Occupational health in oral radiologists: A review

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Dental and Medical Problems, ISSN 1644-387X (print), ISSN 2300-9020 (online) *Dent Med Probl.* 2021;58(3):405–410

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Funding sources
None declared

Conflict of interest
None declared

Received on January 26, 2021
Reviewed on March 6, 2021
Accepted on March 23, 2021

Published online on September 30, 2021

Abstract

Work is a fundamental axis for the development of societies and human well-being, but if a person cannot adapt to their work area and work environment, the individual may be affected by occupational or co-existing illnesses that get exacerbated when working.

A scientific search was conducted in the main health databases – MEDLINE (via PubMed), Web of Science, SciELO, Scopus, Google Scholar, and Dialnet – using the keywords "occupational health", "occupational diseases", "occupational accidents" AND "oral radiology" OR "oral radiologists". Systematic reviews as well as observational, cross-sectional and longitudinal studies were included. Case reports, letters to the editor, editorials, and opinion articles were excluded. In total, 496 articles were recovered, and only 51 fulfilled the selection criteria. Signs and symptoms that affect oral radiologists include back pain, shoulder pain, wrist pain, tenosynovitis, computer vision syndrome (CVS), stress, depression, and burnout syndrome. Preventive occupational health (OH) measures are proposed to help eliminate or alleviate the symptoms associated with non-ergonomic habits at work. Oral radiologists are exposed to several risks and occupational diseases inherent and/or related to their work. By implementing simple habits and ergonomic advice, well-documented in the literature, these risks can be avoided.

This review aimed to provide scientific information on the current concepts of OH in oral radiologists in order to help prevent occupational diseases and occupational accidents, and guarantee safe professional practice.

Keywords: occupational health, ergonomics, radiology, dental staff

Cite as
Londoño-Candonaza FE, Fiori-Chincaro GA, Agudelo-Botero AM, Llaguno-Rubio J, Arriola-Guillén LE. Occupational health in oral radiologists: A review. *Dent Med Probl.* 2021;58(3):405–410. doi:10.17219/dmp/134789

DOI
10.17219/dmp/134789

Introduction

Work plays an especially important role in the development of human societies. As knowledge and technology advance, the forms, modes and environments of work also advance.[1] It has been shown that the health of workers is conditioned by different social and individual factors as well as by access to health services, and the forms, modes and environments of work.[2,3]

Occupational health (OH) has been defined by the Pan American Health Organization (PAHO) as the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing deviations from health, controlling risks, and adapting work to people and people to their work positions.[3–5] Since OH is based on the law, each country has its decrees, laws and regulations, created according to the guidelines of the United Nations (UN), the European Union (EU) and the Organization of American States (OAS), which are major international mainstays for countries.[4,6,7]

The International Labor Organization (ILO) has classified occupational diseases into the following groups: those caused by chemical, physical or biological agents; infectious or parasitic diseases; respiratory diseases; skin diseases; musculoskeletal disorders; mental and behavioral disorders; occupational cancer; and diseases caused by other substances and agents, not included in any of the abovementioned sections. There are also other diseases, not included on this list, that may be related to work activities.[5,7–9]

Oral radiology is a discipline that involves the diagnosis of the diseases and disorders of the mouth, face and jaws with the use of X-rays and other types of radiological techniques. Apart from diagnosing a disease, radiological examinations enable the development of treatment plans and the monitoring of the evolution of lesions and the disease over time.[6,10–14] This profession presents many inherent risks related to the occurrence of diseases and work-associated accidents, which may imply immediate or long-term problems. Moreover, an important aspect to consider is that health professionals, including oral radiologists, live in a competitive environment that is highly demanding and seeks perfection in their daily work; this leads to high levels of emotional stress.[15–18] In addition, the impact of the coronavirus disease 2019 (COVID-19) pandemic on mental health, and consequently on the professional practice of the whole medical staff, must be taken into consideration.[19–21]

This review evaluates the discomfort, illnesses and occupational problems derived from the practice of oral radiology, and proposes some ergonomic recommendations.[1,3,7,8,14] Further, the purpose of this review was to provide scientific information on the current concepts of OH in oral radiologists in order to help prevent occupational diseases and occupational accidents, and guarantee safe professional practice.

