International Journal of Community Medicine and Public Health
*Solanki H et al. Int J Community Med Public Health. 2024 Feb;11(2):899-903*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20240284

**Original Research Article**

# Assessment of awareness, attitude, knowledge and application towards dental ergonomics and musculoskeletal disorder among dental students and professionals in Ahmedabad

**Harsh Solanki*, Vasudha Sodani, Bhumi Sarvaiya, Keyur Chauhan, Reetu Shah**

Department of Paediatric and Preventive Dentistry, Ahmedabad Dental College, and Hospital, Ahmedabad, Gujarat, India

**Received:** 12 December 2023
**Accepted:** 22 January 2024

***Correspondence:**
Dr. Harsh Solanki,
E-mail: 2hsolanki@gmail.com



## ABSTRACT

**Background:** Dental ergonomics, the science of optimizing the workplace for dental professionals, is essential for preventing musculoskeletal disorders (MSDs) and ensuring the long-term health of dental practitioners.
**Methods:** A cross-sectional survey aimed to assess the awareness and attitude of dental students and professionals towards dental ergonomics, with the collected data subsequently subjected to rigorous statistical analysis.
**Results:** A 51% of dental students and 78% of dental professionals were aware about dental ergonomics. Only 12% of the dental students have attended a course regarding dental ergonomics, 73% of the dental professionals among study population have experienced musculoskeletal pain due to dental practice.
**Conclusions:** The survey revealed that dental students exhibited lower awareness of dental ergonomics compared to dental professionals, with a notable discrepancy in the implementation of ergonomic principles. Additionally, a significant prevalence of pain related to MSDs was observed among the dental professionals surveyed.

**Keywords:** Dental ergonomics, Musculoskeletal disorder, Awareness

## INTRODUCTION

Ergonomics is the applied science dedicated to optimizing the design and arrangement of items used by people, ensuring that the interaction between individuals and their surroundings is both efficient and safe.[1] The primary goal of ergonomics is to optimize the interaction between people and their surroundings to enhance well-being, safety, comfort, and overall efficiency. It is concerned with minimizing the risk of injury or discomfort while maximizing productivity and performance.

Dental ergonomics is a specialized field of ergonomics that focuses on the design and organization of dental workplaces and equipment to ensure that dental professionals, such as dentists, dental hygienists, and dental assistants, can perform their tasks efficiently and comfortably while minimizing the risk of occupational injuries and MSDs.

Dental professionals spend long hours in a physically demanding, highly precise, and often intricate practice. The nature of their work requires them to sit or stand in awkward positions for extended periods while maintaining fine motor control. Dental ergonomics aims to address these challenges by creating dental workspaces and procedures that reduce physical strain, enhance productivity, and promote the overall health and well-being of dental practitioners. Dental ergonomics holds immense importance in the realm of dentistry, a fact that cannot be emphasized enough.

In 2003, Valachi and Valachi conducted an extensive study that delved into the factors responsible for MSDs in dental professionals, shining a spotlight on the crucial

role of ergonomics. Their research underscored that a lack of proper ergonomic practices could result in dental practitioners developing work-related musculoskeletal problems. Consequently, it is evident that instilling early education and training in dental ergonomics is imperative to instigate a proactive mindset in dental students. This, in turn, ensures the enduring physical well-being of these students while simultaneously elevating the quality of patient care outcomes.[2]

The primary objective of this study is to evaluate the awareness and knowledge of dental ergonomics among undergraduate students. The research aims to delve into their comprehension of ergonomic principles within the dental field. Additionally, the study seeks to conduct a comprehensive analysis of the factors contributing to the occurrence of MSDs among dental practitioners. This analysis will encompass both postgraduate students and established professionals in the dental field.

## METHODS

This cross-sectional observational study was carried out at Ahmedabad dental college and hospital in Ahmedabad, Gujarat, from January 2023 to February 2023.

To ensure the ethical conduct of this study, ethical approval was diligently obtained from the institutional review board, confirming the strict adherence to ethical standards. The survey instrument's robustness was verified through a meticulous pre-testing phase involving ten experienced professionals, which helped establish its validity and replicability.

A self-administered survey developed, and questionnaire was distributed among a diverse group of participants, which included undergraduate students, as well as working professionals with various levels of expertise in dental disciplines (Postgraduate, bachelor of dental surgery, and master of dental surgery) in Ahmedabad, Gujarat. Survey aimed to assess level of awareness regarding ergonomics principles and the prevalence of MSDs encountered in routine dental practice.

