Bibliographic review

Occupational disorders in dental practice: an integrative review of risk factors

Trastornos ocupacionales en la práctica odontológica: una revisión integrativa de factores de riesgo

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ABSTRACT

Introduction: Occupational diseases represent significant challenges for professionals, affecting quality of life and productivity. Among these diseases, work-related musculoskeletal disorders and repetitive strain injuries stand out, especially common among dental surgeons due to inadecuate postures.

Objectives: To determine the prevalence of musculoskeletal diseases in dental surgeons, as well as to identify the main factors influencing this occurrence.

Methods: This integrative review, conducted between June and October 2023, analyzed articles from the past ten years in the databases PubMed, Scopus, Biblioteca Brasileira de Odontologia, and Web of Science, using specific descriptors. Eligibility criteria included observational studies with a minimum sample size of 50 participants, published in peer-reviewed journals in Portuguese or English. Data analysis and collection were conducted independently by two researchers, following a standardized protocol for data extraction in integrative reviews (URSI, 2005).

Results: Recent studies highlight the high incidence of musculoskeletal pain among these professionals, emphasizing the need for ergonomic interventions and preventive practices starting from academic training.

Conclusion: The relationship between musculoskeletal disorders and quality of life indicates specific risks for dental surgeons, justifying the implementation of preventive approaches.

Keywords: dental surgeon; occupational disorders; ergonomics; occupational health

RESUMEN

Introducción: Las enfermedades ocupacionales representan desafíos significativos para los profesionales, afectando la calidad de vida y la productividad. Entre estas enfermedades, se destacan los trastornos musculoesqueléticos relacionados con el trabajo y las lesiones por esfuerzo repetitivo, especialmente comunes entre cirujanos dentistas debido a posturas inadecuadas.

Objetivos: Determinar la prevalencia de enfermedades musculoesqueléticas en cirujanos dentistas, así como identificar los principales factores que influyen en esta ocurrencia.

Métodos: En esta revisión integrativa, realizada entre junio y octubre de 2023, se revisaron artículos de los últimos diez años en las bases de datos *PubMed*, *Scopus*, *Biblioteca Brasileira de Odontologia* y *Web of Science*, utilizando descriptores específicos. Los criterios de elegibilidad incluyeron estudios observacionales con una muestra mínima de 50 participantes, publicados en revistas revisadas por pares en portugués o inglés. El análisis y la recopilación de datos se efectuaron de manera independiente por dos investigadores, conforme al protocolo estandarizado para la extracción de datos en revisiones integradoras (URSI, 2005).

Resultados: Estudios recientes destacan la alta incidencia de dolor musculoesquelético entre estos profesionales, reforzando la necesidad de intervenciones ergonómicas y prácticas preventivas desde la formación académica.

Conclusión: La relación entre los trastornos musculoesqueléticos y la calidad de vida indica riesgos específicos para los cirujanos dentistas, justificando la implementación de enfoques preventivos.

Palabras clave: cirujano dentista; trastornos ocupacionales; ergonomía; salud ocupacional

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Introduction

Occupational diseases can affect professionals in different fields in different ways, depending on the characteristics of risk exposure inherent to each work activity.[1] In the long term, they can affect the quality of life of professionals, reducing productivity, reducing work productivity, increasing absenteeism, causing

disabilities and posing a challenge to public health.[2,3] The determinants of occupational health include social, economic, technological, and organizational factors that influence living conditions and occupational hazards in work processes.[4] Among occupational diseases, work-related musculoskeletal disorders (WR-MSDs) and repetitive strain injuries (RSIs) are highly prevalent health problems, which often require health care services and have an impact on employment and social security due to temporary or permanent incapacity for work.[5,6]

Work-related musculoskeletal disorders (MSDs) have a complex multifactorial etiology, resulting from an imbalance between the demands of the job and individual functional abilities. These disorders result from musculoskeletal overload due to the overuse of specific muscle groups in repetitive movements, with or without localized effort, or from holding body segments in specific positions for prolonged periods, especially when these positions require muscular endurance against gravity.[7,8]