Methodology

A literature search was carried out using the main sources of scientific information, such as MEDLINE (via PubMed), Web of Science, SciELO, Scopus, Google Scholar, and Dialnet, and search terms with a date limitation of the last 10 years to include information regarding OH and oral radiology. The keywords used were "occupational health", "occupational diseases", "occupational accidents", "ergonomic", "oral radiology", and "oral radiologists". Systematic reviews as well as observational, cross-sectional and longitudinal studies were included. Case reports, letters to the editor, editorials, and opinion articles were excluded. Thus, 496 articles were recovered, of which only 51 fulfilled the selection criteria. These studies were included to evaluate the development of theoretical topics. The bibliographic search was carried out until December 5, 2020 (Fig. 1).

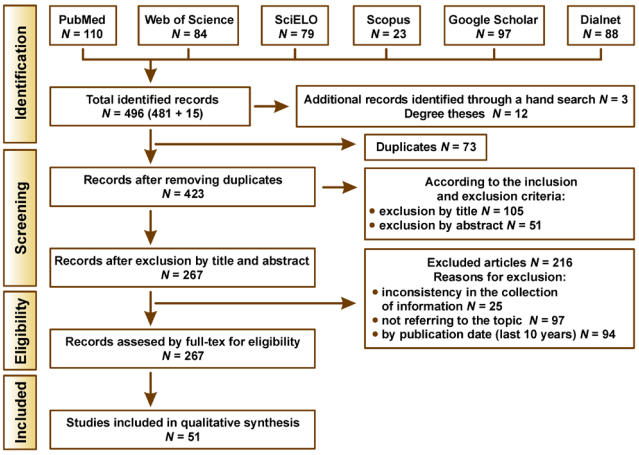

Fig. 1. Flow chart for collecting information

General aspects of occupational health

In recent decades, globalization, technology, the diversification of societies, demographic changes, and the overcrowding of cities have exerted a strong impact on the workplace, leading to the concept of work ethics. This concept is important, since it seeks to balance the risks and benefits between the interested or contracting parties, which, in this case, involve employees and employers.[7]

Work is linked with health and can affect not only physical health, but also mental health due to the transfer of workload to home or other personal spheres. Epidemiological studies have shown that the morbidity and mortality of a population are closely related to labor demands. Occupational accidents due to inadequate working conditions, or worker or employer negligence, can not only have strong repercussions on health, but can also end life.[8,9]

Access to health services adds to the quality of life of populations, families and workers. A study carried out in 17 countries of EU evaluated the health systems of each country and reported that while worker healthcare was mandatory, annual controls to assess the work capacity of workers, and human, institutional and infrastructure resources were insufficient.[10,11]

Occupational diseases in oral radiology

Work-related musculoskeletal symptoms refer to muscular, nerve, cartilaginous, bone, tendon, vascular, or joint-related discomfort in various parts of the body and the human support system that are mainly attributable to the work environment and increasingly worsen over time. Over time, musculoskeletal complaints can become long-term degenerative disorders that decrease productivity at work.[12]

In the study by Al Shammari et al, the most prevalent discomfort reported by radiologists was lumbar pain, pain in the upper extremities and the carpal tunnel, and tenosynovitis.[13] Other studies described pain in the lower back and the spine as well as the neck, as repetitive stress injuries.[14,22] According to various studies, radiologists most frequently report pain or discomfort at least once a week in the neck (66%), the lower back (61%), the upper back (43%), the right shoulder (36%), and the right wrist (33%).[13,23]

Stress is becoming more and more common in the workplace. It has been reported that 55% of radiologists experience symptoms related to stress and exhaustion. Stress often results in physical and emotional consequences, including cardiovascular problems, the lack of sleep, and in extreme cases, severe psychological disorders. The associated risk factors for stress are feeling undervalued, feeling belittled, the inability to achieve goals, experiencing barriers that prevent the person from performing their work and achieving personal development, working conditions, unfair work rules, and loneliness, which combined, can generate synergy.[24,25]

Clinical depression can also affect radiologists, with the most common diagnostic criteria being a depressed mood most of the time, the loss of pleasure, the loss of interest in most of the daily activities, slowing down in carrying out daily activities, a decreased appetite, an unjustified weight loss, permanent insomnia or hypersomnia, restlessness, fatigue and tiredness almost every day and all day, a decreased ability to think, concentrate or make decisions, feelings of guilt and low self-worth, and thoughts of death (the fear of death or suicidal thoughts). A professional is defined as having depression with the presentation of 5 or more of these criteria for a period of 2 or more weeks.[26,27]

