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Research Article

Work-Related Musculoskeletal Pain in the Dental Profession

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Abstract

The aim of this study was to analyze the frequency and the impact of work-related musculoskeletal pain in dental professionals, and to compare results to a previous study conducted in 2008. The knowledge of dental professionals on the topic and the use of preventive measures to improve ergonomics in dentistry was also investigated. Between 33.6% and 42.9% of all participants suffered from neck and/or back pain. More than two-thirds of participants stated that they had achieved a reduction in pain through exercise training and by maintaining awareness of body posture. Participants who used magnification (dental loupes or microscopes) had fewer neck and back problems than non-users. These results indicate that preventive and therapeutic measures are required to avoid musculoskeletal complaints in the field of dentistry. Physical activity and training, the use of dental loupes, and awareness of posture should be promoted as early as possible in dental education.

Keywords: Back pain; Neck pain; Dentistry; Ergonomics; Occupational disease; Prevention

Introduction

Work-related musculoskeletal pain is a common health concern affecting a large part of the population, including dental professionals. The prevalence of musculoskeletal disorders amongst dentists is high, affecting more than 60% of the profession, with the neck, shoulder, and back being the most frequently affected regions [1]. This is largely due to the high physical demands of dentistry, suboptimal work postures, and the repetitive motions inherent to the profession. These work-related musculoskeletal disorders can significantly impact the quality of life and work performance of affected individuals [1,2].

There is relatively little data available on the prevalence of back problems among dentists and dental staff in Switzerland. According to a survey from 2008, work-related pain, associated impairments, and the use of medical treatment were frequently reported in dental professionals [3]. The prevalence and impact of back pain in the dental profession represents a significant workplace issue that demands attention and further development of preventive measures.

The aim of this study was to investigate the current situation of work-related pain experienced by dentists and dental staff in Switzerland and medical assistance sought, and to analyze changes over the past 15 years. The study also analyzed how the use of preventive measures, such as education on ergonomic working practices, the implementation of assistive tools, and the promotion of physical activity, has impacted the work-related health problems of Swiss dentists.

Materials and Methods

The questionnaire used in this survey was adapted from the one used in a previous survey by our research group [3], which was in turn based on the modified questionnaire of the North American Spine Society for the lumbar and cervical region [4].

Participants included dentists, dental assistants, dental hygienists, and dental students. An online version of the questionnaire, available in German and French, was distributed electronically to dentists and dental schools. Additionally, 1,400 flyers containing a QR code linking to the questionnaire were distributed at the annual meeting of the Swiss Society of Dentistry (SSO), held in Berne (June 9th to 11th, 2022). The questionnaire was available online from March 1st to December 31st 2022. While students were requested to participate by their universities, dental assistants and hygienists were either contacted via email or informed of the survey by their employer.

The questionnaire evaluated the frequency and degree of pain experienced in the last week, in various anatomical regions (neck, arms, back/buttock and legs), as measured on a six-point scale ranging from "never" to "always" and "not at all" to "extreme". When evaluating the data 'often'/'most of the time'/'always' were considered 'yes to pain' and 'never'/'rarely'/'sometimes' were considered as 'no to pain'. Participants were asked to indicate if they experienced any limitations with everyday activities such as getting dressed, lifting, walking, sitting, standing, and sleeping, as well as limitations on social life, travel, sex life, and job measured in six categories, category 1 (no limitations), categories 2-6 (pain related limitations), and categories 4-6 (severe pain and limitations). Participants were also asked whether they had sought medical treatment, such as visiting a doctor, physiotherapist, osteopath, or chiropractor, due to work-related complaints. Furthermore, the participants were asked to self-assess their knowledge measured on a six-point scale ranging from "very bad" to "very good" about measures for preventing back pain and whether they actively used this knowledge to prevent back problems. This evaluation collected details on the further education measured on a dichotomous scale "yes or no", regarding back problems, and the applied tools used to support good posture (such as magnifying glass, microscope, and/or ergonomic chair).

