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Prevalence of musculoskeletal pain in dental professionals - A questionnaire based cross sectional study

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Abstract
Introduction: Musculoskeletal pain is a common occupational issue among dental professionals due to prolonged static postures and repetitive movements during patient care, leading to pain and reduced productivity.
Aim: This study examines the prevalence of musculoskeletal pain among dental interns, postgraduate students, and faculty at CSMSS Dental College, focusing on contributing factors and the impact of ergonomic training.
Materials and Method: A study was conducted among 150 participants to assess the prevalence of musculoskeletal pain, the affected regions, and contributing factors such as poor ergonomics and prolonged postures. The role of ergonomic education in alleviating pain was also examined. Various statistical tests, including chi-square tests, Analysis of Variance (ANOVA), and Kruskal-Wallis tests, were applied to analyze the significance of different ergonomic factors in relation to the occurrence of musculoskeletal pain.
Results: A total of 92.65% of participants reported experiencing musculoskeletal pain, with the lower and upper back being the most commonly affected areas (37.33%)**.**Common causes included prolonged posture and improper positioning. Although 71.33% had ergonomic training, many did not consistently apply it.
Conclusion: Musculoskeletal pain is prevalent among dental professionals, highlighting the need for better ergonomic practices and regular training to reduce long-term risks.

Keywords: Musculoskeletal pain, dental professionals, musculoskeletal disorders (MSDs), ergonomic issues, postural discomfort, occupational health in dentistry

Introduction

Musculoskeletal pain refers to discomfort or injury affecting the muscles, tendons, ligaments, bones, and nerves. This pain frequently arises from repetitive movements, poor posture, and physical strain, particularly in occupations that demand prolonged static positions and repetitive tasks. Dental professionals are especially susceptible to musculoskeletal pain due to the physical demands of their work. Dentists often perform hand-intensive procedures while leaning over patients in awkward postures for extended periods, leading to significant strain on the neck, shoulders, back, wrists, and hands [1]. This repeated strain places dental professionals at high risk for developing musculoskeletal disorders (MSDs), which, if untreated, can result in chronic pain and disability [2].

Several studies have documented the widespread prevalence of musculoskeletal pain among dental professionals. A systematic review by Leggat and Smith (2007) found that most dentists experience musculoskeletal discomfort at some point in their careers, with the lower back, neck, and shoulders being the most commonly affected areas [3].

Similarly, Al Wazzan *et al*. (2001) [4] reported that over 70% of dental professionals experienced musculoskeletal symptoms, particularly in the back and neck, largely due to poor ergonomic setups that force dental workers into awkward, static positions [4].

Research has consistently demonstrated that musculoskeletal pain is highly prevalent in the dental profession, and the consequences of untreated musculoskeletal pain are wide-ranging and can severely affect both individuals and the healthcare system. Chronic pain may lead to decreased productivity, absenteeism, and even early retirement in severe cases [5].

Bernard *et al*. (1997) [6] noted that dental professionals are particularly vulnerable to MSDs due to the combination of static postures and repetitive hand movements [6]. Additionally, Mulimani *et al*. (2018) [7] highlighted the link between poor ergonomics and increased musculoskeletal pain, emphasizing that dental professionals are at risk due to the physical demands of their occupation [7].

For instance, Rundcrantz *et al*. (1990) found that nearly 87% of dentists report experiencing musculoskeletal discomfort during their careers, with the lower back, neck, and shoulders being the most affected areas [8]. This aligns with Alexopoulos *et al*. (2004) [9], who emphasized that repetitive tasks and poor ergonomic conditions are the primary contributors to MSDs among dentists [9]. The Journal of Occupational Health has also highlighted that improper working postures and insufficient ergonomic interventions significantly increase the risk of these disorders [1].

Another important aspect of ergonomics in dentistry is its role in dental education. Pejčić *et al*. (2020) studied musculoskeletal pain among dental students and highlighted that over 81% of students experienced musculoskeletal pain during their training [10]. This study suggests that ergonomic education should be introduced at the preclinical stages of dental training to prevent the development of chronic MSDs later in their careers [10].