Burnout syndrome involves chronic work stress that affects a person in all facets of their life, both in the work environment and outside. Some of the consequences of this syndrome are low self-esteem, low energy, the inability to fall asleep, permanent fatigue, weakness, a feeling of frustration, negative attitudes, increased irritability, the degeneration of social relationships, the loss of motivation with regard to life affairs, and depression.[28] This syndrome has 3 components: emotional exhaustion, a feeling of frustration, and a negative attitude toward oneself and others.[29] In South America, the stress levels associated with burnout syndrome are low among radiologists[30,31]; however, high levels of burnout have been reported in Canada, both in apprentices and professionals.[32,33] On the other hand, in India, 54% of radiologists report repetitive stress injuries, 52% of which are accompanied by pain in the neck.[34]

Computer vision syndrome (CVS) has been defined by the American Optometric Association (AOA) as a set of ocular and visual problems related to activities involving near vision, and is experienced while using computers.[35] The manifested symptoms are headache, difficulty in focusing, dry eyes, red eyes, irritated eyes, double vision, and blurred vision, all of which are strongly related to the number of hours in front of a screen. Among Canadian radiologists, the prevalence of CVS is 36%.[36–38]

Metabolic syndrome describes several conditions that include hyperglycemia, high triglyceride and cholesterol levels, obesity, and hypertension. These parameters are found to be higher in professionals with a higher degree of work stress. It has been described that 7.1% of radiologists have metabolic syndrome, presenting 3 or more simultaneous pathological metabolic abnormalities.[39] More scientific evidence on metabolic syndrome among radiologists is required.

Despite the advent of digital radiology, the use of analog radiology is still common today in many parts of the world. Therefore, the working conditions and the substances used for image processing can affect the health of radiologists. Some of the symptoms described include headaches, a sore throat, a shortness of breath, skin rash, a bad taste in the mouth (chemical taste), a runny nose, itchy eyes, nausea, asthma, fatigue, watery eyes, a persistently stuffy nose, a persistently itchy nose, and sneezing, which are collectively known as "darkroom disease".[40]

Additionally, an important aspect to consider is that health professionals, including oral radiologists, have been negatively impacted by the COVID-19 pandemic. The disease has had a significant effect on mental health of the whole medical staff, and consequently on professional practice.[19–21] Therefore, a good, healthy and comfortable work environment is required.

Ergonomics in dental radiology

The International Ergonomics Association (IEA) defines ergonomics as the scientific discipline of studying the individuals' relationships, interactions and adapta-

tions with/to the work environment and each of the elements that compose it, in order to guarantee human well-being and the productivity of the system, to achieve maximum efficiency in terms of the use of movements, space and time, to minimize physical and mental stress, and to prevent occupational diseases, which can be very difficult to treat once they appear.[41]

In the work setting, equipment must be close by, and must be silent and acoustic.[42] Good lighting, including that of the ambient light sources, screens and monitors, is important. A balance between screen lighting and ambient lighting ensures that the radiologist can observe small details. More studies are required to determine the standard maximum luminance of radiological equipment.[35,43,44]

To avoid the symptoms associated with CVS, it is recommended to blink continuously, making this exercise a conscious act. A short break should be made by observing distant objects for at least 5 minutes every 2 hours. Computer screens should be placed below the eye level, i.e., the top edge of the monitor should be below the eye level and further from the eyes than the bottom edge so that there is a downward angle of 14°. The optimum distance from the monitor to the eyes should be at arm's length, or 76–101.5 cm away with a 5-millimeter font size.[45–47]

Radiologists should perform a simple stretching exercise every hour of work.[48,49] The chairs utilized by radiologists must be adjustable. Whilst sitting, the radiologist's feet must not dangle, but rather must be supported on the ground forming an angle of 90–105° between the calves and the thighs. The use of arm supports relieves the effort of the muscles of the back. Curved chairs cause upper body ailments, whereas flat chairs cause lower body ailments.[50,51] An optimal working environment has a temperature of 20–25°C with 40–60% humidity.[43,52,53] Noise should be minimized as much as possible; however, the maximum noise threshold that should be allowed at the workstation is 58 dB.[54–56] When using the mouse, the hand and the wrist should be positioned possibly parallel to the desk. A mouse with a slight increase in height in the most anterior part is recommended (Table 1).[57–60]