These disorders are characterized by various symptoms that can occur simultaneously or in isolation, such as pain, paresthesias, heaviness in the legs, and fatigue. In addition, well-defined neuroorthopedic conditions such as tenosynovitis, synovitis, and peripheral nerve compression may also be present. Often, multiple neuroorthopedic conditions coexist in the same individual, which present as diffuse symptoms or as localized clinical conditions from the anatomical and/or pathophysiological point of view.[9,10] During work activities, dental surgeons frequently adopt kyphotic and static postures, keeping the neck flexed for prolonged periods.[11,12] The work area, usually located below the dentist's line of sight, causes the head to tilt forward and the shoulders to round, which can weaken and lengthen the scapular muscles (trapezius, levator scapula, rhomboid major/minor, serrates anterior and pectorals minor).[13]

Inappropriate posture causes misalignment of the joints, with the consequent wear or degeneration of the affected area, together with compensatory muscle tension, such as contracture or strain.[14] Occupational musculoskeletal disorders have reached worrying proportions; In addition, some anomalies are difficult to treat, becoming recurrent as professionals return to work.[15]

Risk factors are not necessarily the direct causes of RSIs/MSDs, but they can trigger responses that lead to injury or disorders.[16] These factors involve biomechanical, cognitive, sensory, affective, and work organization aspects. For example, organizational factors such as workload and rest breaks can control risk factors in terms of frequency and intensity.[17,18] Interventions in working environments and conditions should be based on a thorough and critical analysis of the organization of work, including an ergonomic analysis of actual work, activities, content of tasks, operating modes, workstations, work pace and intensity, physical and mechanical factors in the workplaces, production norms, shift systems, psychosocial and individual factors, and workplace relationships,[19,20] Prevention of musculoskeletal disorders requires ergonomic organization of the work

environment, proper posture, and the inclusion of breaks during procedures.[21] The repercussions of these conditions can lead to limitations in dental practice and absences from work, highlighting prevention as an essential element in this context.[22]

This research aims to conduct an integrative literature review on the frequency of musculoskeletal diseases among dental surgeons and the main elements that influence this occurrence.

Methods

This integrative literature review was carried out between June and October 2023. To guide this study, we asked the following question: What is the prevalence of musculoskeletal disorders among dental surgeons, and what are the main factors contributing to this incidence?

The methodology consisted of searching for studies in the PubMed, Scopus, Odontology Brazilian Library and Web of Science databases, limiting the search to articles published in the last ten years. Specific descriptors and terms used in the literature were applied, such as "musculoskeletal disorders" (MSDs), "work-related MSDs", "ergonomics", "ergonomic interventions", "dentists", "dental professionals" and "dentistry". Appropriate truncation characters and Boolean operators, such as AND / OR, were used to broaden the scope of the search. Due to the specific characteristics of access to the selected databases, the search strategies were adapted to each of them, taking into account the available tools, such as descriptors, MESH terms and keywords.