The physical demands of dental practice can have serious health consequences, affecting both the quality of life and job performance of professionals.Without timely

intervention, the condition can worsen over time, potentially resulting in permanent disability [11].

Anshasi *et al*. (2022) [12] implemented an ergonomic improvement project in a dental clinic using Kotter's change management model. The project reduced sick leave from musculoskeletal disorders by promoting ergonomic awareness and engaging staff in ergonomic practices [12]. The study emphasized that continuous ergonomic adjustments in the workplace are crucial for mitigating the physical strain on dental professionals.

Musculoskeletal pain is common among dental professionals and can have serious long-term health and career consequences. Recent research highlights the importance of ergonomic interventions, such as proper posture, ergonomic tools, and early education, to prevent these disorders. Incorporating these strategies into daily practice and dental education is essential to safeguarding professionals' well-being.

This cross-sectional study uses a questionnaire to assess the prevalence and causes of musculoskeletal pain in dental professionals and examines the role of ergonomics in reducing these issues, aiming to promote better workplace ergonomics and preventive measures in dentistry.

Material and methods

A cross sectional questionnaire based study was conducted in CSMSS Dental College and Hospital, Chh. Sambhajinagar from June to August 2024. The study subjects included interns, postgraduate students, and the faculty of our institution.

Ethical committee clearance: This Cross-Sectional Study Protocol Was Sanctioned by the Institutional Ethical Committee of CSMSS dental college and hospital, chh. Sambhajinagar (CSMSS: DCH/R/UG/SS/2024-14).

Study group consent: An informed consent was obtained from the participants after explaining the motive and detail about research.

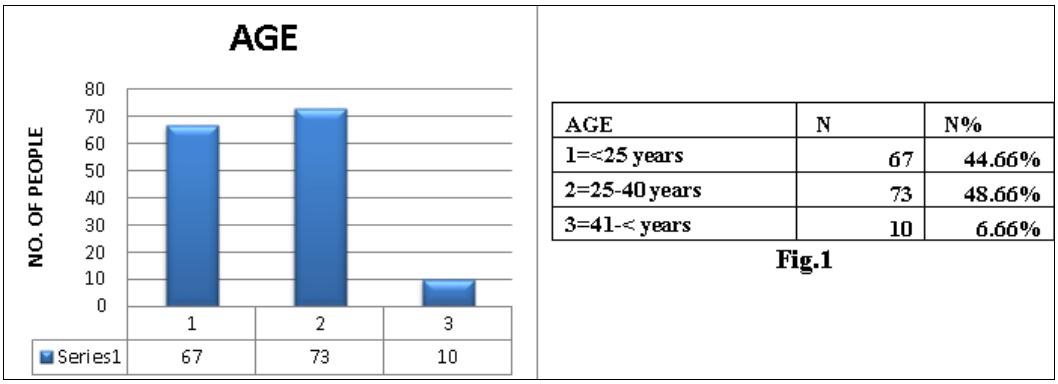
Sample size: The study sample included 150 participants (interns, postgraduate students, and the faculty of CSMSS dental college and hospital, Chh. Sambhajinagar).

Questionnaire & data collection: A self-administered questionnaire, which included basic demographic details, questions related to pain experiences, work practices, knowledge and application of ergonomics and strategies used to alleviate the pain, was administered to the participants. The printed questionnaires were handed over in person to the study participants. 150 questionnaires were distributed to the dental professionals of the institution and they were asked to answer the questionnaire. The completed questionnaires were collected back within a week.

Statistical Analysis: Data was entered in Microsoft Excel and the statistical analysis was carried out. The chi-square test, The Mann Whitney U test and the kruskal-wallis test were done to determine the association among socio-demographic variable, clinical demographic variables and the location of pain. A p-value < 0.05 was considered significant

Results

Out of 150 participants there are 48 males (32%) and 102 female (68%). The age group of participants under study ranged from 22 to 54 years. The mean age of sample is 27.56 years**.** The participants divided according to age in groups as shown in fig.1



AGE	N	N%
1=<25 years	67	44.66%
2=25-40 years	73	48.66%
3=41-< years	10	6.66%

Fig.1

Fig 1

Among the 150 participants 51 were the faculty of the institution, 29 were postgraduate students and 70 interns. The study participants had varying years of practice in the dental field. Half of the participants (74, 49.33%,) had zero to 1 years of experience, representing the largest group in the study. Those with two to five years of practice made up 34% (51) of the total. A smaller percentage of participants 12 (8%) had six to twelve years of experience, while the group with more than twelve years of practice comprised 8.66% (13).

