

## OCCUPATIONAL HEALTH HAZARDS IN CONTEMPORARY DENTISTRY – A REVIEW

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### Summary

Occupational diseases are diseases or health disorders that are caused by the work or working conditions. There are also work related diseases which usually have multifactorial origin. Occupational health hazard can be defined as a risk to a person usually arising out of employment in sense of the nature or working conditions of a particular job. Occupational hazards in dental medicine can be grouped as biological, biomechanical, chemical, physical and psychological. The aim of this paper is to provide a brief overview of the most important occupational health hazards in contemporary dentistry and to present the prevention activities at the School of Dental Medicine University of Zagreb regarding occupational diseases among dental students and dental practitioners.

**Keywords:** occupational diseases; health hazards; dental medicine; Croatia.

### INTRODUCTION

Unexpected situations in our lives causing worsening of our health status usually represent our first confrontation with our own health-related weakness and mortality.

Almost all professions have their more or less pronounced health-related hazards. Occupational (professional) diseases are diseases or health disorders that are caused by the work or working conditions. There are also work related diseases which usually have multifactorial origin. In this case, working conditions can be one more or less dominant factors contributing to the appearance and development of the health disorder [1].

Occupational hazard can be defined as a risk to a person usually arising out of employment in sense of the nature or working conditions of a particular job [2-4]. Occupational hazards cause the appearance of various diseases and disorders, more or less specific to the profession, which can significantly develop and intensify with years [5]. Occupational hazards can also be significantly influenced by age, gender, work station design and geographical factors [6]. Dental profession is recognized as a challenging profession regarding numerous occupational health hazards [7,8]. There is also a controversy in the literature regarding whether dentists with multiple occupational hazards suffer from premature mortality [9].

Numerous papers have been published on occupational health problems among dental health care providers and the most commonly reported health complaints are problems with musculoskeletal system, injuries, allergic reactions, sight and hearing disorders and exposure to different dental materials and biological agents [6,10-13]. Taking this into account, occupational hazards in dental medicine can be grouped as biological, biomechanical, chemical, physical and psychological [14,15].

Occupational diseases are not only physical, psychological and social disease, but also have economic and security impacts when they reach a level of severity that directly affects working capacity, leading to absences and early retirement [16]. Although education and discussion about occupational and work related diseases is of highest importance for their prevention, information regarding occupational and work related diseases, occupational health hazards and their prevention among Croatian dental professionals is usually insufficient. The aim of this paper is to provide a brief overview of the most important occupational health hazards in contemporary dentistry and to present the prevention activities at the School of Dental Medicine University of Zagreb regarding occupational diseases among dental students and dental practitioners.

## **BIOLOGICAL HAZARDS**

Biological hazards or biohazards are biological substances (viruses, bacteria and fungi, as well as parasitic worms and some plants) that are considered as possible threats to the health of living organisms [1,15,17]. In the narrow sense, biohazards primarily pose a threat to the health of humans. They can carry a significant health risk [18].

Biohazards enter the human body when they are inhaled, eaten (ingested) or absorbed through the skin, eyes, mucous membranes or wounds (bites, injuries, etc). Biohazards are transmitted directly or indirectly [19-21]. Direct transmission includes: physical contact between an infected and non-infected person; transmission

via droplets (aerosol) by a cough or a sneeze into the mucous membranes of another person's nose, eyes or mouth; transmission when a person is injected or punctured by an infected object, such as a needle. Indirect transmission includes: attaching infectious agents to food, water, cooking or eating utensils; when an insect carries infectious agents from an infected to a non-infected person; transmission through the air, where infectious agents can be inhaled. Once inside the body, biohazards can multiply quickly, can cause health problems and may be passed from one person to another.

