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ERGONOMICS IN DENTISTRY OF CLUJ-NAPOCA.

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ABSTRACT. Stomatology is considered to be a profession with a high risk of developing Work-Related Musculoskeletal Disorders (WMSD) (Gopinadh, et al., 2013). The method through which the occurance of WMSD can be reduced is by adopting a proper body posture, and appropriate application of ergonomics (Kierklo, Kobus, Jaworska, & Botuliński, 2011; Pîrvu, Pătraşcu, Pîrvu, & Ionescu, 2014). The objectives of this study aimed to investigate the manner in which the workspace and schedule is organised, related to ideal and neutral posture and to determine the presence of WMSD symptoms among dentists who work in Cluj-Napoca. The research took place from the 26th of February 2018 to 6th of July 2018, in Cluj Napoca's dental offices. The results obtained shows a high prevalence (90%) of WMSD specific symptoms which can be an indicator of the poorly applied ergonomics in the dentistry field (Mulimani, et al., 2014). It is, therefore, essential to raise awareness about the importance of the posture and ergonomics among dentists in Cluj-Napoca.

Key words: *Dentistry, Ergonomics, Posture, WMSD, awareness, prevention, Cluj-Napoca*.

REZUMAT. ***Ergonomia în stomatologia din Cluj-Napoca***. Stomatologia este considerată o profesie cu un risc crescut de dezvoltare a leziunilor musculoscheletale asociate profesiei (WMSD) (Gopinadh, et al., 2013). Modul în care incidenţa WMSD poate fi redusă, este prin adoptarea unei posturi corporale potrivite şi prin aplicarea corespunzătoare a ergonomiei (Kierklo, Kobus, Jaworska, & Botuliński, 2011; Pîrvu, Pătraşcu, Pîrvu, & Ionescu, 2014). Obiectivele acestui studiu au dorit să investigheze maniera în care este organizat spaţiul de lucru şi orarul, urmărind o postură ideală şi neutră şi să se determine prevalenţa simtomelor specifice WMSD, în rândul stomatologilor care lucrează in Cluj-Napoca. Cercetarea a avut loc din 26 Februarie 2018 până în 6 Iulie 2018, în cabinetele stomatologice din Cluj-Napoca. Rezultatele obținute prezintă o

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incidență crescută (90%) a simtomelor caracteristice WMSD, fapt ce poate fi un indicator al aplicării neeficiente a ergonomiei în domeniul stomatologiei (Mulimani, et al., 2014). Este necesară, prin urmare, conştientizarea stomatologilor din Cluj-Napoca, legată de importanţa posturii şi a ergonomiei.

Cuvinte cheie: *Stomatologie, Ergonomie, Postură, WMSD, conştientizare, prevenţie, Cluj-Napoca*.

Introduction

Stomatology, as a branch of medicine which "evaluates, diagnoses, prevents and/or treats diseases, disorders and/or conditions of the oral cavity, maxillofacial area and/or the adjacent and associated structures" (Glossary of Dental Clinical and Administrative Terms, n.d.), is considered to be a profession with a high risk of developing Work-Related Musculoskeletal Disorders (WMSD), because through the specific operations in this profession, involving high degree of concentration and precizion, the whole organism is multidirectional solicited (Gopinadh, et al., 2013).

WMSD is characterized by the “presence of discomfort, disability or persistent pain in the joints, muscles, tendons and other soft parts, caused or aggravated by repeated movements and prolonged awkward or forced body postures” (Gopinadh, et al., 2013, p. 229). WMSD does not only affect the physical side of a dentist, but in severe cases it has psychological and social repercussions, causing frequent absence from the work and in the end, early retirement (Muralidharan, Nusrath, & Margabandhu, 2013). According to Gupta, Bhat, Mohammed, Bansal, & Gupta (2014) the main reason for early retirement among dentists, is WMSD (29,5%).