Table 1. Occupational diseases and their origin, and recommendations related to the work activities of oral and maxillofacial radiologists

Occupational discomfort	Causes	Ergonomic recommendations
Lower back and upper limb pain	sustained and bad postures, uncomfortable chairs, desks of insufficient or excessive height, limited space	– a simple stretching exercise and an active break every hour of work – furniture adjustable to the figure and height of the person – using a chair that can be adjusted to the needs of the person sitting on it and can provide good lumbar support, without causing pressure on the thighs and without the feet hanging; the feet must be supported on the ground at an angle of 90–105°
Carpal tunnel and tenosynovitis	repetitive movements with the hands, sustained and awkward postures while using the mouse and the keyboard, transcription of reports in a bad posture	– the mouse and the keyboard should be arranged in such a way so that to minimize the deflection, extension and flexion of the wrist – the mouse should be grasped with the dominant hand and the wrist should be positioned possibly parallel to the desk, a mouse with a slight increase in height in the most anterior part is recommended as well as using gel support pads for the wrists – using a DictaphoneTM
Neck pain	sustained head postures with excessive up or down head movements	– placing the computer screen below the eye level so that to ensure is a 14-degree downward gaze
Burnout syndrome	extended working hours, excessive workload, difficult employment relationships, lack of resources to perform duties properly, neglect of facets of life other than work	– maintaining a balance between work and family life – coping with dictatorial hierarchies – avoiding severe self-criticism – providing sufficient salary rewarding, having a number of employees according to the work volume, allowing spaces for the members of the work team to integrate, respecting nighttime hours and weekends, not interrupting with calls, avoiding tasks to be done at home, outside the workplace and working hours
Clinical depression	endogenous origin or biological, genetically determined predisposition, enhanced by environmental factors or reactive factors that occur in the face of poor adaptation to stressful environmental factors	– occupational medical services regarding mental health focused on medical professionals, including radiologists – controlling any physical illness
CVS	activities that stress near vision and are related to using computers	– adequate ambient lighting – full blink, 5-minute breaks every 2 h, yearly eye exams – using anti-glare filters on monitor screens – use software that reduces blue light – temperature of 20–25°C with 40–60% humidity
Suicidal thoughts	depression, anxiety, bipolar disorder, psychoactive substance abuse, alcoholism, loneliness	– OH services involving the treatment of depression, bipolar disorder, psychoactive substance abuse, alcoholism, self-medication, and feel-good medication
Metabolic syndrome	high degree of work stress, sedentary lifestyle, unhealthy lifestyle	– promoting a healthy lifestyle – physical activity – regular medical exams

CVS – computer vision syndrome; OH – occupational health.

Occupational medical services for medical professionals, including radiologists, should focus on mental health for the early detection of depression, stress, chronic exhaustion, bipolar disorder, psychoactive substance abuse, alcoholism, self-medication to feel good as well as suicide risk factors.

Situations related to lawsuits or possible lawsuits should be managed. Long work hours should be avoided and sufficient sleep is essential. Efforts must be made to maintain a balance between work and family life. A healthy lifestyle must also be promoted by getting physical activity and controlling any physical illness. Work hierarchies that do not tolerate mistakes must be overcome, and also severe self-criticism should be avoided. From an employer's point of view, sufficient salary rewarding should be given according to the context, region, functions, and professional title. Additionally, the number of employees should be in accordance with the work volume. Free-time spaces should be available for the members of the work team to integrate. Nighttime and weekend hours must be respected, and interruptions with calls or tasks outside the workplace and working hours should not be made. In addition, tasks that are needed to be done at home must be avoided. Lastly, it is recommended to spend time outdoors to allow contact with the sun. Exposure to sunlight stimulates the secretion of the hormones serotonin and melatonin, which are related to feelings of well-being and happiness, and sleep.

Conclusions

Oral radiologists are exposed to several risks and occupational diseases inherent and/or related to the work. However, these risks can be avoided by the implementation of the well-documented habits and ergonomic advice that improve a person's overall quality of life.

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