The United States Centres for Disease Control and Prevention categorizes various diseases in levels of biohazard, Level 1 being minimum risk and Level 4 being extreme risk [1]. Biohazard Level 1: includes bacteria and viruses (*Escherichia coli*, varicella, etc.) causing simple diseases. Biohazard Level 2: includes bacteria and viruses that cause only mild disease to humans, or are difficult to contract via aerosol in a lab setting (hepatitis A, B, C, HIV, etc). Biohazard Level 3: includes bacteria and viruses that can cause severe to fatal disease in humans, but for which vaccines or other treatments exist (anthrax, SARS virus, tuberculosis, etc.). Biohazard Level 4 are viruses (currently there are no bacteria classified at this level) that cause severe to fatal disease in humans, and for which vaccines or other treatments are not available (Marburg virus, Ebola virus, etc). Protection levels differ significantly between biohazard levels 1 to 4. For example biohazard Level 1 requires only minimal precautions against the biohazardous materials, most likely involving gloves and some sort of facial protection and biohazard Level 4 requires the best precautions against the biohazardous materials like multiple showers, a vacuum room, an ultraviolet light room, autonomous detection system, and other safety precautions designed to destroy all traces of the biohazard.

Biohazards can include medical waste or samples of a microorganism, virus or biological toxin that can damage human health [22]. Biohazardous waste (infectious waste, biomedical waste), is any waste containing infectious materials or potentially infectious substances such as blood, saliva or other body fluids. Of special concern are sharp wastes such as needles, blades and other wastes that can cause injury during handling. Improper waste disposal in a dental office can cause numerous health hazards such as injuries from sharps, development of nosocomial infections in patients particularly human immunodeficiency virus (HIV), Hepatitis B and C, and emergence of resistant strains of microorganisms [22].

In their every day work, dental professionals are exposed to contact with numerous microorganisms and some of them could be harmful to health. Dental professionals are likely to be exposed to various biohazards. The source of biohazards is, in most cases, the patient (direct and indirect transmission pathways), but it may

also be the water used in a dental unit. Four main pathways of spreading biohazards in dental medicine are identified: blood-borne route (by blood of an infected patient), saliva-droplet route (droplet aerosol from an infected patient containing infected body fluids); direct contact with a patient and contaminated equipment; water-droplet route (water droplet aerosol from handpieces of a dental unit which may contain biofilm with biohazards inside a unit tubing) [19,23-26].

Hepatitis B and C viruses, HIV virus are the most dangerous biohazards in dental medicine spread through the blood-borne route. They can cause serious health and life-threatening diseases. It is estimated that in the case of an injury with a Hepatitis B virus contaminated needle, the probability of infection is 6-30% [27,28]. Hepatitis B virus causes asymptomatic acute or chronic infections, which can lead to cirrhosis or primary liver cancer [29]. Hepatitis C virus is still a serious health problem, but Hepatitis C virus is less infectious than Hepatitis B virus. After an injury with a contaminated needle, the infection develops only in 1.8–6.0% of cases. Hepatitis C virus infection is also like the Hepatitis B virus infection asymptomatic, but it may develop into a chronic liver inflammation and sometimes progress to cirrhosis and chronic liver cancer [29]. The human immunodeficiency virus (HIV) is a RNA-containing retrovirus that causes HIV infection and over time acquired immunodeficiency syndrome (AIDS). After an injury with a HIV contaminated needle, the probability of infection is only 0.3% [19]. HIV infection can cause failure of the immune system, immunity drop and death. All complications including deaths appear most frequently as a result of infection with opportunistic microorganisms, normally indifferent to human health.

Through the saliva-borne route and through direct contact a wide range of prions, viruses, bacteria and fungi can be spread. Herpes simplex virus is considered as the most important biohazard transmitted in this way. Although they are often underestimated, diseases spread by the water-droplet route are also a serious health risk for dental professionals and they require a comprehensive evaluation. Bacteria from *Legionella* species developing inside dental unit waterlines constitute the highest risk [19,30].

Biohazards are inevitable in a dental office. To reduce the negative outcome, different prevention strategies or approaches should be employed. Preventive measures reducing the risk from biohazards transmitted from an infected patient include: personal protection equipment used by a dentist (gloves, masks, eyewear and garments), disinfecting the patient's oral cavity and sterilization of dental instruments, the use of a rubber dam, sterilization of a workplace with UV radiation after a procedure, protective vaccination of dentists especially against hepatitis B, removing biofilm from dental unit waterlines using effective chemical disinfectants [1,19].

