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Occupational Hazards in Dentistry.

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ABSTRACT

Professional Hazards are becoming an impending health problem in various specialties and dentists are no exception because of the nature of the stressful work they perform. Dentists are constantly exposed to a number of specific occupational hazards, which develop and intensify with years. Relying on relevant literature, the present paper discusses occupational hazards in the following categories like physical, chemical, biological, psychological and legal hazards. Awareness regarding these occupational hazards and implementation of preventive strategies can provide a safe working environment for all the dental personnel. There is also a need for continuing dental education programs in dentistry so that dentists can update themselves with the latest and newer techniques and materials.

Keywords: Occupational Hazard, Musculoskeletal Pain, Percutaneous Injuries, Stress, Legal Hazard, Allergy, Dentist

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CLINICAL RELEVANCE

- Dentistry is considered by the practitioners and most of the public as being extremely hazardous.
- Despite of numerous technical advances in recent years, many occupational health problems still persist in modern dentistry.
- The source of these hazards is the work environment which can include physical, chemical, biological, mechanical and social aspects.

BACKGROUND

Dentistry is considered by the practitioners and most of the public as being extremely hazardous. This job is a social interaction between helper and recipient in their limited job setting and with personal characteristics. [1]

Healthy dentist is one of the most important component of successful dental practice. Dentists as well as other dental personnels are constantly exposed to a number of specific occupational hazards. Despite of numerous technical advances in recent years, many occupational health problems still persist in modern dentistry. [2] The source of these hazards is the work environment which can include physical, chemical, biological, mechanical and social aspects.

Studies across the world have shown that as compared to other medical professions, dentists report more frequent and serious health problems, these problems include increased psychological stress, musculo- skeletal disorders and allergic reactions. Beside that Dental professionals on daily basis are in contact with tissues, saliva and blood directly or indirectly. This predisposes them to a large number of transmitted infectious diseases. Awareness from professional hazards is essential as physical wellbeing has been proved to be connected to psychological comfort. Recent hazards like legal and suicidal tendencies. [2, 3]

Abnormal postures, including muscle imbalances, muscle necrosis, trigger points, hypo -mobile joints, nerve compression and spinal disk herniation or degeneration may result in serious detrimental physiological changes in the body. These changes often result in pain, injury or possible neuroskeletal disorders like CARPEL TUNNEL SYNDROME. [4] Current paper reviews various professional hazards associated with dental profession.
Material and methodology: Articles which were published in peer reviewed journals relating to occupational hazards in dentistry reviewed. Present review included legal hazards and psychosocial hazards.

Global prevalence of occupational hazards

A study conducted among public health dentists reported occupational health related problems such as dermatoses, eye, respiratory and systemic complaints. [2,5] In India, an investigation among Navy dentists revealed that 47% of them experienced an injury from a sharp instrument during the past six months and backache was the commonest hazard in 70.6% of the personnel followed by occasional anxiety and wrist ache.

[6] Latex allergy and glove dermatitis were reported in 9% and 22% of dental personnel respectively in a dental school in Australia. [7]

A study [3] reported that, dental students studying at University of Cartagena reported that 80% of the students suffered from muscular pain due to the clinical practice; the clinical areas where more pain was found were surgery and periodontics and 15% of the students reported pain in the neck and lumbar zone. In a study conducted among dentists and dental auxiliaries in Riyadh, showed prevalence of hearing problems in the last five years in the form of tinnitus, difficulty in speech discrimination and speech discrimination in a background noise.

