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## MUSCULOSKELETAL DISORDERS IN DENTIST FROM WEST POMERANIAN REGION

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### SUMMARY

#### Introduction

The dentist is exposed to a number of overloads, resulting from the need to maintain a forced, often non – ergonomic position during work.

#### Aim

The purpose of the study is to determine the movement disorders among dentists, assessment of knowledge level from ergonomics and the need for educational measures.

#### Material and methods

The study was based on questionnaire conducted in a group of 90 dentists.

#### Results

The study confirmed the occurrence of disorders (60%). The pain is mainly located in the lumbar spine (27.8%), cervical spine (23.3%) and sacral spine (10%). 91% of the respondents considered that they knew the principles of ergonomics, 83% of the respondents indicated the need for an educational program.

## WYSTĘPOWANIE ZABURZEŃ UKŁADU RUCHU W GRUPIE STOMATOLOGÓW Z WOJEWÓDZTWA ZACHODNIOPOMORSKIEGO

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### STRESZCZENIE

#### Wstęp

Lekarz stomatolog narażony jest na liczne przeciążenia, wynikające z konieczności utrzymywania wymuszonej, niejednokrotnie nieergonomicznej pozycji w trakcie wykonywania pracy. Naprzeciw szkodliwym zjawiskom towarzyszącym czynnościom zawodowym stomatologów wychodzi ergonomia i działania z zakresu fizjoprofilaktyki.

#### Cel

Celem badania jest określenie zaburzeń układu ruchu wśród stomatologów, ocena stanu wiedzy z zakresu ergonomii oraz potrzeby wprowadzenia działań edukacyjnych.

#### Materiał i metody

Badanie zostało przeprowadzone w oparciu o anonimowy kwestionariusz przeprowadzony w grupie 90 lekarzy stomatologów.

#### Wnioski

Przeprowadzone badania potwierdziły występowanie zaburzeń (60% badanych). Dolegliwości bólowe zlokalizowane są najczęściej w obrębie kręgosłupa lędźwiowego (27,8%), szyjnego (23,3%) oraz krzyżowego (10%). 91% badanych uznało, że zna zasady ergonomii pracy, 83% badanych wykazuje potrzebę wprowadzenia programu edukacyjnego.

## Conclusions

The main disorders occurring in the musculoskeletal system in the dental professional group are pain disorders located in the lumbar, cervical and sacral spine. Factors influencing these disorders are: the type of accepted position during work, length of service and the daily dimension of worked hours. There is a need for introduction of physiotherapeutic prevention education in dentists.

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**Keywords:** dentist, musculoskeletal disorders, pain, workplace ergonomics, physiotherapeutic prevention education

## Introduction

The first mention of dental treatment in Poland dates back to the 13th century (Jesionowski 1971). Over the years, the nature of work of dentists has changed steadily. In the 19th century dentists worked in a classical way – sitting or standing next to a sitting patient (Milka *et al.* 2013). That pattern of work was unchanged until the middle of the 20th century. Use of ergonomics has facilitated the modernization of the workplace, resulting in improved access to the treatment field and reduced adverse effects on the body (Lewczuk *et al.* 2002; Milka *et al.* 2013). The professional work of dentists consists in the diagnosis and treatment of diseases of the teeth, periodontium, as well as filling deficiencies in dentition (Pellowska-Piontek *et al.* 2005; Nowotny-Czupryna 2012; Łukomska – Szymanska *et al.* 2012). The standard working position of dentists is to sit or sit in a sitting, half-sitting or lying patient (Lewczuk *et al.* 2002; Nowotny-Czupryna 2012). The dentist's work is done under static conditions, requiring little activity in the treatment area. It is possible to maintain precision during the operation by coordinating the following components: correct

## Wnioski

Uzyskane wyniki potwierdzają, że w grupie aktywnych zawodowo stomatologów zaburzenia układu ruchu są zjawiskiem powszechnie występującym. Dotyczą głównie odcinka lędźwiowego i szyjnego kręgosłupa. Czynnikiem wywołującym zaburzenia są nieprawidłowa pozycja podczas pracy, dzienny wymiar przepracowanych godzin i zbyt długi czas przeznaczony na terapię jednego pacjenta,

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**Słowa kluczowe:** stomatologia, zaburzenia narządu ruchu, dolegliwości bólowe, ergonomia pracy, fizjoprofilaktyka

positioning of the head, torso, elbow and hand of the working limb (Pellowska-Piontek *et al.* 2005; Nowotny-Czupryna 2012).