This distribution highlights that the majority of participants were relatively early in their dental careers, with less than five years of professional experience. Fig.2

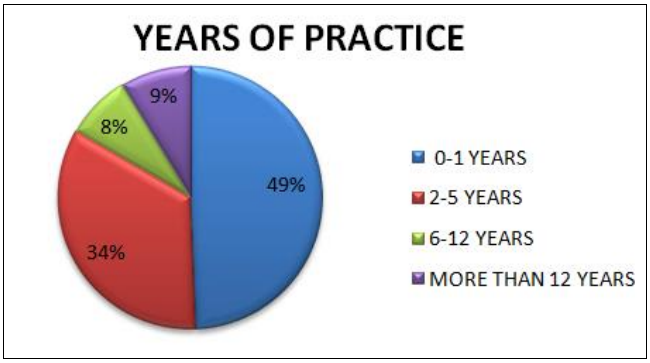


Fig 2

The Participants reported varying frequencies and intensities of musculoskeletal pain. A small percentage (7.33%) experienced pain daily, while 20.66% encountered it weekly, and 33.33% felt it monthly. The majority (38.66%) rarely experienced pain. In terms of intensity, most rated their pain as mild, with 39.33% scoring it between level one to level two and 44% rating it as level two to level five. A smaller group (14.66%) reported more severe pain of level five to level eight while only 2% rated their pain as extreme. This data highlights that while musculoskeletal pain is common, most participants experience it infrequently and at mild to moderate levels. There were different locations of musculoskeletal pain reported by the dental professionals participating in the study. The details about the site and region of musculoskeletal pain felt by participants are described in fig.3

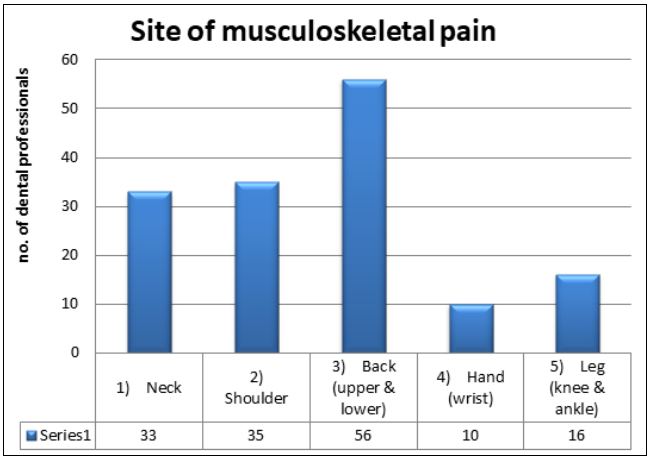


Fig 3

The most common sites of musculoskeletal pain are lower and upper back (37.3%) followed by shoulder and then neck.

A total of 89 participants (59.33%) reported that pain occasionally interferes with their work and daily activities.

Participants identified several factors contributing to their musculoskeletal pain. The most common cause, reported by 61 (40.66%), was prolonged static posture during work. Additionally 49 (32.66%) attributed their pain to patient positioning during treatment, while 29 (19.33%) cited poor ergonomic setups. A smaller group of 11 (7.33%), believed stress or psychological factors played a significant role. These findings suggest that physical strain related to posture and ergonomics is a primary factor in the development of musculoskeletal pain among dental professionals.

The majority of participants 107 (71.33%) reported having received training on proper body mechanics and posture during dental procedures, while 43 (28.66%) participants had not. When asked if musculoskeletal pain had affected their career decisions, 44 (29.33%) acknowledged it had, whereas 106 (70.66%) said it had not influenced their career plans.