The method through which the apparition of WMSD can be reduced is by adopting a proper body posture (Kierklo, Kobus, Jaworska, & Botuliński, 2011; Pîrvu, Pătraşcu, Pîrvu, & Ionescu, 2014). The dentists can be found in uncomfortable and asymmetrical positions, for long periods of time, maintaining the head, neck and shoulders in a tense manner (Kierklo, Kobus, Jaworska, & Botuliński, 2011), or twisting and tilting more in one way than the other (Valachi B. , 2008). With time, the muscles adapt, shortening themselves on one side of the spine or joint, resulting in misalignment or abnormal posture, caused by muscle imbalance and the loss of range of motion in one direction over the other (Valachi B. , 2008).

The working posture of the dentist is one of the most talked about subjects in dental ergonomics. Besides posture, ergonomics focuses on maximizing the

efficiency, in space and time, of the work of a dentist, approaching three specific domaines: physical ergonomics, cognitive ergonomics and organizational ergonomics (Mulimani, et al., 2014). Ergonomics is the science which is concerned with the efficiency of people in their work environment (Gopinadh, et al., 2013).

The main purpose of ergonomics in dentistry is to support the proper posture in hope of preventing the occurrence of WMSD through interventions which target the physical, cognitive and organizational side of the dentist. Physical ergonomics addresses the adoption of the proper posture and ideal movement, appropriate handeling of equipment and tools such as the ones of lighting, image amplification, mirrors etc. and proper use of patient and dentist chairs. In physical ergonomics there also exists interventions which aim for the working area design for example adequate workplace layout of a dentist space. The cognitive component of ergonomics interferes for stress management, relaxation techniques, the improvement of communication. Organizationally speaking, the rhythm and the variety of work as well as the alternation of procedures, management of the working program and the establishment of break frequency are factors which if properly adjusted can contribute to the maintaince of the proper posture for as long as possible. Two other factors are the integration of stretching and mobilization breaks and also and the efficient support of the dental assistant (Mulimani, et al., 2014).

Thus, there are many aspects of ergonomics which have to be taken into account, however unsuccessful application of ergonomics can lead to WMSD (Mulimani, et al., 2014).

Bedi, Moon, Bhatia, Sidhu, & Khan (2015) show through a study carried in multiple cities in India that the adoption of the ergonomical principles has significantly reduced the pain prevalence form 47,8% to 21,7% in the cervical area and from 39,1% to 17,3% in the shoulder area.

The investigation of WMSD symptoms is a tool for analyzing the work environment. WMSD symptoms prevalence speaks about the ways in which the ergonomical principles are applied (Kierklo, Kobus, Jaworska, & Botuliński, 2011).

One of the main reason for which ergonomics is not successfully applied is the proven fact, by multiple researches (Gopinadh, et al., 2013; Kierklo, Kobus, Jaworska, & Botuliński, 2011; Pîrvu, Pătraşcu, Pîrvu, & Ionescu, 2014; Valachi, 2003), namely the deficiency of basic knowledge of ergonomics. Awareness level regarding the correctness of different postures was seen among 59% of participants in the study conducted by Gopinadh, et al., (2013). In the article written by Rania, Salwa, Ibrahim, Sanaa, & Asmaa, (2018), 48,9% out of the studied students had fair knowledge regarding ergonomics and only 5% of students practiced it.

Hypothesis/ assumption and objectives:

Hypothesis/ assumption: The workspace and schedule management is not conceived in such a manner to sustain the neutral posture, also the approach on knowledge regarding the posture is superficial, thus WMSD characteristic symptom prevalence is increased among dentists.
Objectives:
1. We wanted to analize the working conditions and schedule of dentistry from Cluj-Napoca.
2. We intended to observe aspects of general health related to BMI, physical activity and rest.
3. We wanted to find out the dentists' perspective on posture.
4. We aimed to notice the prevalence of WMSD specific symptoms among Cluj-Napoca's dentistry.

Methods:

The research was conducted from the 26th of February 2018 to 6th of July 2018 in Cluj Napoca's dentist's offices. The research sample consisted in 50 subjects who are dentists.

The subjects were blinded to the hypothesis and objectives of the study, with the purpose of obtaining an accurate result.