Musculoskeletal disorders are the most common health problem in the examined occupational group. The professional work of dentists requires a lot of responsibility, concentration and precision. Occurrence of workload and failure to observe the principles of ergonomics may result in disorders in the musculoskeletal system, which literature refers to as: Work-Related Musculoskeletal Disorders (WRMD), Repetitive Stress Disorder Injures (RSI), Cumulative Traumatic Disorders (CTD) and Musculoskeletal Disorders (MSD) (Pellowska-Piontek *et al.* 2005; Nowotny-Czupryna 2012; Łukomska-Szymanska *et al.* 2012). Overloads accumulated in the body are not due to a short, intense stimulus, but from the accumulation of numerous overloads and micro injuries. The effect is to exceed the physiological strength of the tissues (Milka *et al.* 2013). Disorders located in the musculoskeletal systems usually have a functional or structural background. The main symptom is pain, which can gradually develop into chronic pain syndromes (Khalid

*et al.* 2001; Pellowska-Piontek *et al.* 2005; Nowotny-Czupryna 2012). The International Journal of Occupational Safety and Ergonomics (JOSE) in 2013 pointed pain in the thoracic and lumbar spine as the most common movement disorder among Polish dentists (Gupta *et al.* 2013).

Dentist is in the position of trunk flexion in about 30–40% of all working time. In addition, he performs from 800 to 1000 repetitive upper limbs movements in the full range of mobility (Lewczuk *et al.* 2002). Performing dental procedures requires taking a forced position, accompanied by flexion and rotation of the spine (Łukomska-Szymańska *et al.* 2012). The spine in that position, is exposed to tissue dysbalance – excessive pressure on one group of tissues causes the tissue to expand on the opposite side. Regular maintenance of this position predisposes to deformation of the intervertebral disc, which may be the main cause of discopathy and overdosage in intervertebral joints (Piątkowska *et al.* 2009). In addition, changes occur in the muscular system. Overdosage of the muscles of the shoulder, abdominal muscles, spine and neck area. This is due to the need to perform repetitive movements such as lifting and keeping the upper limbs in order to precisely perform surgical procedures (Airen Sarkar *et al.* 2012). Currently, dental equipment which is adapted to the ergonomic working system is widely available. Frequent factor which lowers the quality of dentists' work is disinclination to change the work habits (Snaders *et al.* 1997; Dzieńkowski 2014).

Presentation of correct ergonomic conditions of dentists' work should have its beginnings in the process of education and occupation. During work, the dentist may take a standing or sitting position while lying down, half sitting, or sitting patient position. Working in a standing position while sitting patient makes the highest risk of injury in the body of the dentist (Pellowska-Piontek *et al.* 2005). Variability of the accepted position is the basis for preventive

actions. Ergonomic interventions should be specified individually for the needs of the dentist, considering personal factors such as body weight, postural defects, pain or mobility limitations (Pellowska *et al.* 2005; Milka *et al.* 2013). Seated position is the most ergonomic position during dental procedures (Bladowski 1999). The correct position should be straightened. Do not allow to torso, neck and head rotate during work. Maintaining such position provides adequate muscle tension and articulation unweight (Pellowska-Piontek *et al.* 2005; Malińska 2014).

### **Aim**

The aim of the study is to determine the disorders in the musculoskeletal system of dentists from the West Pomeranian Region and assessment of their knowledge of ergonomics. In addition, define the factors which cause such disorders, the frequency of their incidence and the need to introduce physiotherapeutic prevention education.