Statistical evaluation

The descriptive statistics was carried out with Excel 16.69.1 (Microsoft). Data were analysed separately according to occupational groups (dentists, dental hygienists, dental assistants and dental students), gender, and age (age groups ≤20, 21–30, 31–40, 41–50, 51–60 and >60 years). Dental assistants and hygienists were grouped together when response rates were similar.

Results

A total of 902 questionnaires were filled out, with 764 completed in full. Dentists made up the largest group of participants (49.7%), followed by dental hygienists (19.5%), dental assistants (17.4%), and dental students (13.4%, Table 1). Almost three quarters of participants were female (73.3%, 26.7% men). Women were more frequently represented in all occupational groups, with the highest representation among dental hygienists and dental assistants (98.5%), followed by students (75.2%) and dentists (54.0%). Dentists participating in the survey passed their state examination in approximately equal numbers at the three German-speaking universities (Basel 26.6%, Zurich 25.5%, Bern 22.5%), in French-speaking Switzerland (Geneva 5.8%), or in foreign locations (19.7%).

-	Dentists	Dental hygienist	Dental assistants	Students	Total
Total	448 (49.7%)	176 (19.5%)	157 (17.4%)	121 (13.4%)	902 (100%)
male	46.00%	2.30%	0.60%	24.80%	26.70%
female	54.00%	97.70%	99.40%	75.20%	73.30%
age (mean)	45.9	42.6	32.8	25.3	41.4
≤20y	0	2	19	6	3%
21-30y	56	40	43	100	27%
31-40y	94	43	36	9	20%
41-50y	92	26	37	1	17%
51-60y	116	41	18	0	20%
≥60y	90	23	1	0	13%

Table 1: Descriptive data of the participants.

In all occupational groups, neck pain, as well as back/buttock pain, were the most frequently reported forms of pain (Figure 1).