The survey used for the research was self-designed, containing 27 items, structured in 7 sections, of which the last section was based on Standardized Nordic Questionnaires for the analysis of musculoskeletal symptoms (Kuorinka, et al., 1987). It tests the presence of a WMSD specific symptoms, for example: dull pain, acute pain, discomfort, paraesthesia etc., of the following areas: neck, shoulder, elbow, wrist or hand, upper back, lower back, hip, thigh, knee, ankle or foot.

In the first section of the survey, items about demographic data were included, after which questions regarding specialization and years of practice were asked. Another section targeted the working conditions, more specifically whether or not there was any dental assistant present, the working posture and the laterality, which were followed by questions in regard to the working schedule: hours per week, and whether there exist planned breaks and also the way in which the break time was spent. In the 5th section information about the general health condition was gathered: whether any sports were practiced and the number of hours of sleep per night. The 6th paragraph consisted of questions in which the dentists perspective on posture can be observed, for example: if the

proper posture is considered important by dentists, their knowledge on this subject, the description of their own posture, whether or not there is awareness about the common risks of dentistry field and if there were any measures taken for prevention. The questionnaire was administered by the authors.

For accurate interpretation of the gathered data through the survey, statistical analysis was accomplished with the help of Microsoft Excel program, using "COUNTIF" function for monitoring the frequency of the answers.

Results

Out of the 50 subjects, 26% were male, and the other 74% were female, with ages ranging from 25 to 78 years old and an avarage age of 34.28 years old. Acoording to body mass index (BMI), 30% of the subjects are situated outside of healty BMI and 22% of these were overweight and obese. The distribution of the subjects by specialization can be noticed in the first chart while in the first table the distribution of the subjects by experience, can be observed.

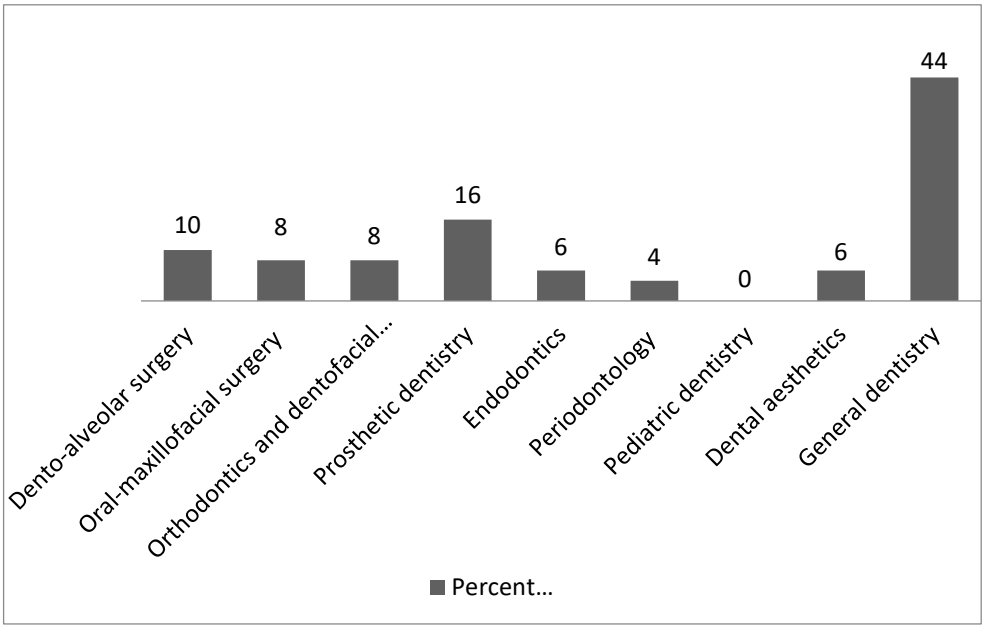

Chart 1. The distribution of the subjects by specialization

Table 1. The distribution of the subjects by experience

	<1 years	1-5 years	6-10 years	11-15 years	16-20 years	>20 years
Percentage	6	36	28	20	4	6

When asked about the intention of changing their field of work, 88% of the subjects expressed their focus on persuing and developing their career in the dentistry field.