## BIOMECHANICAL HAZARDS

Biomechanical hazards can be defined as single or repetitive movements and forces imposing stress on the body (including awkward body working posture) with a potential to cause or contribute to injury or disease affecting the musculoskeletal or neurological systems [1,31-33]. Injuries of this kind occur in the case when the damaging forces on a body tissue (e.g. muscle, tendon, ligament, bone, articular cartilage) are greater than the tissue can withstand. Biomechanical injuries can occur suddenly (single exposure to a high force); or gradually (repeated or long-duration exposure to lower levels of force) [34]. Mechanisms leading to work-related musculoskeletal disorders are multi-factorial. Factors impacting on the risk of injury from biomechanical hazards are mainly physical like exertion, prolonged static postures, movement and repetition, suboptimal lighting, poor positioning and bad body posture, exposure and vibration, genetic predisposition, but could also have psychosocial origin, mental stress, physical conditioning, age and obesity [14,16,35]. Aging is considered as a strong risk factor for musculoskeletal disorders. Psychological and emotional stresses can also have a significant contributory role in the initiation and aggravation of these disorders. Stress, fatigue, emotional distress or anxiety, sleep disturbances, cognitive dysfunction, poor quality-of-life and pain behaviour were found to be significant factors involved in appearance of musculoskeletal disorders [16]. Musculoskeletal disorders can reflect number of conditions, like neck pain, back pain, shoulder pain, pain of limbs, carpal tunnel syndrome, myofascial dysfunction syndrome, atypical facial pain etc. [16]. Symptoms of musculoskeletal disorders can be rather mild and infrequent, but they can also be severe, chronic and debilitating.

Musculoskeletal and neurological injuries resulting from occupational biomechanical hazards have very high prevalence and they are considered one of the most common health related disorders caused by professional activity. It is estimated that more than 80% of dental professionals suffer from at least one symptom of musculoskeletal diseases at some point in their life [36]. Bending of neck and back by dentists, especially while treating maxillary teeth can explain why neck and lower back are the most commonly affected sites of musculoskeletal disorders in dentists. Rambabu and Suneetha compared the prevalence of musculoskeletal disorders among physicians, surgeons and dental surgeons and found that musculoskeletal pain was most prevalent among dental surgeons, 61% [16]. The prevalence of musculoskeletal disorders among Croatian dentists varied from 55.8 % (pain in legs and feet) to 78.3 % (pain in upper back) [12].

It is considered that good ergonomic practices and regular physical activity can drastically reduce the likelihood of severity of musculoskeletal disorders. Regular

physical activity has a significant influence on the quality and quantity of work-related musculoskeletal disorders experienced by dentists. According to the results of Koneru et al. yoga was found to be very effective in the prevention of musculoskeletal disorders [36]. Physical body posture of the doctor while providing dental care, should be such that all muscles are in a relaxed, well-balanced and neutral position. Postures outside of this neutral position for a prolonged period are likely to cause more or less musculoskeletal discomfort [16].

## CHEMICAL HAZARDS

Chemical hazards in dentistry are recognized as drugs, gases, remedies, dental materials, materials in dental personal equipment, disinfectants, sterilizing agents, detergents, soaps, etc. Chemical hazards can cause numerous adverse reactions like allergies, toxic reactions, hypersensitivity, chemical injuries and burns, reproductive problems, etc. [12,23]. 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 [8]. Latex, mercury, nitrous oxide, acrylic resins and ethylene oxide are considered most investigated chemical hazards.