### **Material and methods**

The survey was conducted in the form of an anonymous questionnaire consisting of 30 questions. The issues were analyzed and allocated to two thematic groups. Part one includes general information about tested dentists (sex, age, location, length of service, daily working hours and diagnosed diseases). The second part includes questions about work (including the position taken during the procedure, cooperation with the dental assistant), localization of disorders in the musculoskeletal system, the occurrence of pain (including severity and nature of pain, interference in professional life), physical activity of the person being tested, use of physiotherapeutic services and knowledge of ergonomics (including the source of knowledge and its application in the course of the apprenticeship).

The questionnaire is the result of the author's work and was created for research purposes. The study included a group of 90

dentists working in the West Pomeranian Region and was implemented in the period from February to March 2017 in 20 dental surgeries. The results obtained were subjected to statistical analysis performed by the Statistica 12 program. The Pearson chi-square test was used to examine the relationship between the two variables due to the qualitative nature of the variables. The level of statistical significance was assumed to be equal to  $p = 0.05$ .

### Results

41 men (37%) and 49 women (63%) were involved in the study. The mean age of the subjects was 34 years. The research group was diverse in terms of specialization. Of the 90 dentists surveyed, 31 (34%) did not have specialization, 16 specialized in dentistry, 14 in endodontic and others in periodontics, pediatric dentistry, prosthetics and orthodontics (11%, 9%, 9%, 8% respectively). The average length of working time was between 2 and 5 years, and the daily working hours were between 8 and 10 hours (Figure 1).

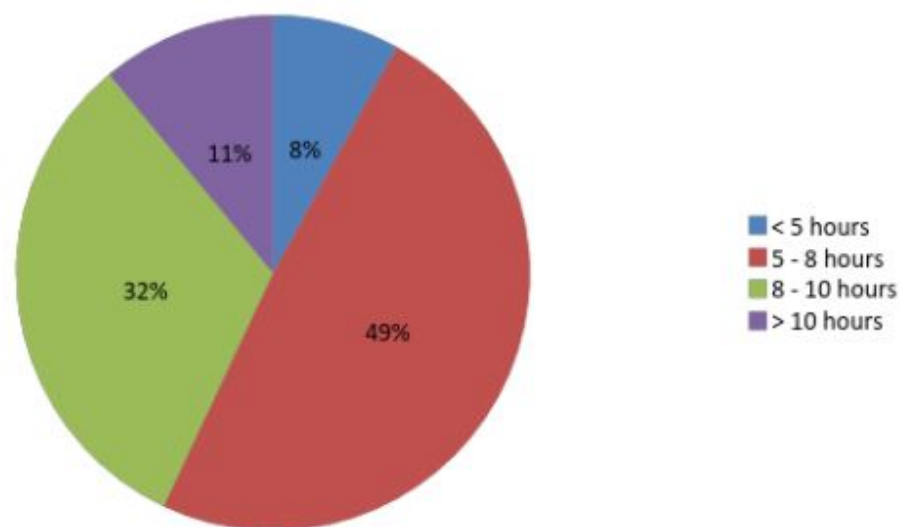
The occurrence of pain in the musculoskeletal system was declared by 54 respondents (60%). The most frequently observed

localization was lumbar spine (27.8%), cervical spine (23.3%) and sacrum spine (10%) (Figure 2).

The relationship between the occurrence of pain and the assumed position during work, length of work, daily working hours and cooperation with the dental assistant was analyzed. The highest percentage of pain disorders was observed in dentists standing on the side of the sitting patient (72.7%) and sitting on the side of the patient lying (65.4%). Least pain reported dentists who are sitting in the back of the lying down patient (46.4%) (Figure 3).

Persons with a work experience up to one year (56.3%) and those working from 2 to 5 years (47.4%) are the least likely to suffer from pain, 80% of physicians with a work experience of more than 10 years have reported disorders of musculoskeletal system. At the level of statistical significance  $p = 0.05$  no significant correlation was found between the occurrence of pain in the musculoskeletal system depending on the assumed position during work ( $p = 0.372$ ) and length of service ( $p = 0.117$ ).

