck pain with or without cervical root problems, carpal tunnel syndrome, tendinopathies, shoulder pain, rotator cuff tendinopathies, and repetitive strain injuries. A Finnish study reports musculoskeletal symptoms from the back and neck of 30% of the dentists. In an American study, 57% of 960 dentists in a Dental Society reported occasional back pain.⁴² The overstress produces a negative effect on the musculoskeletal system and the peripheral nervous system; above all, it affects the peripheral nerves of the upper limbs and the neck nerve roots.^{43, 44}

The dental chair position and the dentist's stool position and orientation relative to that of the patient, combined with the doctor's effort to maintain visibility of the oral environment, result in awkward positions over long periods of time; these in turn result in back problems. The symptoms include low back pain, stiffness, and sciatica with neurological features such as tingling, paresthesia, and muscle weakness

Neck problems are associated with a similar etiology, especially awkward body and head posture, which are often required for direct vision into the mouth. The introduction of magnifying loupes is probably the only development over the years that helps dentists keep a more neutral or balanced posture.⁴⁵

Carpal tunnel syndrome (CTS) is the most common nerve entrapment syndrome. It involves entrapment of the median nerve at the level of the wrist. In the work environment, CTS results from

rapid, repetitive, and daily use of the hand and fingers for many hours at a time. The problem is compounded when working with a bent wrist, exerting force, working with vibratory tools, and in cold environments. Rapid movement of tendons in the synovial tube causes inflammation and fluid buildup. This can result in atrophy of the thenar muscles; tingling in the thumb, index, middle, and half of the ring finger; night pain; and pain when handling tools.⁴⁶

Conclusion

Occupational health hazards are a potential risk in dentistry.

Reckless practice can have devastating health effects on both dentists and patients. Adequate awareness about most of these hazards exists yet needs to be promoted among dentists. The well-being of dentists should be protected by reducing the effect of occupational hazards through the implementation of various health measures.

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