It can be noticed that, in the section referring to the working conditions, barely 34% of the dentists often work with a chairside assistant, and in 14% of the cases the assistant does not exist. 62% of the subjects work mainly while sitting down, and from the laterality point of view 94% are right-handed, 4% are left-handed and 2% are ambidextrous.

In regard to the working schedule, almost three quarters (72%) of the dentists state that they do not have stable working hours. The number of worked days per week can be observed in the second table while the worked hours per day can be noticed in the third table. The majority of the subjects (62%) work 5 days per week. Nevertheless, more than half of dentists (52%) work less than 8 hours per day.

Table 2. Worked days per week

	< 3 days/week	3-4 days/week	5 days/week	6-7 days/week
Percentage	4	20	68	8

Table 3. Worked hours per day

	<4 hours/day	4-7 hours/day	8 hours/day	9-10 hours/day	>10 hours/day
Percentage	4	52	20	16	8

Noticeable, in the fourth table is the frequency with which the subjects take an intentional planned break of 10 minutes. A significant 68% of the dentist rarely take this break. The second highest percentage (16%) is represented by the subjects which do not take a planned break at all.

Table 4. Frequency of planned break

	Always	Sometimes	Rarely	Never
Percentage	6	10	68	16

The frequency of different types of activities during breaks can be noticed in the fifth table.

Table 5. Frequency of different typs of activities during breaks

	Usually	Often	Sometimes	Rarely	Never
Preparations for upcoming patients	44%	18%	14%	6%	18%
Relaxation activity	4%	4%	26%	36%	30%
Phone usage	20%	42%	18%	6%	14%
Stretching and mobilization exercises	0%	2%	8%	24%	66%
Meal or snack	4%	10%	50%	16%	20%

Answering the section which refers the general state of health, most dentists (66%) stated that they sleep about 7 to 8 hours per night. This percentage was followed by a 30% of subjects who manage to get from 4 to 5 hours of sleep. Furthermore, the frequency of sport activity can be seen in the sixth table.

Table 6. Frequency of sport activity

	<1times /week	1times /week	2 times /week	3 times /week	4 times /week	5 times /week	6 times /week	7 times /week
Percentage	24	6	24	24	10	6	2	4

The most often referred to sport activities were: walking, fitness, jogging, swimming and hiking. Also mentioned were: aerobics, pilates, TRX, basketball, football, cycling, dancing, horse riding, gymnastics, physiotherapy, hunting, rollerblading, squash and tennis.

The subjects perspective on posture can be noticed throughout the following answers: all of the participants agreed that adopting the proper posture while operating is very important and enough important.

The way in which every dentist evaluates its working posture can be seen in the seventh table. Over half of the subjects acknowledged that their posture is demanding, but also efficient when it comes to operation performed. Barely 18% (9 of the participants) self-describe their own posture as being very close to the rules of ergonomics.

Table 7. Self-description of working posture

Self-description	Percentage
A safety posture, very close to the rules of ergonomics	18
A demanding, but also efficient posture	60
I did not pay too much attention to posture analysis	22

The eighth table represents the sources from which the subjects gather information in regard to the right posture. Over two thirds (68,49%) of the dentists accumulated their knowledge from university.

Table 8. Knowledge regarding posture

	Percentage
Knowledge from university	68.49
Knowledge gathered from occasional Internet search	13.7
Knowledge gathered from systematic studying of the research papers	8.22
Knowledge from specialized courses	9.59

Referring to the common risks in the dental medicine field of developing WMSD, every participant without exception is aware of the dangers, but 36% of the dentist admit that they do not take any measure to prevent it from happening. Among the 64% of the subjects who try to prevent WMSD, the measures of half of them were directly linked to ergonomics and posture while the others measures were: physiotherapy, massage, sport, orthopaedic shoes, yoga, or the Bowen technique.

The presence of the characteristic WMSD symptoms can be detected in the second chart, depending on the anatomical areas of which they were reported. The common WMSD symptoms with the highest prevalence is found in the lumbar area (60%), followed by the dorsal area (54%). Coming next, in percentage, are the characteristic WMSD symptoms in the neck (52%), shoulder (34%), wrist (30%), hip (18%), knee and ankle (12%). The smallest incidence of the common MSD symptoms was reportedly situated at the elbow (6%).