Dental care providers depend on medical gloves to protect them and their patients against different biological hazards. Natural rubber latex (is produced from liquid extracts of the *Hevea brasiliensis* tree) has long been the preferred material for medical gloves, because it provides excellent barrier protection, comfort, and fit, and it is inexpensive. However, in last decades, the incidence of allergic reactions to latex proteins has raised. It is estimated that 8-12% of health care workers are latex sensitive [23]. Agents involved in the gloves production process such as benzothiazol, thiuram, and carbamate have strong allergenic potential. Cornstarch powder on the natural rubber latex gloves, might contribute to the development of latex irritation. Clinical signs of the immediate allergic reactions to latex can include rash, rhinitis, edema, bronchospasmus, and allergic shock. In case of latex sensitization contact dermatitis can appear. Signs and symptoms include rash, itching, and skin exfoliation [23]. A new generation of latex gloves has been developed that vastly reduces protein levels associated with latex sensitivity. Synthetic gloves (vinyl, nitrile) were introduced as an alternative for latex-sensitive people. Synthetic gloves have proven inferior to latex in respect to their capacity to withstand mechanical stress and tactile sensation. Increased awareness of this problem contributes to the reduction of the prevalence of latex allergy in the soon future.

Mercury is finely dispersed in silver amalgam and has been widely used for centuries as a dental restorative filling material. Low cost, durability, and easiness

in handling and placement have maintained the popularity of the mercury based dental amalgam in most parts of the world. Most dental personnel are exposed to mercury daily, particularly the vapour of elemental mercury [37,38]. Dental health care providers are also exposed to inorganic mercury (mercuric salts, mercurous compounds) and organomercurials from contaminated diet intake and mercury stemming from their own dental amalgam fillings. Mercury is readily absorbed into the body through the skin during handling and by inhalation. About 80% of inhaled vapour is absorbed into the blood, where the dissolved vapour can remain long enough to cross the blood–brain barrier. Mercury appears to affect pregnancy outcome, causing problems such as spontaneous abortion, congenital abnormalities and infertility [37]. It is considered that overexposure to mercury may cause weakness, fatigue, anorexia, headache, loss of memory, drowsiness or insomnia, and tremors in the hands, lips, head, tongue or jaw. The comparison of mercury concentration among dentists revealed that the concentration increased with the age [39]. Persons exposed to mercury for a long time can experience problems with digestion, eyesight and the urinary system and symptoms of irrational behavior, excitability, inability to concentrate, indecisiveness and depression [37]. Sealed 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 [8].

Nitrous oxide ( $N_2O$ ) is used in dental offices, primarily as a sedative to reduce patient anxiety. Exposure to nitrous oxide in dental offices is usually small, but the exposure is continuous and occurs over the long term. Several studies linked occupational exposure to anesthetic gases like nitrous oxide with congenital malformations, spontaneous abortion and infertility. Anesthetic gases slow the rate of cell division and increase the rate of abnormal cell formation and chromosomal aberrations [37,40].

Acrylic based resins are extensively used in dentistry for the fabrication of denture bases, orthodontic removable appliances, temporary crowns, and denture relining [41,42]. Undesirable effects caused by acrylic based resins have been widely evidenced. The most common and frequently reported a problem with the patients having allergic reactions to denture base acrylic resin is mouth soreness and burning sensation. They can also cause contact dermatitis among dental health care providers. Monomers used in dentistry present severe cytotoxicity and cause hand eczema. Impression dental materials, polyethers and vinyl polysiloxanes have also significant cytotoxic potential [23].

Ethylene oxide (EtO) is a flammable, highly reactive, colorless gas used for sterilization of dental equipment. Acute exposures to ethylene oxide may result in eye

pain and blurred vision, sore throat, respiratory irritation and lung injury, headache, nausea, dizziness, vomiting, diarrhea, shortness of breath, convulsions, skin irritation and cyanosis. Dental health care providers are usually exposed to trace amount of ethylene oxide which would accumulate over their working lifetime. Chronic exposures to ethylene oxide have mutagenic potential and are linked with neurotoxicity, peripheral paralysis, muscle weakness, cancer, reproductive disorders, etc. [37]. Sterilizing agents like aldehydes, phenols, and quaternary ammonium compounds can cause lung problems and dermatitis [23].

## PHYSICAL HAZARDS

Physical hazards in dental medicine include lights, noise, vibration, heat, trauma and radiation (ionizing and non-ionizing). Physical hazards can cause sight and hearing disorders and health problems related to radiation, vibration, heat and injuries [12,43].