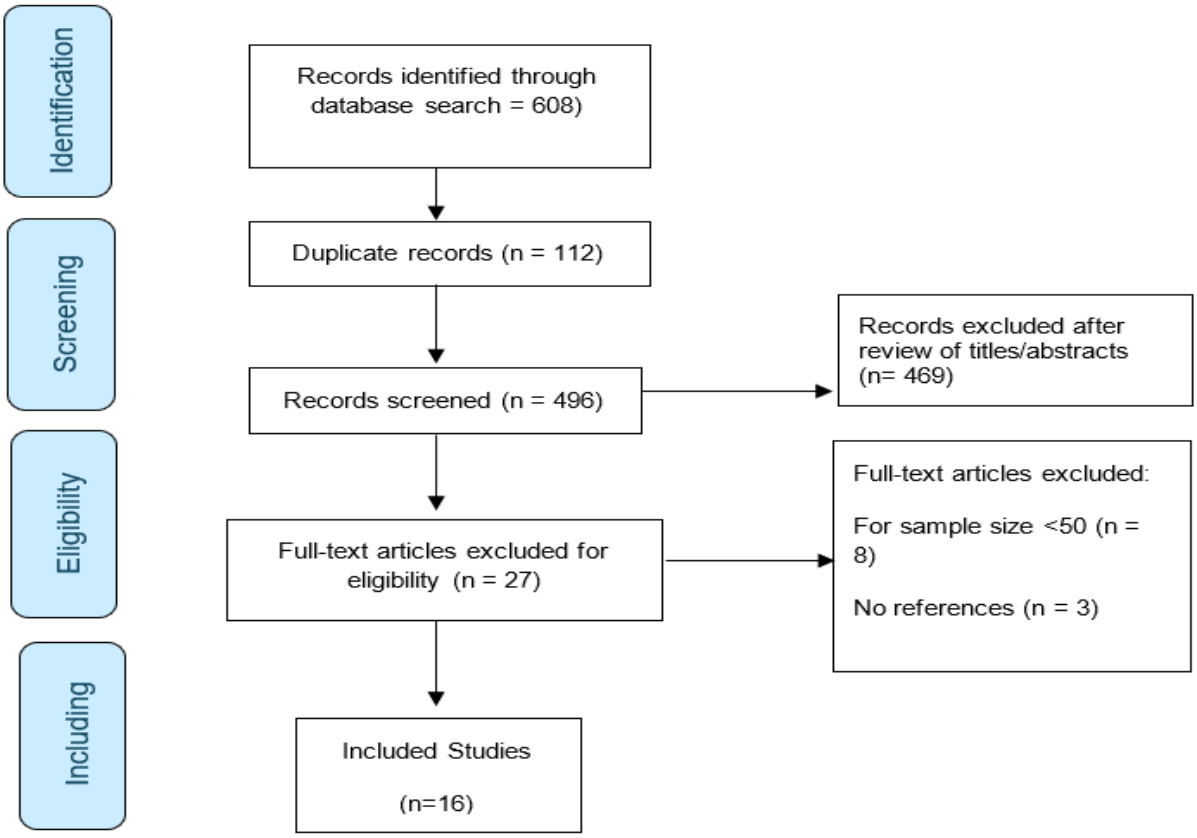
Eligibility criteria for study selection, including study sample, exposure, study design, and outcomes, were specifically established. Participants in the studies analyzed were dental professionals working in general oral health facilities, including dental surgeons, assistants, technicians and dental students. No restrictions were imposed on age, sex, race or socioeconomic status. The exposure considered was occupation in the dental field, and studies were eligible if they investigated prevalence rates and/or occupational risk factors related to musculoskeletal disorders. We included observational studies, such as cross-sectional studies (analysing prevalence), retrospective and prospective cohort studies, and case-control studies, provided they were available in peer-reviewed journals and fully accessible in Portuguese or English.

The exclusion of studies prior to 2013 allowed an updated view of knowledge on the subject, focusing on research.

Results

Data analysis and extraction were performed independently by two authors, following a standardized protocol for data extraction in integrative reviews (URSI 2005). The search strategy initially identified a total of 608 titles, and during the screening process 112 duplicate titles were identified and excluded. Thus, after reading the titles and/or abstracts and applying the inclusion criteria, 469 articles were eliminated because they were outside the scope of this bibliographic review. Reasons for exclusion included the absence of measures of the prevalence of musculoskeletal disorders among dental surgeons or of possible risk factors, articles that did not fit the objectives of the research or that were literature reviews, as well as the lack of bibliographic references in the manuscripts analyzed.

After applying the inclusion criteria, 27 potentially relevant articles were selected, which were analyzed in their entirety by reading the full text. Sixteen of these articles were considered appropriate and included in this integrative review, as shown in Figure 1. Relevant information on the characteristics of the study, its design, and the population of articles studied, including sample size, prevalence rates, and risk estimates, as well as the results were collected and organized using Microsoft Excel, 2016 version as shown in Table 1.