In terms of preventive measures, over half of the participants 83 (55.33%) rarely reviewed or adjusted their ergonomic setup and work habits to prevent pain. Some 31 (20.66 %,) participants made occasional adjustments, while 17 (11.33%) did so frequently, and 19 (12.60%) participants consistently reviewed their ergonomics. This data underscores the importance of continuous ergonomic awareness to prevent musculoskeletal issues in the long term.

Among all the participants 108(72%) felt that the data research about musculoskeletal health specific to dental professionals is not sufficient and the awareness about it is not adequate. The information of type of treatment which was received by participants is given in table no.1

Table 1

Type of treatment did you receive	N	N%
1. Medication	98	65.33%
2. Physical Therapy	15	10%
3. Ergonomic Adjustments	37	24.66%
4. Surgery	0	0

There are different strategies used by the participants to prevent musculoskeletal pain which is given in the following figure. Fig.4

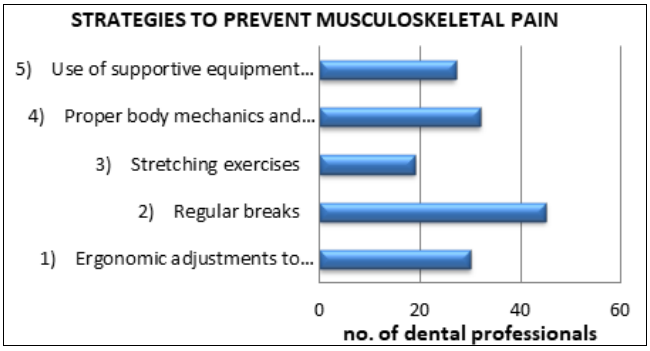


Fig 4

Participants varied in their primary work positions, with 74 (49.33%) participants primarily sitting 14 (9.33%) mostly standing, and 62 (41.33%) alternating between the two. In terms of adjusting posture during extended procedures 49 (32.66%) participants reported doing so regularly, while 89 (59.33%) made occasional adjustments. A smaller group of 12 (8%) participants, rarely adjusted their posture, and none (0%) reported never making changes.

These findings highlight that while many professionals adjust their posture during long procedures, a portion may not do so frequently enough to prevent discomfort.

When asked if access to online resources or webinars on ergonomics and musculoskeletal health would be beneficial, 72 (48%) of participants found it to be very beneficial. Other49 (32.66%) considered it somewhat beneficial. However 19 participants (12.66%) did not see any benefit, while 10 (6.66%) participants were unsure of the potential value. This suggests that a majority of participants view such resources as helpful in addressing musculoskeletal issues. The details about the responses and p value are described in the following table (table.2)

Table 2

Questions	n	n%	p value
How often do you experience musculoskeletal pain			
1. Daily	11	7.33%	
2. Weakly	31	20.66%	0.576257335
3. Monthly	50	33.33%	
4. Rarely	58	38.66%	
On a scale of 1-10 how would you rate the intensity of your pain in recent			
1. 1-2	59	39.33%	
2. 2-5	66	44%	0.7584
3. 5-8	22	14.66%	
4. 10	3	2%	
In which region of body do you experience the musculoskeletal pain?			
1. Neck	33	22%	
2. Shoulder	35	23.33%	
3. Back (upper & lower)	56	37.33%	0.784800907
4. Hand (wrist)	10	6%	
5. Leg (knee & ankle)	16	13.30%	
On average, how many hours per week do you spend treating patients?			
1. 1-2	10	6%	
2. 3-4	31	20.66%	0.373252
3. 5-6	48	30.66%	
4. >6	61	40.66%	
How often does the pain interfere with your work & daily life?			
1. Rarely	34	22.66%	
2. Sometimes	89	59.33%	0.543303639
3. Often	27	18%	
4. Always	0	0.00%	
What do you believe contributes most to your musculoskeletal pain?			
1. Prolonged static posture	61	40.66%	
2. Poor ergonomic setup	29	19.33%	0.458878285
3. Patient positioning during treatment	49	32.66%	
4. Stress or psychological factors	11	7.33%	
Were you educated on proper body mechanics and posture during dental procedures?			
1. Yes	107	71.33%	0.074203
2. No	43	32.66%	
Has musculoskeletal pain affected your career plans or considerations?			
1. Yes	44	29.33%	0.079758
2. No	106	70.66%	
How often do you review and adjust your ergonomic setup and work habits to prevent musculoskeletal pain?			
1. Rarely	19	12.60%	
2. Sometimes	83	55.33%	0.1199466
3. Often	31	20.66%	
4. Always	17	11.33%	
Do you feel that there is adequate awareness & Sufficient research and literature available on musculoskeletal health specific to dental professionals			0.412010976
1. Yes	42	28%	
2. No	108	72%	
10. What type of treatment did you receive?			
1. Medication	98	65.33%	
2. Physical Therapy	15	10%	0.952320391
3. Ergonomic Adjustments	37	24.66%	
4. Surgery	0	0	
Do you use any strategies or modifications to alleviate or prevent musculoskeletal issues at work?			
1. Ergonomic adjustments to workspace	30	13%	
2. Regular breaks	45	30%	0.423997351
3. Stretching exercises	19	12.66%	
4. Proper body mechanics and posture	32	21.33%	
5. Use of supportive equipment (e.g., chairs, stools)	27	18%	
Primary Work Position:			
1. Mostly sitting	74	49.33%	0.294383144
2. Mostly standing	14	9.33%	
3. Alternating between sitting and standing	62	41.33%	
How often do you adjust your work posture or position during long procedures?			
1. Regularly	49	32.66%	0.0305105
2. Occasionally	89	59.33%	
3. Rarely	12	8%	