Hazards related to eyes and vision include eye strain, dry-eye syndrome, maculopathies, cataract, trauma, infection and chemical burns. Eye strain can be a problem, due to reduced blinking and prolonged concentration, insufficient lighting, and inappropriate position of working light in relation to the dental practitioner [23]. Dry-eye syndrome is characterized by decreased tear production or increased tear evaporation. Pathological conditions of the macula can be caused by poor lighting in the dental office and by blue (ultraviolet) curing light. The eyes of dental health care providers operating curing lamps are at risk from acute and cumulative effects, mainly due to back reflection of the blue light and to exposure time. Prolonged irradiation and use of magnification devices can adversely affect vision [44-47]. Cataract can be caused by trauma (penetrating injuries) and ultraviolet lights. Infections can be caused by splashing material, aerosols, and trauma from wires, burs, and other projectiles. Trauma caused by infected projectiles could cause various eye infections. Ocular injuries may have serious and long term effects. Symptoms of direct mechanical trauma often relate to the degree and type of trauma, and include pain, lacrimation, and blurring of vision [48]. Chemical eye burns come from acids or alkaline substances in dental office. Acids are usually less dangerous than alkalis [23].

Occupational noise exposure in the dental office can lead to noise-induced hearing loss [8]. Symptoms of hearing loss can begin with tinnitus and include more or less difficulty during speech communication. Greatest noise damage is usually caused by harmful sounds at 3000 to 6000 Hz. Hearing loss can be caused by repeated exposure to sounds at various loudness levels, measured in decibels (dB), over an extended time or by a 1-time exposure to an intense sound [23,49]. A noise



level of 85 dB in the normal range of hearing, for an 8-hour per day exposure, over a period of years, might be damaging. Dental devices causing the most dangerous noise levels are scalers, gypsum cutting devices, vibrators, aspirators, air turbine handpieces and micromotor handpieces.

Mechanical vibrations arise because the various machines operating at the dentist's workplace contain moving parts [50]. Occupational exposure to vibrating tools can result in the occupational disorder named hand-arm vibration syndrome [51]. Among dental professionals the symptoms are mainly developing in upper limbs. Neurological symptoms include tactile sensitivity, finger numbness and tingling. Vascular components include painful finger blanching attacks that are triggered by cold and known as vibration white finger. Exposure to vibration from dental tools has been associated with early stages of hand-arm vibration syndrome. The main sources of vibrations are vibrating low- and high-speed handpieces and ultrasonic instruments. They are producing local vibrations travelling from the handles to the dental practitioner's hand.

Needles and sharps are commonly used during dental procedures and dental professionals are susceptible to injuries inflicted by contaminated needles and sharp objects [52]. Needlestick/sharps injuries are injuries with a high risk of cross-infection. Other injuries like thermal injuries, burns and scalds from sterilizing equipment and eye injuries from acrylic and other particulate matter sustained in the laboratory environment are injuries with a low risk of cross-infection [53].

Dental professionals may be exposed to ionising and non-ionising radiation in dental practice. Sources of ionising radiation are dental X-rays devices for intra-oral and extra-oral imaging. Sources of non-ionising radiation are devices used for curing or polymerisation dental materials (like composite resin, bonding agents and sealants) producing blue/ultraviolet light. Dental radiography is used in almost all fields of contemporary dentistry and today many dental offices are equipped with dental radiography devices for digital or conventional film radiography. Ionising radiation can cause radiation injuries and adverse health effects. If a living cell becomes ionised there are three possible outcomes: the cell dies, the cell repairs itself, or the cell mutates incorrectly and can become cancerous. The deleterious effect of ionising radiation on human tissue can be divided into non-stochastic (deterministic) or stochastic effects. Deterministic effects only occur once a threshold of exposure has been exceeded. The severity of deterministic effects increases as the dose of exposure increases. Examples of deterministic effects are skin erythema, cataract, sterility, radiation sickness, etc. Stochastic effect occurrence follows a linear no-threshold hypothesis. There is no threshold level for these effects but the risk of an effect occurring increases linearly as the dose increases. Examples of stochas-

tic effects are cancer and hereditary defects like Down syndrome [54]. Dental staff should take steps to protect themselves during exposures by standing behind protective barriers, use of radiation monitoring badges and regular equipment checks [11,55,56]. As previously mentioned exposure to blue/ultraviolet light can cause damage to various eye structures including the cornea, lens and the retina. Non-ionising radiation safety shields and glasses are recommended.

