Prevalence and Impact of Work-Related Musculoskeletal Disorders Among Dental Students in Iran: A Systematic Review and Meta-Analysis

Fahimeh Feili[1,2], Mohamad Ali Roozegar [1,2*], Aminollah Vasigh[3]

Abstract

Background: For medical students, maintaining physical health is crucial for effective practice, but these students are often exposed to both physical and mental health challenges, including work-related musculoskeletal disorders (WMSDs). Dental students are particularly vulnerable due to the physically demanding nature of their training, which involves repetitive movements, heavy workloads, and inadequate rest breaks. These disorders can lead to chronic pain, impairing quality of life and professional productivity. Methods: This systematic review and meta-analysis examined the prevalence of WMSDs among dental students in Iran. Searches were conducted in several domestic and international databases, and articles published between 2000 and 2024 were included if they reported data on the prevalence of musculoskeletal pain in dental students. A total of 289 articles were initially identified, with 4 meeting the inclusion criteria. Data were extracted and analyzed using Comprehensive Meta-Analysis (CMA) software to evaluate WMSD prevalence rates. Results: The meta-analysis revealed that 22.6% of dental students experienced back pain, 38.8% had neck pain, 25.2% reported shoulder pain, and 15.2% experienced hand/elbow pain. Overall, 72.0% of dental students reported pain in at least one part of the body. These findings align with similar global studies, with variations in prevalence possibly due to differences in sample sizes, study designs, and geographical factors. Conclusion: The study highlights a high prevalence of musculoskeletal disorders, particularly in the neck, back, and shoulders, among dental students in Iran. The findings underscore the need for preventive interventions focused on improving ergonomics and occupational health to reduce the risk of WMSDs and enhance the well-being of dental students.

Keywords: Musculoskeletal disorders, dental students, prevalence, ergonomics, systematic review

Significance | This study determined the high prevalence of musculoskeletal disorders among dental students in Iran, urging the need for preventive ergonomic interventions.

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Editor Mohammed Khadeer Ahamed Basheer, Ph.D., And accepted by the Editorial Board October 23, 2024 (received for review July 15, 2024)

Introduction

The primary objective of universities is to educate and prepare skilled personnel essential to societal needs, while also advancing knowledge, expanding research, and fostering a supportive environment for national development (SeyyedMajidi et al., 2016). To meet this mission, universities must cultivate a capable and resilient workforce, particularly in fields such as medicine, where physical health is fundamental for effective practice (Harrison et al., 2016; Kang & Yu, 2014; Uraz et al., 2013). Given the demanding nature of medical professions, medical students face heightened exposure to both physical and mental health challenges. These challenges often lead to severe consequences, such as burnout, suicide, dropout, and job resignation due to the psychological and

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Please Cite This:
Fahimeh Feili, Mohamad Ali Roozegar, Aminollah Vasigh (2024). "Prevalence and Impact of Work-Related Musculoskeletal Disorders Among Dental Students in Iran: A Systematic Review and Meta-Analysis", Journal of Angiotherapy, 8(10),1-5,9981

