

## Review Article

### Occupational hazards to dental staff

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#### ABSTRACT

Dental professionals are predisposed to a number of occupational hazards. These include exposure to infections (including Human Immunodeficiency Virus and viral hepatitis); percutaneous exposure incidents, dental materials, radiation, and noise; musculoskeletal disorders; psychological problems and dermatitis; respiratory disorders; and eye insults. Percutaneous exposure incidents remain a main concern, as exposure to serious infectious agents is a virtual risk. Minimizing percutaneous exposure incidents and their consequences should continue to be considered, including sound infection control practices, continuing education, and hepatitis B vaccination. Basically, for any infection control strategies, dentists should be aware of individual protective measures and appropriate sterilization or other high-level disinfection utilities. Strained posture at work disturbs the musculoskeletal alignment and leads to stooped spine. The stooped posture also involved certain groups of muscles and joints. This may lead to diseases of the musculoskeletal system. Continuous educating and appropriate intervention studies are needed to reduce the complication of these hazards. So, it is important for dentists to remain constantly up-to-date about measures on how to deal with newer strategies and dental materials, and implicates the need for special medical care for this professional group.

**Key Words:** Dental staff, dentist, occupational disease

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#### INTRODUCTION

Dentistry is considered by the practitioners and most of the public as being extremely hazardous. The hazards include the following:

- Infectious hazards: Needles and other sharp objects, spatter, and aerosols can transmit viral infections such as life-threatening infections such as acquired immunodeficiency syndrome and hepatitis B.<sup>[1,2]</sup> Bacterial infections also play an important role.<sup>[3]</sup> The leading causes that should be concerned are syphilis and tuberculosis.<sup>[4]</sup>

- Psychological hazards: Stress is the leading psychological condition that occurs in the dental profession. Many studies implicate that dentists perceive their profession as more stressful than other jobs.<sup>[5,6]</sup> Negative picture induced by the media of dentistry as a profession filled with dangers may be the leading causes.<sup>[5]</sup>
- Allergic reactions: Gloves containing latex are the main causes of the allergic skin irritation, but dental materials, detergents, lubricating oils, solvents, and X-ray processing chemicals could lead to an allergic skin reaction.<sup>[7]</sup>
- Physical hazards: These include musculoskeletal complications which have direct relation to dentistry procedure, like postural situations that may increase the risk of twisting and contorting the body, varicose, etc.<sup>[8]</sup>
- Mercury health hazard: It has been proved that high mercury vapor high dose exposure can lead to biological and neurological insults.<sup>[9]</sup> Sealed

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amalgam capsules use with lower mercury level, water irrigation and high suction, good ventilation and proper collection, and discarding of amalgam have substantially diminished the mercury dangers.<sup>[9,10]</sup>

- Ionizing radiation: Taking X-ray machines in the dental office predispose dentists to suffer from ionizing radiation.<sup>[10,11]</sup>
- Non-ionizing radiation: This has recently become a concern since the use of composites and other resins, next to the use of lasers in dentistry procedures, which has added another potential hazard to eye and other tissues that may be directly exposed.<sup>[10]</sup>
- Anesthetic gases in the dental office: Using nitrous oxide gas regularly over an extended period of time may contain hazard.<sup>[12]</sup>

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. Barrier utilities such as gloves, masks, protective eye wear, high power suction, and good ventilation reduce aerosols and vapor hazards.<sup>[13]</sup> Hypoallergenic non-latex gloves can decline latex allergy. Lead aprons, periodic maintenance of the X-ray machine and radiation level sensors deal with radiation dangers.<sup>[7,11]</sup> The current paper reviews studies relating to occupational health problems in dental practice.

## INFECTION

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).<sup>[1,2]</sup> In dentistry, sharp injuries occur because of a small operating field, frequent patient movement, and the variety of sharp instruments used in dental procedure.<sup>[12-14]</sup> 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.<sup>[14]</sup>

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.<sup>[15,16]</sup> 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).<sup>[17]</sup> Percutaneous exposure to HBV containing transmission risk about 2% for HBeAg-negative and about 30% for HBeAg-positive blood.<sup>[14]</sup> 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.<sup>[1,2,14]</sup>

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.<sup>[18-23]</sup> The U.S. Public Health Service recommendations for HCV exposures implicate precise follow-up of the exposed practitioners and referral for appropriate therapy if an infection occurs.<sup>[24]</sup>