People who work more than 10 hours a day (85.7%) and those who work up to 5 hours a day (70%) have the most pain disorders.



**Figure 1.** The average length of working time of dentists from West Pomeranian Region.

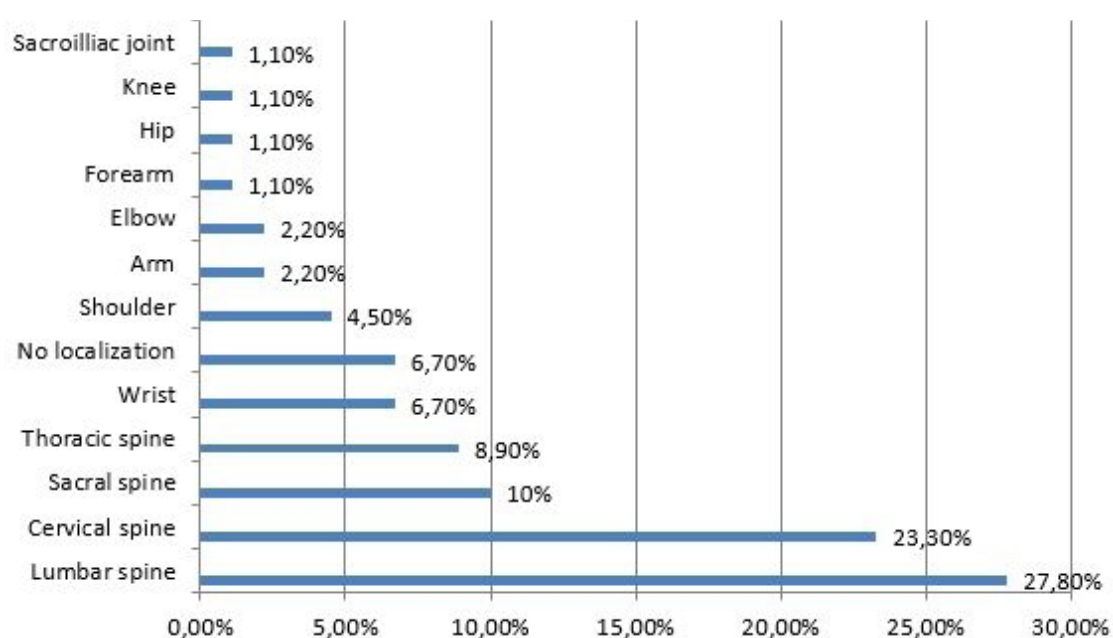


Figure 2. Localization of pain disorders in study group.