Source: Self elaboration.

Fig. 1 Search Strategy Flowchart.

Table 1 - Main Findings

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
Dhanya Muralidharan, Nusrath Fareed, M. Shanthi, Epidemiology Research International	2013	Musculoskeletal Disorders among Dental Practitioners: Does It Affect Practice?	India	Analyze the prevalence and distribution of Musculoskeletal Disorders among dental professionals	Descriptive cross-sectional study, using the standardized version of the Nordic Musculoskeletal Questionnaire (NMQ)	n=73 Dentists	78% of professionals reported having at least one musculoskeletal disorder symptom in the last twelve months. The most affected areas were the neck (52%), lower back (41%), shoulders (29%), and wrists (26%). Three-quarters of professionals reported symptoms in more than one body area.	High incidence of Musculoskeletal Disorders highlights the urgency of investigating specific risk factors. The lack of ergonomically oriented work practices may contribute, but further studies are required for definitive conclusions.
Melanie J Hayes, Derek R Smith, Jane A Taylor, BMC Research Notes	2013	Musculoskeletal disorders and symptom severity among Australian dental hygienists	Australia	Investigate the prevalence of Musculoskeletal Disorders and symptom severity among Australian dental hygienists	Descriptive cross-sectional study, using a modified version of the Nordic Musculoskeletal Questionnaire (NMQ)	n=560 Hygienists	More than two-thirds reported musculoskeletal symptoms in the neck, shoulders, and lower back over the past year. In the lower extremities, pain was reported by less than	Musculoskeletal Disorders are common among dental professionals in Australia, impacting daily routines. This study underscores the need for initiatives

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
							17% of participants.	aimed at promoting occupational health and quality of life.
Garbin et al, Revista Dor	2015	Musculoskeletal pain and ergonomic aspects of dentistry	Brazil	Verify the prevalence of musculoskeletal pain and observe if the work of dentists is performed ergonomically	Descriptive cross-sectional study, using images captured during dental care and NMQ	n=80 Dentists	65.67% of dentists reported occupational pain/injury. Public sector workers had higher absence rates due to pain (64%) compared to private sector (18%). Posture during care often caused pain.	High incidence of musculoskeletal pain associated with inappropriate postures and long working hours highlights the need for further investigation into preventive and management strategies.
Rafie et al, Journal of Environmental and Public Health	2015	Prevalence of Upper Extremity Musculoskeletal Disorders in Dentists: Symptoms and Risk Factors	Iran	Analyze the relationship between posture and musculoskeletal pain in dentists' upper extremities	Descriptive cross-sectional study, using NMQ and Rapid Upper Limb Assessment (RULA)	n=130 Dentists	RULA assessment indicated 57% needed ergonomic improvements and 24.8% required immediate changes. High prevalence areas: neck (55.9%), shoulders (43.8%), lower back (39.2%), wrists (34.5%).	Significant prevalence of pain and high risk per RULA suggests inadequate postural habits. Study proposes an intervention program focusing on ergonomics and regular exercises to

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
								reduce symptoms.
Saliba et al. Revista Dor	2016	Work-related musculoskeletal disorders among dentists and quality of life	Brazil	Examine the occurrence of work-related musculoskeletal disorders and painful symptoms and their relation to quality of life among dentists	Descriptive cross-sectional study, using NMQ and WHO Quality of Life (WHOQOL-bref)	n=64 Dentists	49.2% experienced neck and cervical pain, 40% lower back pain. 54.7% worked more than 8 hours daily, 50% exercised twice a week. Pain correlated with lower quality of life.	Findings highlight the need for preventive approaches like ergonomic reform and physical exercise. Quality of life impact underlines the importance of workplace health interventions.
Al-Mohrej et al. BMJ Open	2016	Prevalence of musculoskeletal pain in dentists in Riyadh, Saudi Arabia	Saudi Arabia	Estimate the prevalence of musculoskeletal disorders among dentists and identify common risk factors	Descriptive cross-sectional study, using an adapted version of NMQ	n=204 Dentists	90.2% reported musculoskeletal pain; lower back was the most affected (68.1%). 12% took sick leave, but only 3.8% sought medical help.	High prevalence of musculoskeletal pain among dentists suggests a need for improved ergonomics in clinics and highlights the importance of targeted interventions to reduce pain severity.