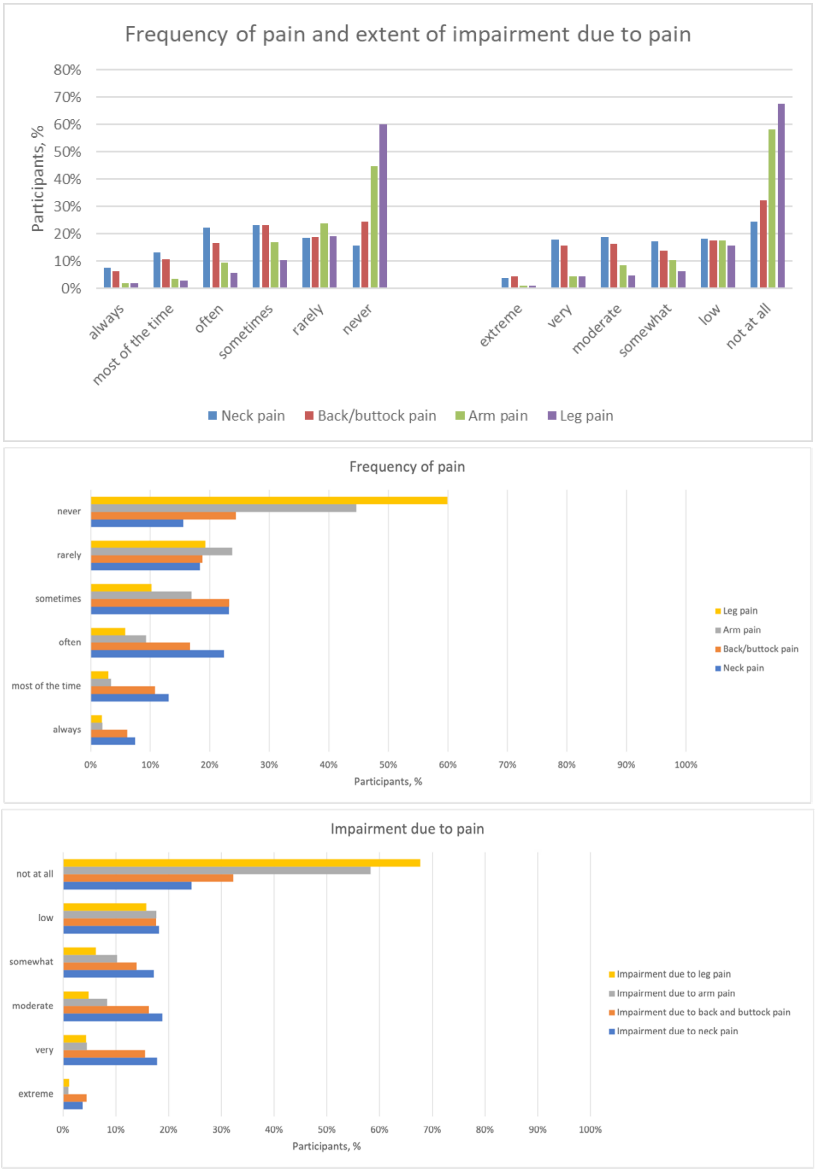


Figure 1: Frequency of pain and impairment.

Women generally stated that they suffered more frequently and more intensely from pain than men. Approximately one-third (33.8%) of all dentists reported often, most of the time, or always suffering from neck pain during the last week and 31.2% were moderately, very, or extremely affected by the neck pain. Back/buttock pain was reported by dentists at a slightly lower rate of 28.4%, with 29.3% of dentists reporting impairment due to back/buttock pain. Pain, numbness, or weakness in arms or legs were reported less frequently by dentists, with frequencies ranging from 2.4% to 11.5%. For dental assistants and hygienists, the average frequency of neck pain was 59.4%, with 55.3% reporting impairment, and the average frequency of back/buttock pain was 43.8%, with 47.3% reporting impairment. Furthermore, dental assistants and hygienists, on average reported suffering from pain (21.9%), numbness (15.5%), and weakness (13.4%) in their arms, and pain (18.6%), numbness (8.0%), and weakness (5.9%) in their legs. For students, the frequency of neck and back/buttock pain was 33.6% and 26.2%, respectively, with corresponding perceived impairment in 34.6% and 32.7% of participants, respectively.

The percentages of all participating women who were always/most of the time/often affected by neck (50.0%) and back/buttock pain (36.1%), and corresponding impairment (47.7% and 40.8%, respectively), were higher than for men, who reported neck (23.6%) and back/buttock pain (26.8%) with impairments in 20.1% and 23.6% of participants.

Dentists reported varying proportions of pain-related limitations (categories 2–6) in daily activities: 32.9% in sleeping, 30.8% in lifting objects, 30.5% in standing, 25.0% in social life and recreation, 24.6% in getting dressed, 18.8% in walking and running, 17% in traveling, and 7.2% in sexual life. Overall, 60% reported that they could sit on a chair as long as they wanted to, and 29.1% reported that they needed an ergonomic chair to prevent pain. Severe pain and impairment (categories 4–6) were reported in social life and recreation (6.4%), lifting objects (5.5%), sleeping (5.4%), and standing (4.9%). Pain during or after long treatment sessions (>60 minutes) was described by 35.8% of participating dentists and 11.8% stated that they already had pain after short sessions (<60 minutes).

Compared to the other occupational groups, impairments due to pain in activities of daily living (categories 2–6) were more prevalent among dental assistants and hygienists: 43.7% in sleeping, 42.8% in standing, 41.9% in lifting objects, 34.6% in social life and recreation, 27.2% in getting dressed, 23.6% in traveling, 22.6% in walking and running, and 9.5% in sexual life. Overall, 43.2% reported that they could sit on any chair as long as they wanted to and 31.4% reported that they needed an ergonomic chair to prevent pain. Problems related to treatment time were described by 51.9% during or after long treatments, and 18.8% during shorter treatments.