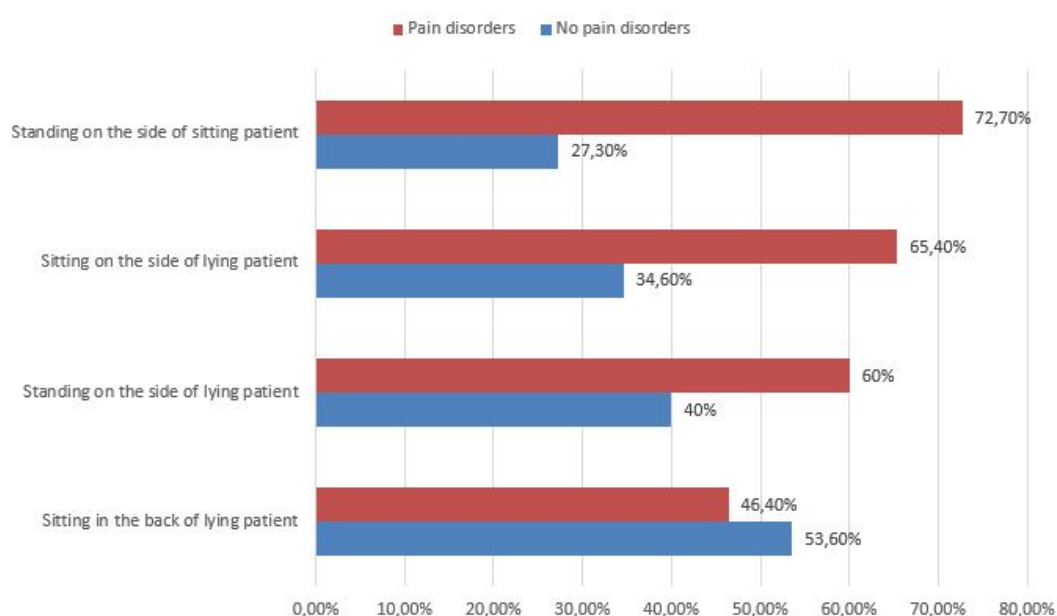


Figure 3. The relationship between the occurrence of pain and the a position during work in dentists.

Physicians working from 5 to 8 hours a day (56.8%) and 8 to 10 hours a day (51.7%) reported the least pain problems (Figure 4). This is not a statistically significant relationship ( $p = 0.350$ ).

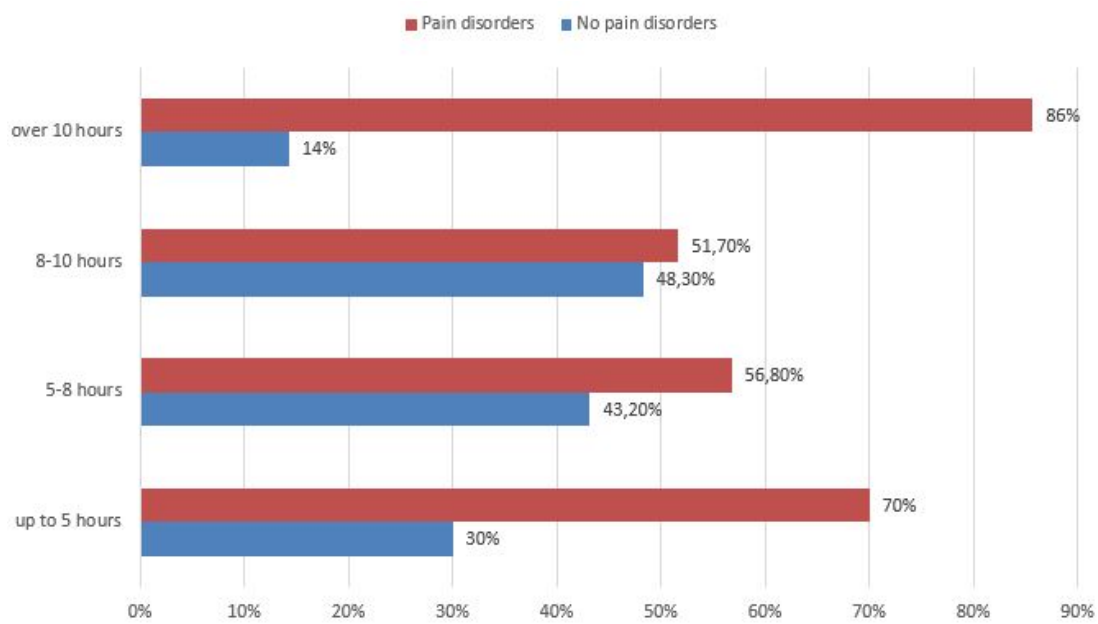
The necessity to limit the number of patients admitted concerned slightly more than a quarter (26.4%) of the respondents who were complaining about the painful symptoms of the musculoskeletal system.

There was a statistically significant relationship between the occurrence of pain and the need to limit the number of patients ( $p = 0.001$ ).

Knowledge of the principles of ergonomics in dental practice is declared by 82 respondents (91%), but only 58 (64%) use it in their everyday work.