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
Cho et al. The Journal of Physical Therapy Science	2016	Risk factors associated with musculoskeletal symptoms in Korean dental practitioners	South Korea	Assess the severity of musculoskeletal symptoms among dental professionals and analyze risk factors	Descriptive cross-sectional study, using NMQ, Korean Occupational Stress Scale, and Psychosocial Well-Being Index	n=88 Dentists and 313 Dental Assistants	86.8% reported musculoskeletal pain, mostly in shoulders (72.8%), neck (69.3%), lower back (68.3%). Pain severity correlated with physical workload and psychosocial stress.	High prevalence of musculoskeletal pain with multiple anatomical regions affected. Emphasizes need for preventive strategies to preserve health and improve working conditions in dentistry.
Freire et al. Revista Dor	2017	Musculoskeletal disorders and disability in dentists in São Paulo	Brazil	Investigate the prevalence of musculoskeletal disorders and their correlation with work-related disability among dental professionals	Descriptive cross-sectional study, using NMQ and Pain Disability Questionnaire (PDQ)	n=94 Dentists	90.4% reported work-related musculoskeletal disorders. Neck, lower back, and upper back were the most affected areas. 69.1% reported "moderate" work disability.	Highlights the importance of considering risk factors such as poor posture, long hours, and psychosocial stress. Suggests preventive interventions to improve occupational health.
Pejčić et al. IOS Press	2017	Assessment of risk factors and preventive	Serbia	Identify and assess risk factors for	Descriptive cross-sectional study, using the	n=356 Dentists	82.6% reported work-related musculoskeletal pain,	Results indicate general health and workload

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		measures for musculoskeletal pain in dentists		musculoskeletal pain in dental practice and establish effective preventive measures	standardized version of NMQ		with neck (49.5%) and lower back (46%) most affected. Physical activity was protective, while lack of breaks and chronic diseases increased risk.	organization influence musculoskeletal pain. Experienced professionals, especially women with chronic conditions, showed higher risk.
Garbin et al. International Journal of Occupational Medicine and Environmental Health	2017	Musculoskeletal disorders and perception of working conditions: A survey of Brazilian dentists in São Paulo	Brazil	Examine the frequency of Work-Related Musculoskeletal Disorders among public-sector dentists in São Paulo, Brazil	Descriptive cross-sectional study, using NMQ and PDQ	n=204 Dentists	63.7% worked over 8 hours without breaks. 81.4% reported pain in the last year, mainly in neck, shoulders, and upper back. 50.5% sought medical treatment. 75.9% experienced "moderate" disability.	Findings highlight high prevalence of musculoskeletal disorders affecting neck, shoulders, back, and wrists/hands. Awareness of risk factors increased among those with pain, suggesting experience influences perception.
Šćepanović et al. Workplace Health &	2019	The Prevalence of Musculoskeletal	Slovenia	Investigate musculoskeletal pain frequency,	Descriptive cross-sectional study, using	n=87 Dentists, Hygienists,	79.8% reported musculoskeletal disorders, with neck	High prevalence of musculoskeletal pain among dental