A study conducted among dentists in Southern Iran reported lower back pain and severe neck pain. 6% of Flemish dentists revealed dimished sensitivity at the finger tips, 20% auditory disorders, 54% lower back pain. More than 50% of the hospital dental personnel of Bristol reported percutaneous injuries. [2] In Nigeria, less than 5% were aware about legal hazards. [8]
INDIA: 59.7% dentists of private institution in India had musculoskeletal disorders, 50% reported sharp injuries. 46% HP dentists suffered with musculoskeletal pain, 8% reported allergic dermatitis of hands. Government employed dentists suffered more with musculoskeletal pain than private dentists in HP. [9] 78% of dentists suffered with musculoskeletal pain (Nellore), which was highest among orthodontists and oral physicians. [10]

PHYSICAL HAZARDS

MUSCULOSKELETAL DIORDERS: Repetitive movements of upper limbs, and posture such as sitting and standing for prolonged periods, are intrinsic to the practice of clinical dentistry. Back pain syndrome diagnosed in dental workers originate from spinal degeneration in its different phases. Neck discopathy results in cervical nerve pain or cervicoacromial pain, which are particularly common among dental practitioners. Younger and less experiences dentists were more likely to report MSD of the neck, upper back and shoulders was found in a study of dentists. It might be due to experienced dentists are well versed in adjusting their working position and techniques. Dentists are exposed to high load on the trapezius muscles bilaterally, as well as forward bending of the head. The strained posture leads to overstress of the spine and limbs leading to negative effects on musculoskeletal system and peripheral nervous system. [2, 3, 11]

The posture of the dentist at work, with the neck bent and twisted, one arm abducted, and repetitive and precise movements of the hands , are according to Milerad and Ekenvall and other study is a frequent cause of the neck syndrome and pain in the shoulder and upper extremities. [11] The dentists make constant repetitive movements that stresses the wrist and elbow joints. Mechanical vibrations are also of consequence. Studies shown that in some dentists, defect of median nerve (acroparaesthesiae) or carpal tunnel syndrome is seen. [4, 11]

Motions carried out during extractions stress not only the elbow joint and the wrist joint but may result in chronic tendon sheath inflammation. The long term effects of all of

those adverse circumstances occurring in the work of the dentist may lead to medical conditions described as cumulative trauma disorders. [3, 11]

RADIATION: Dentists commonly get exposed to ionizing and non ionizing radiation in his practice. Dentists and his staff takes steps to protect themselves during exposure by standing behind protective barriers, use of radiation monitoring badges and regular equipment checks. [3]

Non ionizing radiation has become an increasing concern among dentists with the use of ultraviolet and blue light to cure or polymerize various dental materials. Exposure of these wavelengths can cause damage to various structures of eyes, including the cornea, lens and retina. [12] Safety shields and glasses have been shown to be protective in this regard when used correctly. A study conducted among Canadian dentists reported that occupational doses of ionizing radiation among dentists and dental workers have decreased markedly since the 1950s. [13] Now, Scattered radiation representing the greatest source of radiation received by dentists and dental staff.

EYE PROBLEMS: Many clinical and laboratory procedures increase the chances of serious eye injuries. These injuries include traumatic injuries due to projectiles, those from harsh chemicals or heat, and infections from contact with patient body fluids, calculus etc. Earlier research suggests that eye injuries amongst dentists may be as high as 10%, [2] although Saudi study reported one month prevalence of 42%. [14] A study in Australia suggested a continuing but low prevalence of eye injuries amongst dental students and assistants. [15] From a preventive point of view, the regular use of eye shields and goggles has been shown to reduce this problem. Use of eye protection by dentists was found to be as low as 57% when using laboratory cutting equipments in UK study. [2]

HEARING / NOISE PROBLEM: Dentists and Dental personnel are exposed to noise of different sound levels while working in dental clinics or laboratories which leads to hearing problems. 16.6% of dentists reported tinnitus, 30% had difficult in speech discrimination and 30.8% had speech discrimination due to background noise. [3, 15] Ultrasonic scalers may be potential hazard to auditory system of the clinician and the patient. Damage to the operator hearing is possible through air borne sub harmonics of the ultrasonic scalers. The noise levels of modern dental equipments have now generally fallen below which the risk of hearing loss is believed to be minimal. [2]

CHEMICAL HAZARD

DENTAL MATERIALS: Many potential toxic materials that are used in dentistry pose health hazard if appropriate precautions are not used. Dental materials undergo an extensive range of tests both before and after use. Some of the dental materials are aerosolized during high speed cutting and may there by inhaled by dental staff. Other dental materials are volatile and give rise to dermatological and respiratory effects.