75 respondents (83%) declared the need to introduce action against pain among



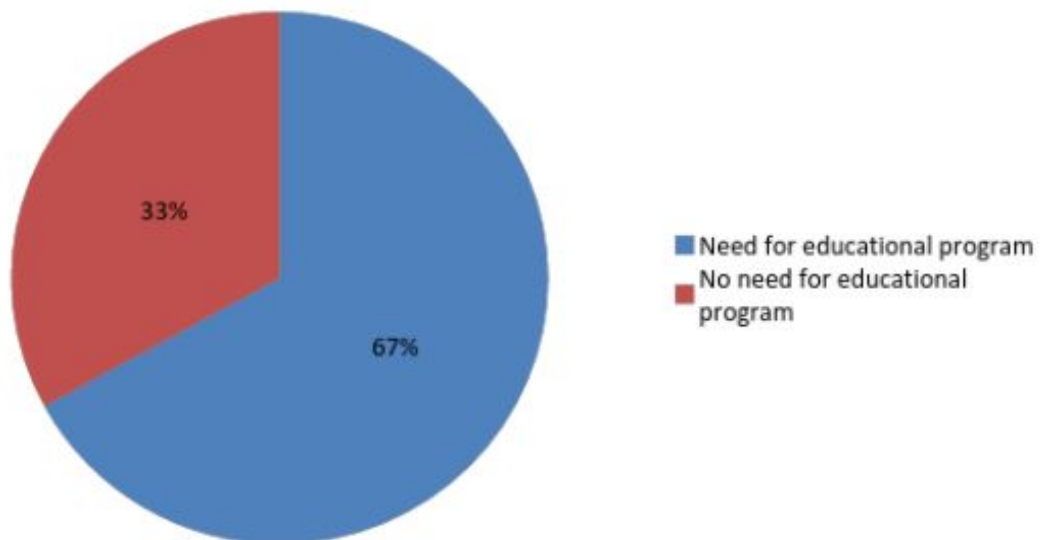


**Figure 4.** The relationship between the occurrence of pain and daily working hours in dentists.

dentists. 60 respondents (67%) need to increase the number hours of physiotherapeutic prevention education during their studies (Figure 5). Based on the results of the study, it can be concluded that there is a high need for prevention programs in the area of physiotherapeutic prevention.

**Discussion**

Musculoskeletal disorders are the result of long-term overloads accumulated in the human body in which the strength and efficiency of the movement apparatus exceeds. The basis for the development of occupational diseases among workers is multifactorial. The most common causes include incorrect behavior during work, repetition of work-related movements, and



**Figure 5.** Need to introduce an education program based on physiotherapeutic prevention and ergonomics.

development of required strength during work (strength is defined by the number of muscles or muscle groups involved in the activity, repetition, and time the strength is maintained (Bugajska *et al.* 2011; Kopacz *et al.* 2015). The occurrence of musculoskeletal disorders is common in many different occupational groups, including those with no classical physical risk factors. Health care services, especially physiotherapists, nurses, treatment physicians and dentists are exposed to overload (Bugajska *et al.* 2011). Based on the information obtained from the literature reviewed and the results of our own research it is possible to conclude that the work of dentists is subject to high risk of health burden. Studies in this research show that more than half of the respondents declare pain in the musculoskeletal system. Maryam Rabiei *et al.* examining the presence of MSD among dentists, confirm the presence of movement disorders (73%) in the dental profession (Rabiei *et al.* 2012). The results of our own research show that the main localization of movement disorders is lumbar, cervical and sacral spine. The above statement is confirmed by the results of the research carried out by Skalska-Izdebska. The author conducted a study on the occurrence of pain in the cervical spine in dentist's profession. The most common symptoms were cervical and lumbar spine (Skalska-Izdebska *et al.* 2013). The effect on the occurrence of disorders in the movement system is also the way professional activities performed by dentists. Analysis of the authors of the study indicates that the standing position of the patient sitting at the side of the patient is at the highest risk of motor disorders. On the other hand, the most commonly used position among the subjects was the position sitting behind the back of the lying patient, which is the most ergonomic position because it is burdened by the slightest risk of developing ailments. Equally important is the dependence affecting the occurrence of disorders in the motion system is the length