4. Never	0	0.00%	
Would you find it beneficial to have access to online resources or webinars focused on ergonomics and musculoskeletal health?			
1. Yes, very beneficial	72	48.00%	
2. Yes, somewhat beneficial	49	32.66%	0.754493351
3. No	19	12.66%	
4. Unsure	10	6.66%	

Discussion

- **Prevalence and Frequency of Musculoskeletal pain in Dental Professionals**

Musculoskeletal pain is widely recognized as a major occupational hazard for dental professionals. Our study revealed that musculoskeletal pain is highly prevalent, with 92.67% of respondents experiencing some form of pain at varying frequencies. Among these participants (7.33%) experienced daily pain, while (20.66%) reported weekly occurrences. The majority, however, reported experiencing musculoskeletal pain either monthly (33.33%) or rarely (38.66%). These findings align with other studies which have found that the repetitive tasks, awkward postures, and extended static positions common in dentistry contribute significantly to musculoskeletal discomfort [1].

Although the majority of participants experience pain less frequently, the overall prevalence indicates that musculoskeletal disorders remain a persistent problem within the profession.

- **Intensity and Regional Distribution of Pain**

In terms of pain intensity, the study showed that 39.33% of participants rated their pain at a low level of one or two, while 44% rated their pain is from level two to level five. A smaller percentage of 14.66%, reported moderate levels of pain from level five to level eight, with only 2% experiencing severe pain above level eight to level 10. These variations suggest that while musculoskeletal pain is present, its intensity is typically manageable for most dental professionals, though it may become more severe for a subset of individuals.

In terms of pain localization, the back (both upper and lower) was the most frequently affected region, reported by 37.33% of participants. The neck and shoulders followed, with 22% and 23.33% of respondents respectively reporting pain in these areas. This regional distribution of pain is consistent with the findings of previous studies, which have shown that the nature of dental work—particularly forward flexion of the neck, shoulders, and back—leads to strain in these areas [11]. This emphasizes the need for targeted interventions to address specific pain points in dental professionals.

- **Contributing Factors and Risk Exposure**

The study results indicate that the most significant contributor to musculoskeletal pain is prolonged static posture, with 40.66% of participants identifying this as the primary cause. This finding aligns with extensive research showing that maintaining awkward, sustained positions during dental procedures can lead to significant musculoskeletal strain and pain [13].

Improper patient positioning was the second most cited factor (32.66%), followed by poor ergonomic setups (19.33%) and stress or psychological factors (7.33%). The existing literature also highlights the importance of ergonomic risk factors, including poor chair design and inadequate tool handling, as major contributors to musculoskeletal pain [5].