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
Safety		Pain of Dental Workers Employed in Slovenia		affected regions, and associated risk factors among dental professionals	adapted NMQ and Cornell MS Discomfort Questionnaire	and Assistants	(60.71%) and back (52.38%) as most affected. Women reported higher frequency of pain (82.8% vs. 68.4% for men).	professionals without significant correlation to posture or physical activity. Recommends preventive programs in dental education.
Meisha et al. Clinical, Cosmetic and Investigational Dentistry	2019	Prevalence of work-related musculoskeletal disorders and ergonomic practice among dentists in Jeddah, Saudi Arabia	Saudi Arabia	Evaluate the prevalence of work-related musculoskeletal disorders and identify associated ergonomic practices among dentists	Descriptive cross-sectional study, using adapted NMQ and Numeric Pain Scale	n=234 Dentists	70% reported work-related musculoskeletal disorders. Main affected areas: lower back (85%), neck (84.6%), shoulders (81.2%). Regular exercise reduced the likelihood of disorders.	High prevalence of musculoskeletal disorders, especially among women and those with poor ergonomic practices. Findings highlight the importance of ergonomic awareness and physical exercise in prevention.
Kumar M; Pai K; Vineetha R, Medicine	2020	Occupation-related musculoskeletal	India	Determine the prevalence of musculoskeletal	Descriptive cross-sectional study, using	n=151 Dentists from various	58.3% reported musculoskeletal disorders in the last	Increasing prevalence of musculoskeletal

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
and Pharmacy Reports		disorders among dental professionals		disorders among dental professionals and assess their ergonomic awareness	adapted NMQ	specialties	12 months. Neck (66.7%) and lower back (52.9%) were most affected. 33.11% reported pain in multiple sites.	disorders among dentists, especially endodontists. Highlights importance of posture and regular breaks to reduce risks.
Ohlendorf et al. International Journal of Environmental Research and Public Health	2020	Prevalence of Musculoskeletal Disorders among Dentists and Dental Students in Germany	Germany	Provide an update on the prevalence of musculoskeletal disorders among dentists and identify gender differences	Descriptive cross-sectional study, using adapted NMQ	n=450 Dentists and Dental Students	95.8% reported musculoskeletal pain in their careers; 92% in the last year. Main affected areas: neck (78.4%), shoulders (66.2%), lower back (58.7%).	Consistent prevalence of pain, especially among women. Highlights need for ergonomic habits in daily routine to promote occupational health.
Rickert et al. Risk Management and Healthcare Policy	2021	Prevalence of Musculoskeletal Diseases of the Upper Extremity Among Dental Professionals in Germany	Germany	Provide additional information on the prevalence and risk factors of upper extremity musculoskeletal disorders	Descriptive cross-sectional study, using adapted NMQ and DASH	n=229 Dentists	92.6% reported musculoskeletal symptoms, mainly neck (65.1%) and shoulders (58.1%). Symptoms increased with age, reaching 98.7% for professionals aged	Findings suggest that pain, physical workload, comorbidities, and female gender are risk factors. Recommends ergonomic workplace design

Authors and Journal	Year of Publication	Article Title	Country	Objective	Study Type and Method	Sample	Main Results	Conclusion
							51-65.	and training for neck and shoulder muscle strengthening.
Macrì et al. Frontiers in Public Health	2023	Interpreting the prevalence of musculoskeletal pain impacting Italian and Peruvian dentists likewise: A cross-sectional study	Italy	Describe the prevalence of musculoskeletal pain and its relationship with environmental conditions, lifestyle, and medication use	Descriptive cross-sectional study, using adapted NMQ	n=187 Dentists	87.2% of Italian dentists and 91.4% of Peruvian dentists reported musculoskeletal pain in the last year. Main affected areas: neck (60%), lower back (52.1%), shoulders (43.3%).	Highlights need for ergonomic practices and awareness programs to prevent musculoskeletal overload among dentists. Pain prevalence emphasizes urgency of preventive measures.

Source: Self elaboration.