of work. By analyzing the data obtained from the conducted own studies, it can be stated that in the group of people working for more than 10 years the pain is most common (80%). Similarly, the proportion in the group with a working age of 6–8 years was 62.5%, and in the group with a work experience of 2d – 5 years 47.4%. Milka *et al.* conducted a study among dentists to analyze the pain syndromes of the lumbosacral spine. Authors describing the results of the study emphasize the significant influence of age and length of work on the intensity of pain (Milka *et al.* 2013). Taking into account the factors that influence the development of musculoskeletal disorders, the daily work dimension cannot be ignored. Data obtained from the present study, the highest percentage of pain in the study group worked up to 5 hours a day and above 10 hours a day. The influence on the occurrence of disorders in the musculoskeletal system also has an ergonomic working style which includes most natural body position by a dentist (the smallest muscle tension), professional activity in an environment adapted to healthy working principles and compliance with basic of health standards (specific working hours and intervals between dental sessions) (Pelłowska-Piontek *et al.* 2005; Diaz-Caballero *et al.* 2010; Shaik *et al.* 2016,). On the basis of own data, it can be stated that knowledge of ergonomics among dentists is very good (91% declare that have knowledge about ergonomics rules). On the other hand, the practice of ergonomics is at a lower level, as compliance with the rules is declared by just over half of the respondents (64%). Łukomska-Szymańska *et al.*, analyzing the assessment of dentists' work style in ergonomics on the basis of their own research, report that ergonomic education in dentistry is moving in the right direction, but far from satisfactory in terms of level of teaching. A small percentage of dentists in the study group presenting an ergonomic working style (Łukomska-Szymańska *et al.*

2012). In addition, the information presented in the literature (Hille *et al.* 2013) emphasizes that there is still insufficient attention to both graduates and active dentists in ergonomics. Research highlights that most practicing dentists do not develop the knowledge and skills they need to follow the principles of ergonomics (Hille *et al.* 2013). It is worth pointing out that the addition to the study program the course: medicine – ergonomics and occupational safety in 2005 significantly improved the knowledge of dentists in the field of occupational disease prevention and initiated the shaping of proper working habits (Piątkowska *et al.* 2009).

In the literature so far, little attention has been paid to the consideration of the need to introduce education in the field of action against pain and introduction of physiotherapeutic prevention education in the dental profession. According to our own research, 83% of respondents see the need to introduce changes to prevent pain disorders in the musculoskeletal system. This result may indicate insufficient assistance from preventive, diagnostic and therapeutic care. On the basis of the results obtained, it can be concluded that it would be a good idea to create a preventive program closely related to the study group. This program should include information on the possible causes of musculoskeletal disorders, preventive actions and therapeutic actions in case of existing motor disorders (Smith *et al.* 2002; Valachi *et al.* 2003,). The idea of such a project should also be to provide assistance in the form of consultations with appropriately trained health care providers, including: physician, physiotherapist, dietitian or psychologist. It is also worth emphasizing that the introduction of basic knowledge in the field of physiotherapeutic prevention could have a positive effect on reducing the occurrence of disorders in the motor system. According to our own research, 67% of respondents see the need to increase the number of introduction of

physiotherapeutic prevention education hours during their dental study.

The conducted research was the first in the West Pomeranian Region. The results show many musculoskeletal disorders in dentists. Respondents see the need to introduce changes to prevent pain disorders in the musculoskeletal system, they also see the need to change the dental educational system. It can be stated that the introduction of additional hours in the field of ergonomics during dental student education will have measurable effects in reducing musculoskeletal disorders.

### Conclusions

The main disorders occurring in the musculoskeletal system in the dental professional group are pain disorders located in the lumbar, cervical and sacral spine. Factors influencing these disorders are: the type of accepted position during work, length of service and the daily dimension of worked hours. Despite the knowledge of ergonomics in dentistry, the presence of disorders in musculoskeletal system is still widespread. There is a need for introductory of physiotherapeutic prevention education in dentists.



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