## MUSCULOSKELETAL

During dentistry procedure, the dentist's posture is strained (while standing and sitting close to a patient who remains in a sitting or lying position), which induce stress injury on musculoskeletal system. This occurs in 37.7% of work time.<sup>[25]</sup>

Musculoskeletal complications among dentists is prevalent like other healthcare workers and well documented.<sup>[26-29]</sup> Most dentists (87.2%) indicated at least one symptom of musculoskeletal diseases in the past last year.<sup>[30]</sup> A study in Greece indicated that 62% of dentists complained at least one musculoskeletal complaint, 30% chronic complaints, and 16% sought medical care. Low back pain is the most prevalent musculoskeletal complaint.<sup>[27,31]</sup> Severe chronic back pain is reported in more than 25% of dentists with back pain.<sup>[27]</sup> Sitting position induced more severe low back pain than position alternating between sitting and standing.<sup>[32-34]</sup>

Hand/wrist complaints among dentists and especially dental hygienists are highly prevalent.<sup>[27,35-40]</sup> Hand/wrist complaints follow low back disorders<sup>[27,39]</sup> and result in a significant higher chronicity than any other complaint.<sup>[27]</sup> Despite carpal tunnel syndrome, prevalence among dentists is not very high, about 5%,<sup>[38]</sup> 56% of dental hygienists complain some

symptoms of carpal tunnel syndrome.<sup>[40]</sup>

Neck and shoulder complaints were less prevalent than back pain. Musculoskeletal disturbances was frequent, 62% of dentists reported at least one musculoskeletal complaint, 35% reported at least two musculoskeletal complaints, 15% reported at least three musculoskeletal complaints, and 6% reported spells of all four complaints in the past year.<sup>[27]</sup>

Dentists with back pain more often complained neck pain and hand/wrist pain than those without back pain. Neck and hand/wrist pain was strongly associated since 50% of subjects with neck pain also experienced hand/wrist pain in the past 12 months. Age and gender were significant only for neck pain. Senior people and women more disturbed from neck pain.<sup>[26,27]</sup>

Educational level and continuous working were significant risk factors for shoulder pain. Living alone was significant for neck and shoulder pain. Increased age was related to all complaints chronicity. Female gender was significantly related to chronic back and shoulder pain. Comorbidities were more among those with higher physical load, lower job control, and working long hours.<sup>[27]</sup>

Musculoskeletal pain may be induced by mechanical vibrations affecting the organism through the upper limbs and causing changes in the vascular, neural, and osteoarticular systems. These changes may produce an occupational disease called vibration syndrome. But based on available literature, it cannot be considered any direct link between vibrations emitted by the working dental instruments and the incidence of symptoms characteristic of the vibration syndrome.<sup>[29]</sup> Musculoskeletal pain and disorders affect dental operators have multifactorial causes.

There is relationship between the biomechanics of seated working postures, repeated unidirectional twisting of the trunk, working in one position for prolonged periods, operator's flexibility and core strength, operators knowing how to properly adjust ergonomic equipment, and physiological damage or pain.<sup>[28,41]</sup> Studies indicate that protocols preventing the multifactorial problem of dentists developing musculoskeletal disturbances such as malposition and posture and considering ergonomics are helpful.<sup>[28,38]</sup>

## STRESS

Not only physical impairments, but job-related psychological disorders may also affect dentist's health.

Risk factors affect dentist's psychological conditions that include job-related stress, tension, depression, emotional exhaustion, and depersonalization.

Dental practice is stressful. Dentists have to overcome many stressors in their personal and professional lives.<sup>[42]</sup> There are some evidences that suggest dentists suffer a high level of job-related stress.<sup>[33,43-46]</sup>

Eighty-three percent of dentists believed that dentistry is "very stressful,"<sup>[43]</sup> nearly 60% believed that dentistry is more stressful than other professions.<sup>[47]</sup> Dentists indicated running behind schedule, causing pain, and heavy work load, late and anxious patients as well as being the most intense stressors in their work.<sup>[47,48]</sup> Dentists, who reported that dental anxiety was primarily the result of general psychological problems in patients, usually had solo practices older than 18 years and reported high perceived stress.<sup>[47]</sup>

There was no difference between levels of stress among dental specialties. Working in the field of pediatric dentistry was related to the highest median levels of stress, though this result was not significant.<sup>[49]</sup>

A large number of factors are responsible for stress situations including low autonomy, work overload, and inappropriate relation between power and responsibility. Teaching role in addition to clinical role may increase the levels of stress, but there is also evidence that this dual role may decline job-related stress.<sup>[50]</sup>

Understanding and controlling of the underlying physiological mechanisms precisely are necessary to develop and implement a comprehensive approach to minimize the risks of the work-related injuries. Maintaining good physical and mental health is emphasized to dentists to enjoy and be satisfied with their professional and personal lives.