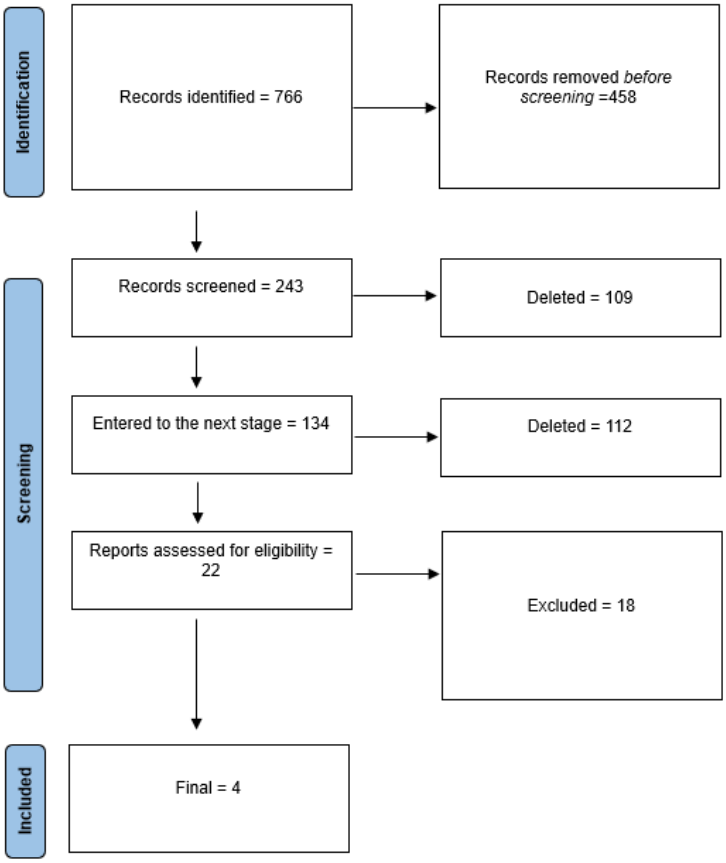

Figure 1. Articles included in the study

Table 1. Specifications of the articles

-	Reference	Author	Years	Place	Age	N	back	Neck	Shoulder	hand / elbow	at least one part of their body
1	(27)	Aghahi	2018	Kerman	-	199	-	-	-	23	69
2	(16)	Ziaeefar	2024	Tehran	27.30(2.44)	108	36.1	45.4	25	5.6	78.7
3	(28)	Movahhed	2013	Mashhad	23.63(2.99)	177	15.8	41.8	46.9	18.65	-
4	(29)	Burhan	2008	Ghazvin	24.8	70	18.6	27.1	10	-	68.6

physical strain associated with their studies and future work (Keyes et al., 2012; Eskin et al., 2016; Aboalshamat et al., 2017). Maintaining health in medical students is crucial, as any professional-related health issue can reduce their satisfaction with their studies and anticipated career, ultimately impacting their ability to deliver quality care to patients (Ayub et al., 2024; Hopcraft et al., 2023). Among the prevalent health issues faced by medical and dental students are work-related musculoskeletal disorders (WMSDs), which are impairments affecting the musculoskeletal system that interfere with daily functioning. WMSDs encompass disorders in muscles, bones, joints, nerves, and blood vessels, contributing to pain, disability, decreased productivity, absenteeism, and increased costs for individuals and employers (Plante et al., 2024; Besharati et al., 2020; Kinaci & Ataoğlu, 2020).

WMSDs result from various factors, including age, genetic predisposition, and poor ergonomic practices. Dental students, in particular, are at a high risk of developing WMSDs due to the physically intensive nature of their practical training, which often involves repetitive movements, heavy workloads, and inadequate rest breaks (Greggi et al., 2024; Rashidi Maybodi & Mehrparvar, 2017; Shams-Hosseini et al., 2017). The chronic pain associated with WMSDs can significantly impair quality of life and has been reported in multiple body regions, including the back, neck, shoulders, arms, and even as headaches (Mohammadi et al., 2024; Mohammadi et al., 2024; Ghiasi et al., 2024; Vasigh et al., 2018; Hatefi et al., 2019; Bastani et al., 2024; Karimiyarandi & Khalilizad, 2023).

Given the serious impact of WMSDs on health and professional productivity, understanding the prevalence, causes, and contributing factors of these disorders is essential for developing targeted interventions. To contribute to this understanding, the present study aims to analyze the prevalence of WMSDs among dental students in Iran through a systematic review and meta-analysis (Komlakh et al., 2024; Sadeghi & Mohammadi, 2023; Darabi et al., 2023). This approach will help provide a clearer picture of the scope of WMSDs and inform strategies for improving ergonomic practices and supporting the physical well-being of future dental professionals.