Students indicated the lowest prevalence of impairment across all daily activities: 28.7% in standing, 17.8% in lifting objects, 16.8% in social life and recreation, 14.9% in sleeping, 11.9% in walking and running and getting dressed. Traveling was affected in 6.9% and sexual life in 3%. Few students indicated being dependent on the availability of an ergonomic dental chair, with 63.4% reporting being able to sit on any chair as long as they want. A total of 47.5% of participating students reported having problems during or after long treatment sessions, and 4% during short sessions.

When asked about the use of medical help, more than half of all participants stated that they had already received treatment for work-related musculoskeletal complaints during their occupational activity. Of all participants when specifying the type of treatment received, 56.9% stated they had sought physiotherapy, 28.5% osteopathy, and 28.3% went to a chiropractor. General medical treatments were reported by 65.7% of the dental assistants, 63.3% dental hygienists, 52.9% dentists, and 22.8% students (Figure 2).

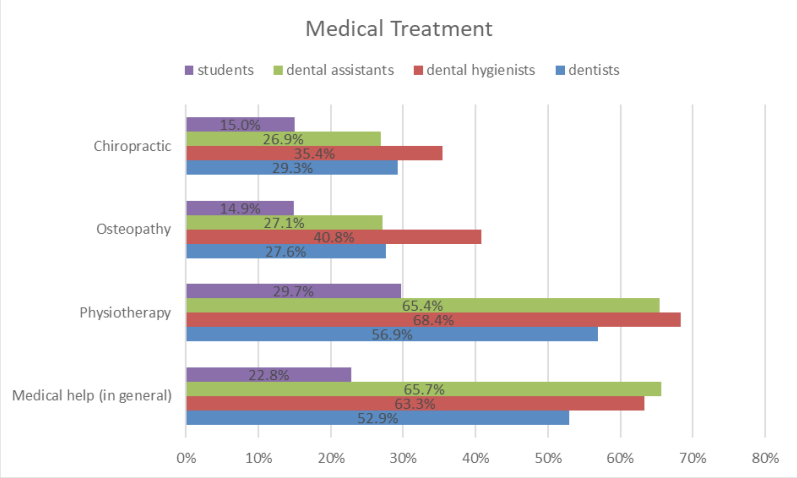


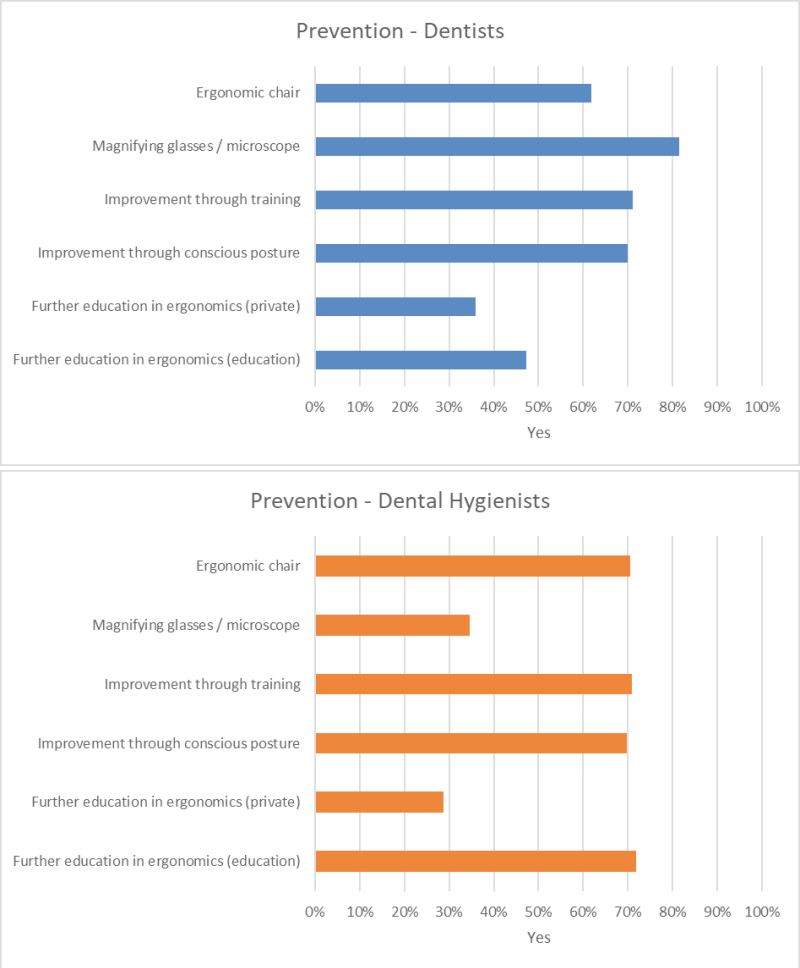
Figure 2: Frequency of medical treatments during the whole professional career.