DENTAL POLYMER: Major cause of contact dermatitis. During polymerization of chemical and visible light cure materials monomers which are non reactive are released in atmosphere. This will lead as irritation to skin, eyes, mucous membrane, asthma [11] and paresthesia of the fingures. [16] Another study reported allergic contact dermatitis from

eugenol used with polymethylmethacrylate. [17] Additionally disturbance of the central nervous system such as headache, pain in the extremities, nausea, loss of appetite, fatigue, irritability, loss of memory and changes in the blood parameters. Carmichael et al. reported the case study of a patient who presented with recurrent facial dermatitis associated with dental work in response to epoxy acrylate BIS-GMA (bisphenol – A0 glycidildimethacrylate). [11] Few studies reported that asthma, conjunctival symptoms and allergic contact dermatitis among dental technicians who are exposed to acrylate compounds. [18] Local exhaust ventilation was not efficient in reducing the concentration of airborne acrylic dusts. [11]

The types of gloves were: 1 vinyl glove, 2 latex gloves, 2 nitrile gloves, and a 4H glove. Their results indicated that the 4H glove gave by far the best protection, followed by the 1 nitrile gloves. Latex gloves and the vinyl glove gave very poor protection against the adhesive. It is therefore suggested that when acrylate allergy is suspected, nitrile or 4H gloves should be used. [8]

MERCURY: Amalgam containing mercury is no longer as widely used as it was once; it is nevertheless frequently encountered in dental procedures and remains a hazard for dental staff. The greatest exposure to mercury for dentists comes from handling for restoration, although storage and disposal of amalgam and amalgam capsules also represents important sources of exposures. Storage practices for excess mercury and amalgam by dentists were shown to vary, although such practices are not consistent with guidelines published elsewhere, where it was advised that materials be stored in a closed container under a radiographic fixer. [12] 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. [2]

LATEX GLOVES: Gloves and mask form an intergral part of a dentist's protective equipment. Latex gloves dusted with cornstarch powder are the most often used. The gloves and the mask form an efficient barrier against most pathogens and recently proven, they also constitute a very good barrier against viruses, provided the gloves and the mask are intact. [11] However, they may also be a source of allergies- primarily in those persons who use rubber products on a regular basis. In this respect, dentists are at particularly high risk. It is estimated that 2.8%-17% of the employees in health service are allergic to latex. [3]

Allergy to latex gloves is the most frequently reported cause of dermatitis in dental personnel in various studies around the world. [2, 7] The prevalence of occupational dermatoses symptoms occurred more than once over the previous 12 months was found tobe higher among females, as well as younger and less experienced dentists in Queensland study. [19] New Zealand dentists study showed that solvents are known to be important irritants in the investigation of occupational dermatoses in dentists. [20]

The increased use of rubber gloves to prevent infections caused by human immunodeficiency viruses (HIV) and hepatitis viruses is closely related to the number of persons with allergies to latex. Sufferers from latex allergy should rather use vinyl or nitril gloves, while it is advisable for severe sufferers to work in latex-free environment. There was found among health care workers, dental personnel are especially likely to have reactions to glutaraldehyde and formaldehyde. [1]

NITROUS OXIDE GAS: Nitrous oxide and oxygen are widely used for conscious sedation in dental surgeries. Inhalation of nitrous oxide is administrated via a special nosepiece. Nitrous oxide sedation alters the patient's perception of time, making it seem to pass more quickly. With a relaxed, conscious and cooperative patient, dental treatments become less stressful for patients and dental office personnel. Studies reported the potential detrimental action of N2O on the reproductive, neurological, hematological, hepatic and renal systems, plus the possibility of increased cancer risk, congenital anomalies and fetal growth retardation, although absolute occupational effects are still uncertain . Sweeney *et al.* were the first to demonstrate an adverse influence of N2O on vitamin B12 metabolism and DNA synthesis in humans which was supported by European authors. [1, 21]