2. Methodology

This systematic review and meta-analysis focused on the prevalence of work-related musculoskeletal disorders (WMSDs) among dental students in Iran. The study employed specialized keywords, including “student,” “dental student,” “pain,” “musculoskeletal disorders,” “prevalence,” “disease,” “work-related musculoskeletal disorders,” “Iran,” and “medical science student.” Searches were conducted across both domestic Iranian and international databases, including Scopus, PubMed, ISI, Science Direct, EBSCO, and Google Scholar, utilizing Boolean operators (AND, OR, NOT) to refine the search strategy.

Articles published between 2000 and 2024 were included, provided they met the following criteria: (1) focused on dental students in Iran, (2) had abstracts or full texts available in English or Farsi, and (3) reported data on the prevalence of musculoskeletal pain in at least one body part (e.g., back, neck, shoulder, hand/elbow) or specifically WMSDs. The initial search retrieved articles with relevant titles and abstracts, from which duplicates were removed (Figure 1).

The data extraction process involved gathering relevant information from each article based on the inclusion criteria. These articles were then imported into EndNote X software for organization and deduplication. Finally, statistical analysis was performed using Comprehensive Meta-Analysis (CMA) software, enabling a systematic evaluation of WMSD prevalence rates among the targeted population.

3. Results and Discussion

The initial search identified 289 articles related to pain in dental and medical students, from which 4 articles met the final inclusion criteria for analysis (Table 1). The meta-analysis results revealed that back pain prevalence among dental students was 22.6% [CI=12.2-38.1], neck pain was 38.8% [CI=29.8-48.6], shoulder pain was 25.2% [CI=10.5-49.1], and hand/elbow pain was 15.2% [CI=8.4-26.0]. Notably, pain reported in at least one part of the body was 72.0% [CI=65.1-78.0] (Fig. 2-Fig. 10).

Pain is a multifaceted experience that can result from various factors, including occupational strain, and significantly impacts individuals' physical, emotional, and social well-being. Due to the high prevalence of pain among dental students observed in this study, understanding the nature and extent of musculoskeletal disorders (MSDs) in this population is crucial. The findings underscore the widespread issue of MSDs among dental students in Iran and align with similar reports worldwide.

In this meta-analysis, back pain prevalence in dental students was found to be 22.6%, consistent with global research but somewhat lower than findings by Viratelle et al., who reported a 48.4% prevalence among dental studentsudies show variation, with Dajpratham et al. noting a 28.4% prevalence of upper back pain and 54.1% for lower back among dental assistants , and Hod. reporting lower back pain prevalence of 49.3% among dentistry students . This discrepancy on differences in sample sizes, study designs, and geographic variations.

Neck pain prevalence in this study was 38.8%, which is similar to other reports, such as Syeda Batool et al.'s findings of 32%
among dental students . However, other studies, incby Vijay et al., found higher rates, with neck pain prevalence of 58% in female and 37% in male dental students . Variability in prevalence rates may bd

to the diverse physical demands and ergonomic factors in dental training across institutions.

The prevalence of pain in at least one body part was notably high at 72%, reflecting trends in international studies. For instance, Felemban et al. reported a 91.2% prevalence of musculoskeletal pain among Saudi dental students over the past year. Similarly, Madaan et al. observed that 81% of dnts experienced pain . The widespread pain reported across studies underscores t targeted ergonomic and occupational health interventions to alleviate pain and enhance student well-being.

4. Conclusion

The findings indicate a high prevalence of MSDs among Iranian dental students, particularly in the neck, back, and shoulders. These results emphasize the need for preventive training in occupational health and ergonomics to mitigate MSD risks in this population.

Author contributions

F.F. contributed to the conceptualization of the study and data collection. M.A.R. supervised the research, guided the methodology, and served as the corresponding author. A.V. performed data analysis and contributed to drafting and reviewing the manuscript.

Acknowledgment

The authors were grateful to their department.

Competing financial interests

The authors have no conflict of interest.

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