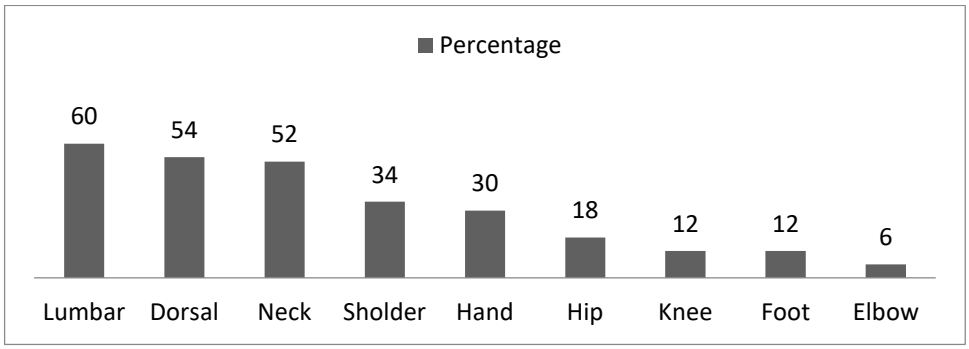

Chart 2. Distribution of WMSD characteristic symptoms

With the help of the third chart it can be noticed that only 10% of the dentists have not encountered the characteristic WMSD symptoms, and the same percentage represent the people who only feel one of the anatomical areas troubled. Over three quartes show the symptoms in multiple anatomical areas.

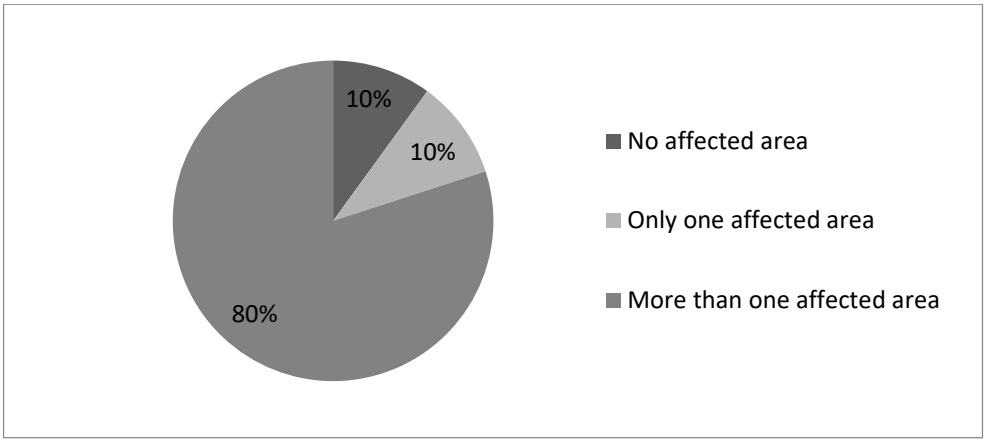

Chart 3. Number of area affected

Amongst the patients who have encountered specific WMSD symtoms, almost two thirds (64%) have not consulted a doctor for the discomfort felt, however in 77.78% of the cases these symthoms have not led to the unability to execute the different types of working activities.

Discussions

Many studies have talked about specific conditions in which a subject is exposed to the risk of developing WMSD. Statistically speaking, when it comes to personal background, women are at higher risk than man of developing WMSD (Faisal & Mathias, 2014; Khan & Chew, 2013; Sharma, Sharma, & Khattri). Furthermore, the risks are higher as the age grows (Gopinadh, et al., 2013). The occurrence of WMSD is also connected to the general health. Proper rest, a normal BMI and the physical activity can reduce the risks of developing WMSD (Gopinadh, et al., 2013). However, the majority of the participants in this study do not find themselves at these risks. 70% of the subjects are situated at a healthy weight, 66% get 7 to 8 hours of sleep per night and 70% practice physical activity at least 2 times per week.