Male dentists who worked in offices where N2O was used eight hours per week or more had significantly higher incidences of liver, kidney and neurological diseases. Unexposed wives of these dentists had a 1.5-fold increase in spontaneous abortion rates. Female chair side assistants in these surgeries also had an increased incidence of liver, kidney and neurological disease as well as a 2.3-fold increase in number of spontaneous abortions when compared to dental assistants in control group offices where N2O was not used. [1 ,3, 21]

The toxicity of N2O are concentration- and timedependent. In Europe the recommended concentrations range from 25 parts per million (ppm) - in France and Denmark to 100 ppm – in Sweden. A level of 100 ppm is under consideration by the British Health and Safety Commission. [22] Occupational exposure to nitrous oxide can be minimized by the use of scavenging systems, local exhaust systems, careful sedation technique, and equipment management.

BIOLOGICAL HAZARDS

Dentists constitute a group of professionals who are likely to become exposed to biological health hazards - include prions, viruses, bacteria and fungi. A dentist can become infected either directly or indirectly. In direct infection, microorganisms pass into the dentist through a cut on the skin of his/her hand while performing a medical examination, or as a result of an accidental bite by the patient during a dental procedure, or through a needle wound during an anesthetic procedures. An indirect infection occurs when an infectious agent is transmitted into the dentist through carrier. The following are the main sources of indirect infection: aerosolized saliva, gingival fluid, natural organic dust particles (dental caries, calculus) mixed with air and water, and organisms released from the surfaces of used dental instruments and devices. [1, 2, 3, 11]

Dental practice presents opportunities for cross-contamination. The dentist's face is at high-risk of infection transmission. The areas around nose and the inner corner of eyes were the most contaminated areas. Zygoma was the least contaminated area. The contaminated areas during periodontal treatments were significantly more than prosthetic treatments. [23]

The aerosol contamination resulting from dental procedures. This assessment demonstrated 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 (anaerobic bacteria) greater as compare to initial load. [11]

PERCUTANEOUS INJURIES: Several studies suggest that half of the dentists report PEI due to needle stick injuries or due to drilling instruments. [1,3] commonly occurs while giving injections, when there is residual body fluid in the needle from punctured site. Needle stick and sharp injuries were found to be very common. The contact of the contaminated blood to the doctor depends on various factors, such as: Type of exposure, inoculums size, host response, infectious agents and the amount of blood. [3] PEI within the previous six months and during the course of professional life were reported by 19.1% and 81.3%, respectively in Brazil. [24]

PEI can be prevented by using safety syringes which are costlier but shown dramatic reduction of needle stick injuries. A recently published 10yr review of literature indicated that PEI may have been steadily declining. Dentist has to follow strict infection control guidelines for gloves tear and ensure that skin cuts and grazes are covered by waterproof dressings. [2]

INFECTIONS : Although there is little evidence of transmission of viruses such as Hepatitis B, C, Herpes B virus and HIV., bacteria, fungi and prions via aerosols causing disease amongst dentists during dental procedures. [1, 2, 3, 11]

12-27% of dental team staff revealed seropositivity of hepatitis B virus. Needle stick and other sharp injuries and contaminated instruments also represent a cause of concern for the transmission of infectious disease, as well as bacterial and other infective splatters and aerosols generated from various sources including dental procedures. [1-2]

Infection control procedures such as general hygiene, appropriate “sharps” disposal, personal protective measures, sterilization or high level disinfection and HBV immunization remain the best defense, not only dentist, but also to help to prevent transmission of infectious agents between dental patients. [2] Recent study showed that infection control procedures are being widely adopted by dentists. [25] A large proportion (85.7%) reported receiving the hepatitis B vaccine, but only 56.2 percent the three doses. [1]