Physiotherapy was used by 67.2% dental assistants and hygienists, 56.9% dentists, and 29.7% students. Of the dentists who had indicated receiving some kind of ergonomic education in their studies, 46.5% had sought medical help during their career and 49.5% had visited a physiotherapist. In contrast, a noticeably higher percentage of 58% and 63%, respectively, of those who had not conducted further ergonomic education needed to see a physician or physical therapist.

Sex-specific analysis showed that 53.7% of women sought medical help for work-related complaints and 58.2% visited a physiotherapist, compared to 50.7% of men who sought medical help and 53.4% who received physiotherapy. Approximately one-third of all women and one-quarter of all men used chiropractic or osteopathy.

Overall, 74.3% of all participants self-reported that they were very well- or rather well-informed about preventive measures to avoid musculoskeletal pain. In total, 94.9% of the students, 71.8% of the dental hygienists, 47.2% of the dentists, and 34% of the dental assistants reported to have had further education on the subject during their studies, while 35.9% of the dentists, 28.8% of the dental hygienists, 15.2% of the students, and 12.5% of the dental assistants attended further training courses privately. Additionally, 50.1% of all participants reported often or always consciously paying attention to their posture, and 67.3% reported a subsequent improvement in work-related complaints. Overall, 35.8% preventively engaged in sports 2–3 times per week, with 67.7% reporting an ensuing improvement. When comparing participants with little to no sporting activity to those who exercised at least three times per week, the more active group experienced less neck (37.6%) and/or back/buttock (28.8%) problems than the less active group (43.6% and 33.6%, respectively).

Of all participants, 68.6%, had very great or great motivation to change their habits to achieve an improvement in the situation or to prevent problems in advance. In addition, a majority of participants used magnifying glasses and/or microscopes in their daily work. Overall, 81.4% of dentists, 60.6% of students, 34.6% of dental hygienists and 3.0% of dental assistants reported using these tools, while 70.5% of the dental hygienists, 61.8% of the dentists, 47.1% of the dental assistants, and 41.4% of the dental students used an ergonomic chair to improve their posture (Figure 3).