When it comes to the specialization, the Orthodontists were at higher risks of developing WMSD in neck, shoulder and wrist area, whereas Prosthodontists were having a higher ratio of musculoskeletal symptoms at low back region (Faisal & Mathias, 2014). Our survey has shown that out of the subjects, 80% of the General Dentists and Dento-alveolar Surgeons and 100% of the Oral-maxillofacial Surgeons, Orthodontics and dento-facial Orthopedics, Prosthetic Dentists, Endodontics, Periodontologists, Pediatric Dentists and Dental Aesthetics develop characteristic WMSD symptoms. All in all, the dentists must identify the risk factors and they are responsible for the proper adjustment of their own life and work style to escape the risk zone.

Speaking from the organization of work point of view, almost three quarters (72%) of the subjects do not follow a stable work schedule, this having a negative impact on the long-term health (Boisard, Cartron, Gollac, & Valeyre, 2003). Over 62% of the participants work mostly from a sitting position, 84% rarely or never plan their breaks in between the patients and when these do exist, only 10% actually spent part of this time doing stretching exercises. These exercises could lead to the reducement of the effect caused by this workstyle (Kierklo, Kobus, Jaworska, & Botuliński, 2011). Out of the dentists only 34% work with a chairside assistant regularly. In the other cases this can lead to demanding movements for all of the segments in trying of working more efficiently. To sum it all up, there is a predominantly static posture, usually seated, when in fact, it is recommended to alternate the work position between sitting and standing (Gupta, Bhat, Mohammed, Bansal, & Gupta, 2014).

When it comes to the dentist perspective on posture, it can be noticeable that all of the involved subjects state that the proper posture is thought to be very important or at least important. Despite this fact, 22% of the participants do not pay attention to the posture and 60% describe their posture as being

demanding, but also efficient, thus neglecting an undemanding and neutral posture, in favour of the efficiency of procedures. However, the studies have shown that in fact, the proper posture gives the dentist "on one hand, optimal working conditions (access, visibility and control of the mouth) and on the other hand, physical and psychological comfort throughout the execution of the clinical acts" (Pîrvu, Pătraşcu, Pîrvu, & Ionescu, 2014, p. 177). In other words, the correct posture maintains a good professional performance for a longer time, thus influencing the quality of the medical services provided, while a non-neutral or demanding posture may induce a poor quality of work, which affects efficiency (Simu, Mesaroş, Muntean, Vincze, & Borzan, 2016; Pîrvu, Pătraşcu, Pîrvu, & Ionescu, 2014). Because of this, a superficial approach to the posture can be visible and also the low level of awareness in regard to the posture, which can be seen all around the world with the help of other surveys (Gopinadh, et al., 2013; Kierklo, Kobus, Jaworska, & Botuliński, 2011; Rania, Salwa, Ibrahim, Sanaa, & Asmaa, 2018). It can also be observed that just 31.51% of the subject in this study show interest in learning more about the neutral posture.

In addition, all of the participants confirm their knowledge in the specific risks of developing WMSD in the dentistry field, but 36% do not do anything in hope of preventing it, and only 36% act on the ergonomically factors and on the posture.

The results which were found (90%) in regard to the prevalence of WMSD symptoms are similar to other countries : Poland (92%) (Kierklo, Kobus, Jaworska, & Botuliński, 2011), Australia (87,2%) (Leggat & Smith, 2006), India (68,3%) (Bedi, Moon, Bhatia, Sidhu, & Khan, 2015) or Romania (89%) (Simu, Bocanet, Mesaroş, & Borzan, 2014).

Conclusion

In conclusion, there is a grown incidence of the common WMSD symptoms and the ergonomics in the dentistry field is poorly applied.

In can also be noticed, a fact which is also supported by Dr. Bethany Valachi (2008) that although the majority of dentists show deficiency of basic knowledge in ergonomics and demonstrate a lack of interest in the appliance of the ergonomically principles, most of them (90%) hope to maintain what could be considered a long lasting career.

It is essential to raise awareness about the importance of the posture and ergonomics and to improve the education in this area, with the purpose of ultimately maintaining a good professional performance for a longer time, influencing the quality of the medical services.

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