## PSYCHOLOGICAL HAZARDS

Dental medicine is a very challenging profession with numerous professional requirements. A successful dental practitioner should be a high quality dentist able to establish a good dentist-patient relationship; he or she should also be a skilful manager of a dental office with sufficient knowledge in business, economy, law and other related fields; and last but not least he or she should be a leader of the dental team maximizing positive characteristics of each team member and minimizing their shortcomings. All of this can be very physically and emotionally exhausting and that is why dental medicine is considered also a psychologically hazardous profession.

Psychological hazards mainly include stress, chronic tiredness and burnout syndrome. Exposure to psychosocial hazards in the workplace not only produces psychological damage to individual employees such as depression and anxiety, but also causes somatic disorders such as cardiovascular diseases, hypertension, neurological disorders, insomnia and headaches, etc. [12,57-59]. Dentistry is considered as more stressful than other occupations. Psychological hazards and especially cumulative stress have decreasing influence on work efficiency and overall productivity of a dental practitioner. 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. Negative picture induced by the media of dentistry as a profession filled with dangers may be the leading cause [8]. Recognising causes of work related stress is the most important step in prevention of associated adverse effects. Sources of stress among dentists could be job (dis)satisfaction, business income, working hours, staff/patient interactions [11,60]. Stressors in dental medicine could also be falling behind schedule, striving for technical perfection, causing pain or anxiety in patients, cancelled or late appointments and lack of cooperation from patients. Work-related or occupational stress appears when there are inconsistencies between the professional requirements and strengths, abilities or desires of the individual employee. Professional consequences of stress may include absenteeism, reduced productivity and job dissatisfaction, leading in some cases to redundancy or early retirement [59,61].

Puriene et al. found that the most intense impact on psychological wellbeing of Lithuanian dentists was the establishment of the law regarding patients legal rights and compensation for iatrogenic health damage [62]. This law led to a highly increased psychological pressure in already very intense and stressful working environment of a dental practitioner. Chronic stress in the work environment is one of the leading factors for burnout syndrome and could have a deleterious effect on health. Burnout is defined as a feeling of hopelessness and inability in carrying out one's job effectively [63]. Burnout is considered as a psychological and physical response of an individual which may arise when the employees are exposed to a stressful working environment involving high professional expectations, followed by high emotional exhaustion, high depersonalisation and low personal accomplishment. Among dental professionals inadequate financial compensation may or may not have significant influence. Lack of effective control of the work-related stress is one of the first signs of burnout. Exhaustion, cynicism including distancing behaviour towards work and work related inefficiency are the most important components of burnout.

Symptoms of psychological burnout/depression are sometimes related to misuse or abuse of alcohol or other mind-altering substances among dental professionals. At the extreme of burnout and/or depression is suicidal behaviour. Dentists have been generally recognized as an occupational group with a high incidence of suicide [61]. Meltzer et al. examined occupations and suicide rates in England and Wales in 2001–2005. They reported that the main contributors to the high proportional mortality ratios among health professionals were male dental practitioners followed by medical practitioners and female veterinarians [64].

Popular and recommended stress management tools among dental professionals include sport, reading, deep breathing, self-hypnosis, meditation, yoga, talking to friends and family, social networking, music and gardening.

## **EDUCATION AS PREVENTION**

First report on the overall health status of Croatian dentists published in 2016 showed undesirable results and relatively high prevalence of occupational health problems [12]. It was found that over 78.18 % of the Croatian dentists experienced work related pain in upper back, 76.97 % of them in lower back; work-related skin problems were reported by 29.29 % of dentists; sight and vision problems were reported by 46.87 % and hearing problems by 19.03 % of participants.