## LATEX

The routine use of latex gloves and other personal protective equipment significantly reduced the chance of HIV/blood-borne disease transmission; however, as more and more Healthcare Workers (HCWs) were exposed to latex-containing products on a regular basis, problems began to be reported.

The etiology of latex sensitivity is based on a reaction to the plant containing allergenic proteins in natural rubber. Referred to as Type I allergy to natural rubber latex protein, allergic reactions can be severe sometimes fatal.

The American Dental Association (ADA) began investigating the prevalence of Type I latex hypersensitivity in dental personnel in 1994. At that time, over 2 000 dentists, hygienists, and assistants volunteered for testing at the 1994 and 1995 ADA Annual Sessions. Results showed that 6.2% of participants tested were positive for Type I latex hypersensitivity.<sup>[51,52]</sup> Data from 1996 to 2001 from this ongoing cross-sectional study showed a decline in prevalence from 8.5% to 4.3%.<sup>[51]</sup>

This decline is related to the use of a better quality of latex gloves with lower allergen content.<sup>[51,53-55]</sup> In order to reduce the risk of latex product-associated adverse reactions in both HCWs and patients, federal regulatory agencies such as the Food and Drug Administration (FDA), The National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), and the CDC have instituted policies and recommendations regarding appropriate selection of products, work practices to reduce risk, employee education, and the monitoring of allergic symptoms. For example, the FDA requires all medical/dental products and/or devices that contain latex to be clearly labeled “contains latex.” In the newly released Guidelines for Infection Control in Dental Healthcare Settings, 2003, the CDC suggests a number of protocols to decline and manage latex sensitivity and associated adverse reactions in dentistry.<sup>[51]</sup> Accordingly,

- Dental healthcare providers (DHCP) should be familiar with the signs and symptoms of latex sensitivity.
- A physician should evaluate DHCP experiencing symptoms of latex allergy, because further exposure could result in a serious allergic reaction.
- A diagnosis is made through the medical history, physical examination, and diagnostic tests.
- Procedures should be in place for minimizing latex-related health problems in DHCP and patients while protecting them from infectious materials. These procedures include reducing exposures to latex-containing materials, using appropriate work practices, training and educating DHCP, monitoring symptoms, and substituting non-latex products when appropriate.

## EYE

In the modern dental practice, safety concerns must be paramount to avoid injury and litigation. The

principle of “do no harm” must also apply to patient for injury prevention. Similarly, dentists must be vigilant in wearing personal protective equipment to ensure their own personal safety and thus remain healthy and active in their profession. Because the majority of dental procedures are accomplished with instruments being passed over or near the patient’s face and with aerosols and chemicals frequently in close proximity, both patients and dentists should wear eye protection. Curing lights are also a potential hazard to those who place restorative resins due to phototoxic and photoallergic reactions originating from absorbed radiation.<sup>[56]</sup>

Visual field constriction related to mercury exposure is reported.<sup>[57]</sup> Color vision examination has been shown as a sensitive indicator of subtle neurotoxic effects from exposure to solvents and heavy metals.<sup>[58,59]</sup>

In 1991, the U.S. OSHA mandated protective eyewear use reducing the risk from blood-borne pathogens during procedures in which splatter or the use of aerosols might occur.<sup>[60]</sup> The CDC’s latest update simply states “Protective eyewear for patients can shield their eyes from splatter and debris during dental procedures.” Infrequently, the dental literature supports the use of safety eyewear during restorative procedures to reduce the risk of ocular injuries.<sup>[61,62]</sup>

## EAR

Dentists are at risk for noise-induced hearing loss. Although hearing loss may not be symptomatic, the first complication and the reason for seeking a hearing evaluation may be tinnitus.<sup>[63]</sup>

Noise is always present during the work of dental staff divided into distracting noise and destructive noise. This division results from the variety of parameters determining sound hazards and their influence on the human organism.

The sources of dental sounds inducing hearing loss that can be diminished are high-speed turbine handpieces, low-speed handpieces, high-velocity suction, ultrasonic instruments and cleaners, vibrators and other mixing devices, and model trimmers. At last, it should be worth mentioning that air conditioners and office music played too loud.<sup>[64,65]</sup>

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