It is interesting to note that while ergonomic setups are often cited as a crucial element in preventing musculoskeletal pain, the majority of respondents (71.33%) had received training on body mechanics and proper posture during dental procedures. However, despite this education, many participants reported only occasionally adjusting their posture or ergonomic setup, highlighting a gap between knowledge and practice. This suggests that while dental professionals are aware of ergonomics, they may struggle to implement adjustments consistently, possibly due to time constraints or workload pressures [5]. Continuous education and reinforcement of ergonomic practices, perhaps through regular workshops or online webinars, could help bridge this gap.

- **Career Impact and Long-Term Considerations**

The impact of musculoskeletal pain on career longevity and job satisfaction is another area of concern. According to our study, 70.66% of respondents reported that musculoskeletal discomfort has influenced their career plans or decisions, with 29.33% confirming that pain has had a noticeable impact on their career considerations. This finding aligns with existing literature which highlights that persistent pain can lead to burnout, early retirement, and reduced job performance [14].

For a profession that demands prolonged focus and physical precision, chronic pain poses a significant threat not only to individual practitioners' careers but also to the overall productivity and effectiveness of dental teams.

- **Ergonomic Adjustments and Preventative Measures**

The study examined preventative strategies used by participants to reduce musculoskeletal pain, revealing that while most take action, these efforts are often inconsistent. Only 32.66% regularly adjusted their posture during long procedures, 59.33% did so occasionally, and 8% rarely made adjustments. These findings highlight the need to improve the adoption of consistent ergonomic practices among dental professionals. The use of strategies such as regular breaks, ergonomic workspace adjustments, stretching exercises, and supportive equipment can significantly reduce the risk of long-term musculoskeletal issues [2]. Encouraging practitioners to integrate these practices more consistently into their daily routines may help to alleviate some of the physical strain associated with dental work.

Additionally, 48% of respondents found online resources on ergonomics highly beneficial, with 32.66% considering them somewhat beneficial, highlighting the demand for accessible, updated educational materials for dental professionals. There is growing evidence that virtual ergonomic interventions, such as online courses or workshops, offer accessible ways to promote ergonomic awareness and reduce musculoskeletal discomfort [13]. additionally, ergonomic training programs, both virtual and

in- person, have been shown to significantly lower the prevalence of musculoskeletal pain in dental professionals [15]. Providing these resources may offer dental practitioners practical tools to improve their ergonomic habits and overall well-being [16].

- **Gender, age, and practice experience**

Gender and age were not significantly associated with musculoskeletal pain, with both male and female participants reporting similar rates of pain frequency and intensity. However, younger professionals (aged<25) reported slightly higher rates of pain than older groups, which may be indicative of less experience in managing posture or ergonomics effectively [9]. Interestingly, no significant differences were found between BDS and MDS degree holders in terms of pain prevalence, suggesting that the level of education does not necessarily correlate with better ergonomic practices or reduced pain. Additionally, years of practice were also not strongly associated with musculoskeletal discomfort, implying that even experienced professionals continue to face significant physical challenges in their work.

- **Limitations and future directions**

While this study offers valuable insights into musculoskeletal disorders among dental professionals, its cross-sectional design limits causal conclusions, and self-reported data may introduce bias. Future research should include larger sample sizes and longitudinal studies to track pain development over time. Additionally, evaluating the effectiveness of interventions, such as ergonomic training programs, would provide data to support targeted preventive strategies in dental practices, helping to reduce musculoskeletal pain more effectively.

Conclusion

The findings of this study confirm that musculoskeletal pain is a common and significant issue among dental professionals, with prolonged static postures and poor ergonomic setups being the primary contributors. While many dental professionals receive education on ergonomics, there remains a gap in the consistent application of these practices in daily work routines. The impact of musculoskeletal pain on career decisions further emphasizes the importance of addressing this issue to improve the quality of life and career longevity for dental practitioners. Moving forward, there is a clear need for greater emphasis on practical ergonomic interventions and the dissemination of accessible resources to support dental professionals in managing their musculoskeletal health. Emerging research on the effectiveness of ergonomic training programs and adjustments suggests promising strategies for reducing the prevalence and impact of musculoskeletal disorders in the dental profession [17].

Conflict of interest: there was no conflict of interest.

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