Discussion

The analysis of the prevalence of musculoskeletal disorders among dental professionals around the world raises great concerns about the occupational health of these workers. Studies seek to deepen the understanding of the relationship between dentists' working conditions and their impact on physical health, focusing on work-related musculoskeletal disorders (WR-MSDs).[23,24] The existing literature highlights that the prevalence of these disorders ranges from 64 to 93% in this occupational category. In particular, frequent complaints of back pain (with a prevalence ranging from 36.3 to 60.1%) and neck pain (with rates ranging from 19.8 to 85%) are critical aspects to explore.[25]

In India, Dhanya Muralidharan et al. identified a high prevalence of these disorders, affecting more than one-third of dental surgeons. Their results show that 78% of professionals reported at least one symptom of musculoskeletal disorder in the last twelve months, with the most affected areas being the neck (52%), the lumbar region (41%), the shoulders (29%) and the wrists (26%).[26] Factors such as the general health status of dentists and workload organization significantly influence the manifestation of musculoskeletal pain, underlining the need to identify specific risk factors and the importance of ergonomically oriented work practices.[27]

In a systematic review, Hayes and others found similar results: more than two-thirds of Australian dentists reported having suffered musculoskeletal disorders in the neck, shoulders and lower back in the past 12 months. Among those affected, 36% (wrist/hand) and 67% (hips/thighs) required medical treatment, underscoring the impact of these disorders on daily activities and the demand for medical care.[28]

When addressing signs and symptoms associated with pain and musculoskeletal disorders in dental practice, Garbin et al. reported that 65.67% of dental surgeons indicated occupational pain or injuries. In the public sector, absenteeism rates due to pain/injury were significantly higher (64%) compared to the private sector (18%), often associated with improper posture during clinical care, underscoring the need for ergonomic practices.[29]

Regarding the frequency of work-related musculoskeletal disorders among dentists working in public clinics in São Paulo, Brazil, the results revealed a high prevalence of musculoskeletal disorders, mainly in the neck, shoulders, spine, and wrists/hands. In particular, dentists who reported pain demonstrated increased knowledge of risk factors, underscoring the importance of preventive measures and awareness in the dental context. (30)

Examining the incidence of musculoskeletal disorders among dental surgeons in São Paulo, Brazil, Freire et al. identified a high prevalence of musculoskeletal pain, with the upper and lower back regions being the most Exploring the relationship between posture and musculoskeletal pain in the upper extremities of dental surgeons, Rafie et al. revealed a high frequency of pain and elevated levels of risk, with most dental surgeons reporting neck and shoulder pain at least once in the past year, consistent with previous research.[32] In Saudi Arabia, Al-Mohrej et al. estimated that nine out of ten dental professionals experienced musculoskeletal pain. In a study by Meisha et al. the prevalence of musculoskeletal disorders was 70% among dentists, with the lower back (85%) and neck (84.6%) being the most common pain points. These results indicate the need for interventions focused on ergonomic practices and regular exercise to reduce these disorders.[33]

Focusing on quality of life, Saliba et al. studied the correlation between musculoskeletal disorders and quality of life among dental surgeons. The results showed that 49.2% of the professionals experienced neck and spine pain, which significantly affected their quality of life. Preventive measures, such as workplace exercises and ergonomic adjustments, were identified as essential to reduce stress and prevent pain symptoms and musculoskeletal disorders.[34] Studies indicate that dentists are at increased risk of carpal tunnel syndrome (CTS) due to frequent wrist movements, which lead to inflammation of the flexor tendons and compression of the median nerve. Other disorders frequently observed among dental surgeons are muscle pain, headaches, visual disturbances, poor circulation, shoulder and elbow bursitis, tendonitis, spinal problems such as kyphoscoliosis, cervical, thoracic and lumbar alterations, as well as asymmetry in the height of the shoulders.[36,37]

Ergonomics aims to mitigate these risks and detrimental factors, minimizing the frequency of pathological conditions and their adverse impacts, while improving the relationship with the posture and work environment of dental professionals.[29]

Conclusion

The significant incidence of pain and injury, especially in areas such as the neck, lower back, shoulders and wrists, underscores the urgent need for ergonomic practices from the early stages of academic training to professional practice, as they are essential to mitigate the impacts of these disorders. In addition, strategies such as regular physical exercise and awareness of occupational risks are essential to promote occupational health in dentistry.

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Conflict of interest

Authors declare to have not conflict of interest.

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