PSYCHOLOGIC HAZARDS

Not only physical impairments but also job-related psychological disorders contribute greatly. Dental practice is stressful due to job-related stress, tension, depression, emotional exhaustion, depersonalization. Dentists have to face many stressful situations in their personal and professional lives. The values of burnout and its constituents among dental workers are amazingly high. [1-3]

Recent findings suggest that burnout has features of maladaptive coping in the short term but is, paradoxically, protective in the longer term. Dentists are prone to burnout due to the nature of their work but may be able to prevent it if they can recognize the burnout

process and take regular holiday breaks 10.6% of England dentists showed overall burnout, 25.53% Emotional exhaustion, 8.88% depersonalization and reduced personal accomplishment in 34.42 % of dentists. [26] Whereas among Spanish dentists high values of emotional exhaustion – 54.3 %, depersonalization – 55.6 % and personal achievements – 6.9% were seen. [21]

Male dentists reported a higher score of depersonalization than did female dentists. However, results indicate that underlying factors, such as working hours, have a profound effect on these differences. [1] A study in England shows amazing results: 60%of general dental practitioners feel nervous, tense or depressed, 58% had headache, 60% reported difficulty in sleeping at night and 48% feeling tired for no apparent reason. [27] Study has shown that depression in two specialties common- periodontics and pediatric dentistry. [28]

The media repeatedly portrays dentists and other health professionals as being at risk of committing suicide. While this message often is accepted without question, there are little reliable data available that verifies this alleged risk. There is little valid evidence that dentists are more prone to suicide than the general population, although some related data suggest that female dentists may be more vulnerable. [29] It is very interesting that male doctors seem to be at less risk than men in the general population. The excess risk of suicide in female doctors highlights the need to tackle stress and mental health problems in doctors more effectively. Furthermore, the risk of female suicides requires particular monitoring in the light of the very large increase in the numbers of women entering medicine. [1, 29]

Dental societies, family and friends are also in an ideal position to provide resources and support. Active membership in local, state and national organizations can lessen the feelings of professional isolation and can provide contacts, which can help starting practitioners improve their practice environments. Even the Stress Thermometer (an easily accessible Internet-based instrument for feedback on work stress and burnout) was made-up to effectively call attention to sensitive personal issues concerning work-related stress and burnout. [1, 30]

Measures should be strongly promoted and developed to help to overcome all these dental society problems. Emphasis on faculty training and clinical rotations should be strongly placed also. The prevention program does have a positive effect on burnout scores among dentists, while different forms of self-initiated prevention activities also appeared to be effective. Eight principles are offered for consideration: 1) patient care is the point of practice; 2) the doctor-patient relationship is essential; 3) discuss options and possibilities; 4) mistakes will be made; 5) tell the truth; be assertive; 7) consult; and 8) manage your stress and your life. It may also be a good point in preventing dental staff from stress and problems in their lives. [31]

LEGAL HAZARDS

In every country there are relevant statutes and regulations which apply to the practice of dentistry. The contravention of any of these may warrant that legal actions be brought against a dental practitioner particularly in developed countries where the citizens appear more aware of their rights. Many dentists in different part of the world graduate

from the dental schools heavily in debt because of the high costs of their education. This overhead expenses lead tension or suicidal tendencies if any failure in their practice. Sometimes slight negligence can cause great effect. Dentists should follow proper protocol starting with case history till completion of treatment along with consent of patient. So sound practice and sound earning, which is essential for good living and good relationship. [3, 8]

CONCLUSION

Despite of numerous advancement and regulations, occupational hazards are prevailing in current dental profession. For every positive advancement one or the other negative inertia will be there. So dentists should be familiar with signs and symptoms of these hazards so as take proper measures to prevent them as early as possible before it blasts. Continuing dental education programs on upcoming advancements in ergonomics, immunizations, relevant statutes and regulations etc should be organized to save our dentists from hazards of dentistry.

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