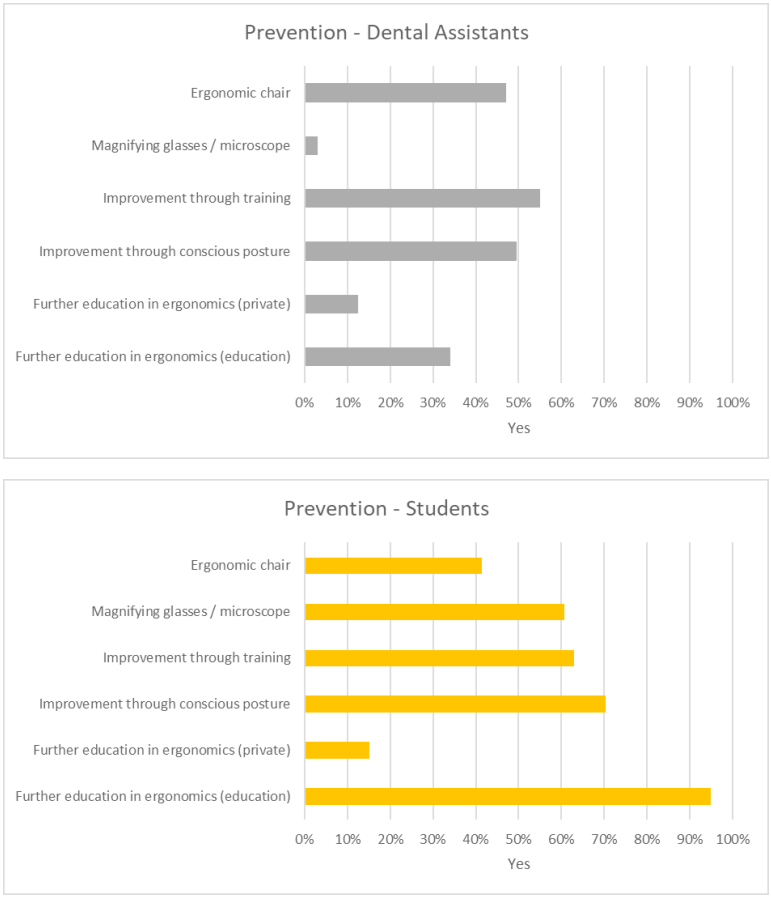


Figure 3: Use of preventive measures among dentists (a), dental hygienists (b), dental assistants (c), and dental students (d).

Discussion

The present questionnaire analyzed the frequency of self-reported musculoskeletal pain among dental professionals and demonstrated that around half of the dental assistants and hygienists, and one-third of the dentists and dental students suffer from neck and back/buttock pain. A negative impact on their lives was reported, most prominently affecting sleep, standing, lifting objects, and social life.

As the current questionnaire was distributed electronically to dentists and dental schools, a calculation of a response rate was not feasible. The different means of contact and varying availabilities of participants in each group also explain the different group sizes. As a possible limitation of this study, a selection bias may exist since participants already suffering from pain may had a greater interest in the current topic and participation.

In the current study, 47.6% of dentists, 70.7% of dental assistants and hygienists, and 51.5% of students reported experiencing pain-related problems during or after work and over 50% of all participants had visited a doctor or physiotherapist during professional activity due to pain-related complaints. Data from the previous survey from 2008 showed similar results, with almost 40% of participating dentists and 50% of dental assistants and hygienists experiencing problems during or after work, as well as over 50% of all participants reporting seeking medical help or visiting a physiotherapist [3]. While three-quarters of the participants in the 2008 analysis were male, the gender ratio had changed in the current study to three-quarters female. In both surveys, the percentage of female dentists suffering from neck and back/buttock pain was higher (38.4% and 24.9% in 2008, 42.2% and 30.5% in 2022) compared to male dentists (17.4% and 18.6% in 2008, 23.8% and 25.9% in 2022). A greater impairment with higher median pain scores for neck, shoulders, upper back, elbows, and wrists/hands was reported for female dentists compared to their male counterparts in Jeddah, Saudi Arabia [5]. In another study conducted in Saudi Arabia, 85% out of 225 members of the Saudi Dental Association reported developing pain due to work after joining the dental profession, and 42% were suffering from pain at the time of the survey. The most prominent areas affected

were the lower back, shoulders, neck, hands, and upper back, with women reporting work-related musculoskeletal disorders more often than men: 39% of all participants sought medical help due to work-related pain [6]. The increased proportion of female dentists in part explains the temporal increase in the proportion of dentists. The proportion of impaired dental assistants and hygienists did not increase in the current study compared with the 2008 analysis. Therefore, gender distribution in certain dental professions is an important factor to be considered. The majority of current dental students are female (75.2% of participating students in this study).