Such devastating results highlighted the need for urgent development of an institutionally based approach in prevention of occupational diseases. At School of

Dental Medicine University of Zagreb such needs were recognized and programme entitled “Education as prevention” was started in 2013. Two main goals were identification of the problem on the individual level in order to increase the awareness of the health risks related to dental profession and employment of specific education activities tailored for different users groups like dental students and active dental practitioners. On the beginning dental students and active dental practitioners were surveyed regarding occupational health risks, health related habits and occupational health disorders. Almost 1500 participants were involved in the two anonymous and voluntary online surveys. These surveys gave important insight in the occupational health hazards and health disorders among Croatian dental students and dental practitioners. Obtained results provided directions for planning further activities. In 2014 the first symposium on occupational diseases and diseases related to work in dental medicine was organized by School of Dental Medicine University of Zagreb and supported by Croatian Dental Chamber. The symposium gathered medical doctors from different fields (like orthopaedics, internal medicine, ophthalmology, dermatology, neurosurgery, otorhinolaryngology, psychiatry, physical therapy, gynaecology, infectious disease, occupational medicine, etc.) and doctors of dental medicine and provided a fruitful discussion regarding occupational diseases with many important conclusions. Encouraged by the success of the first symposium, it was decided to organize the symposium once a year.

In 2015 at School of Dental Medicine University of Zagreb a new course entitled “Occupational diseases in dental medicine” was started for undergraduate students. The course was planned as a multidisciplinary course based on lectures and practical lessons for students of the 6th semester (last semester before students start clinical work with patients). Teachers of the course are doctors of dental medicine and physicians of different specialties such as otorhinolaryngologists, dermatologists, ophthalmologists, immunologists, cardiologists, orthopaedic specialists, etc. During 15 lectures students have an opportunity to learn about almost all health risks related to dental profession and how to prevent the health related problems. During the practical lessons students are introduced to dental ergonomics and shown how to avoid musculoskeletal disorders by applying special exercises for dentists [26]. To provide an appropriate literature regarding this topic, in 2015 was published a textbook entitled “Occupational diseases and diseases related to work in dental medicine” authored by 48 doctors of dental medicine and physicians of different specialties. In 2015 a web page was also established to provide to most recent information regarding occupational diseases in dental medicine (<http://profesionalne-bolesti.sfzg.hr/>).

Mentioned educational activities were well accepted and increased the awareness about occupational and work related diseases among Croatian dental students and

dental practitioners. Further activities should be planned and the concept education as prevention should be developed. Networking and collaboration with other dental schools and occupational health experts should be encouraged and supported.

## CONCLUSION

Dental medicine is considered to be a profession with a high risk for development of occupational diseases and diseases related to work. Occupational hazards in dental medicine are numerous and can be grouped as biological, biomechanical, chemical, physical and psychological. Unfortunately education on occupational health is not a standard part of the curriculum of dental schools and this should be changed if we want to avoid or diminish the adverse effect of being a dental practitioner.

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## Sažetak

### **Profesionalni zdravstveni rizici u suvremenoj stomatologiji – pregledni rad**

Profesionalne bolesti su bolesti ili zdravstveni poremećaji uzrokovani radom ili radnim uvjetima. Osim toga, postoje i bolesti vezane uz rad koje imaju višezročno podrijetlo. Profesionalni zdravstveni rizici se mogu definirati kao rizici koji se javljaju kod određenog zanimanja s obzirom na radne uvjete pojedinog radnog mjesta. Profesionalne opasnosti u stomatologiji se mogu podijeliti na biološke, biomehaničke, kemijske, fizikalne i psihološke. Svrha ovog rada je pružiti pregled najvažnijih profesionalnih zdravstvenih opasnosti u suvremenoj stomatologiji i predstaviti aktivnosti na Stomatološkom fakultetu Sveučilišta u Zagrebu s obzirom na prevenciju profesionalnih bolesti među studentima stomatologije i stomatolozima.

**Ključne riječi:** profesionalne bolesti; zdravstveni rizici; stomatologija; Hrvatska.

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