Dental assistants have to adapt their working posture to the dentist in charge, and could therefore be categorized as a high-risk group for musculoskeletal disorders. This assertion is corroborated by the current data, which revealed a higher percentage of dental assistants seeking medical treatments (65.7%) compared to female dentists or male dentists (both 53%; Figure 4).

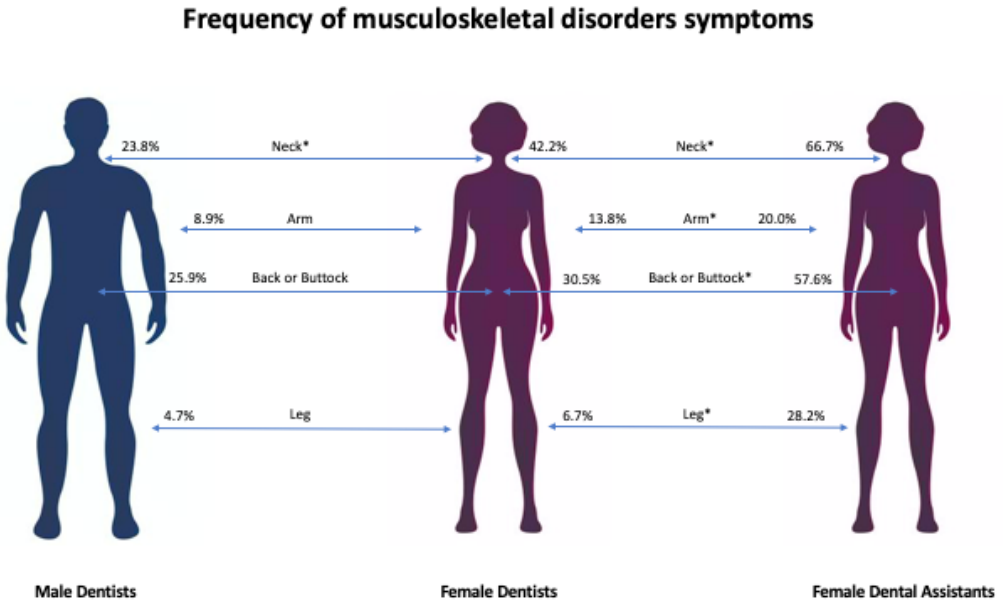


Figure 4: Frequency of symptoms of musculoskeletal disorders (Participants experiencing pain often/most of the time/always). **Note:** *Statistically significant differences at alpha set at 0.05.

In the present study, about two third of the participants reported achieving an improvement in pain by consciously maintaining a better posture, and through physical activity and training. Two-thirds of the participants were motivated to change habits to improve or to prevent pain. The observation that participants who exercised at least three times per week had less neck and/or back/buttock pain is in accordance with a survey from South Africa, in which 45.7% of the 94 participating dentists had no work-related musculoskeletal pain, but adhered to regular exercise, such as running, strength training and flexibility, with on average three sessions per week of at least 30 minutes [7]. Dental students who engaged in regular sporting activities have also been reported to have less neck pain compared with students who did not exercise regularly [8].

According to a study among dental professionals, a 10-week resistance training program resulted in a significant increase in maximum strength with a decrease in pain intensity in the neck and lower back after the fifth training unit and relief in the upper back after the tenth training unit. These results must be interpreted with caution since only 17 subjects were analyzed during a relatively short-time period of 10 weeks, with only two trainings per week, and without a control group [9]. In healthy and active individuals, skeletal muscle proteins display turnover rates of 1-2% per day, which would imply that a longer period of training is required to observe relevant changes in the musculature [10]. In a one-year randomized controlled trial investigating the effect of exercise interventions on musculoskeletal pain in all body regions among office workers, improving strength by training three times a week for 20 minutes was shown to prevent and reduce pain, and also reduced muscular imbalances that may play a critical role in pain reduction [11]. Musculoskeletal pain and discomfort arise when the postural stabilizing muscles of the trunk and shoulders become fatigued, leading to a weakening of these

muscles. Consequently, dentists may fall into poor postures, which, in turn causes musculoskeletal pain. Preventive measures based on strengthening exercises for the core and shoulders have been recommended to promote health and integrity of the vertebrae, along with maintaining a proper ergonomic posture during work [12]. Dentists who regular exercise will also optimize the function of their arms and hands, minimizing the likelihood of developing musculoskeletal pain [12]. Therefore, educating dental students as early as possible in ergonomic postures, exercises and working-aids is of significant importance [13]. In the current study, participants with additional education in ergonomics reported visiting a doctor for musculoskeletal disorders less frequently (46.1%) compared to those without further ergonomic education (60.9%).

The results of this study indicated that 58.5% of the participants incorporated dental loupes and/or microscopes into their work practices. This group reported fewer musculoskeletal problems during or after work (50.3%) compared to those not using magnification aids (63.9% with musculoskeletal discomfort). A similar survey conducted among Australian dental hygienists demonstrated that dental loupes wearers were less likely to experience musculoskeletal pain due to improved posture, working distances, and more effective muscle use with fewer side effects and less strain on muscles [14,15]. More recent data from a study among 400 dental students and dentists carried out in Jeddah, Saudi Arabia confirmed these observations, showing that users of dental loupes had significantly fewer problems in the lower back, neck, shoulders, elbows, upper back, and feet compared to non-users. Participants stated that dental loupes helped them to work more accurately, enhanced the quality of treatment, and improved vision comfort. It was suggested that dental loupes should be included as a topic in undergraduate curricula and that acquisition of dental loupes should be facilitated by subsidizing the costs, especially for dental students, since cost was the main barrier for not using dental loupes [16]. It has been suggested that future studies should focus on the evaluation of loupes with the possibility of vertical adjustment to change and maximize declination angles, which may positively affect posture and reduce musculoskeletal disorders [17].

A literature review examined various ergonomic interventions and their impact on the frequency and severity of musculoskeletal disorders and working posture among dental professionals [18]. It was documented that ergonomic dental chairs provided support for the lumbar region and helped to stabilize the natural curvature of the lower back resulting in positive changes in the working posture of dentists with reduced bending and rotation of the back and alleviated pressure on the neck and shoulders [18]. The use of prismatic spectacles was found to have positive effects on working posture and reduced the symptoms of musculoskeletal disorders among dental professionals. Specifically, prismatic glasses significantly reduced neck flexion and discomfort in the neck, back, and shoulders. Overall, 80% of participants reported that the use of prismatic spectacles improved their work, making them a suitable intervention for preventing musculoskeletal disorders and improving posture in dental professionals [19]. It was further reported that the weight and diameter of instruments (e.g. periodontal curettes) was related to muscular tension. Using light-weight and wider diameter curette handles greatly reduced symptoms of shoulder pain and the number of nights awakening with finger numbness, compared to heavier and more narrow instruments which caused more symptoms of musculoskeletal disorders [20]. When applying resistance training, the focus should be on strengthening and especially stabilizing the trunk and neck muscles, such as the transversus abdominis, multifidi, and semispinalis muscles [21]. Moreover, it is advised to train muscles in the shoulder, neck, and upper extremities to strengthen them and make them more enduring for the physical labor of the dental profession [3].

In conclusion, neck and back problems are still a significant problem in the dental profession in Switzerland, and further education for the prevention and improvement in musculoskeletal health should be implemented in the dental setting. This education about ergonomic working posture and targeted muscle training should be implemented early during the dental curricula and the education of dental assistants and hygienists. An ergonomic working posture can be supported by using a mouth mirror and dental loupes/microscopes with a fixed working distance, which prevents flexion and rotation of the cervical spine. Additionally, ergonomic chairs should be used to maintain an upright posture, straighten the pelvis, stretch the spine, and shift body weight to the legs and buttocks. Further studies comparing the different types and specifications of dental loupes, working postures and their respective effects on musculoskeletal activity are required to give more concise advice to find an optimal workplace setting.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations of Interest: None

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