Two sets of questionnaires were crafted: one tailored for undergraduate students and the other designed for experienced dental practitioners. The questionnaires were meticulously formulated and validated to meet stringent reliability and authenticity standards. Each questionnaire was accompanied by an informative document elucidating the study's purpose and procedures, ensuring transparency, and obtaining informed consent.

Participants in the study were chosen based on specific inclusion criteria, which involved willing and voluntary participation from undergraduate students and working dental professionals actively practicing within Ahmedabad, Gujarat. Exclusion criteria were applied to individuals who had either ceased their dental practice or were unwilling to participate in the survey.

Before participating in the study, everyone was thoroughly briefed on the study's overarching objectives and the precise procedural guidelines. This approach ensured that every participant was well-informed and aware of the study's purpose and methodology, thereby upholding the principles of informed consent and ethical research practices.

After collection of data, the data were coded and entered in Microsoft excel 2019. The data analysis was conducted using IBM SPSS software version 20, and for continuous variables, descriptive statistics were reported as means with standard deviations (SD), while categorical variables were presented with frequencies (n) and percentages (%). The significance of associations between categorical variables was assessed using either chi-square or Fisher's exact test, and a p less than 0.05 was considered statistically significant.

## RESULTS

In the first segment of the study, a sample size of 300 participants was divided evenly, with 150 students representing the final year of the BDS program and another 150 students undergoing internship. Among them 200 were females and 100 were male (Table 1).

**Table 1: Demographic data of undergraduates.**

| Variables | N | Percentage (%) | P value |
|---|---|---|---|
| **Gender** | | | |
| Male | 100 | 33.33 | <0.0001 |
| Female | 200 | 66.66 | |
| **Education level** | | | |
| Final year | 150 | 50 | 1 |
| Intern | 150 | 50 | |

In order to assess the subjects' comprehension of dental ergonomics, various questions were posed to gauge their awareness, attitude, and knowledge. While students are aware of what are MSDs, awareness regarding ergonomics is significantly less among study population (Table 2).

**Table 2: Awareness regarding ergonomics among undergraduate students.**

| Questions | Yes, N (%) | No, N (%) | P value |
|---|---|---|---|
| **Are you aware about dental ergonomics?** | 153 (51) | 147 (49) | 0.73 |
| **Are you aware about MSDs?** | 205 (68.3) | 95 (31.7) | <0.0001 |

The students have demonstrated a positive attitude toward dental ergonomics. Although only a few participants have attended seminars or courses on dental ergonomics, they believe that ergonomic practices and musculoskeletal problems should be emphasized before entering the

clinics, and that ergonomics could potentially enhance their daily performance in the clinic (Table 3).

**Table 3: Attitude regarding ergonomics among undergraduate students.**

| Questions | Yes, N (%) | No, N (%) | P value |
|---|---|---|---|
| **Have you attended any course/ seminar related dental ergonomics?** | 37 (12.3) | 263 (87.7) | <0.0001 |
| **Ergonomic practice and muco-skeletal problems should be emphasized before entering to clinics?** | 190 (63.3) | 110 (36.7) | <0.0001 |
| **Do you think ergonomics might improve your daily performance in clinic?** | 224 (74.7) | 76 (25.3) | <0.0001 |

The student demonstrates a profound knowledge of the appropriate placement of operators and chairs within the realm of dental ergonomics (Table 4).

**Table 4: Knowledge regarding ergonomics among undergraduate students.**

| Questions | Correct answer, N (%) | Wrong answer, N (%) | P value |
|---|---|---|---|
| **7 o' clock to 12 o clock is an ideal position for left-handed operator?** | 170 (56.7) | 130 (43.3) | 0.02 |
| **Bending forward towards patient will improve your ergonomics?** | 197 (65.7) | 103 (34.3) | <0.0001 |
| **Supine/ semi supine is idea choice for patient position for better ergonomics?** | 223 (74.3) | 67 (22.3) | <0.0001 |
| **Do you believe practicing standing dentistry can lead to MSDs in future?** | 202 (67.3) | 98 (32.7) | <0.0001 |
| **Do you believe operator chair/ position and patient chair/ position has role in development of MSDs?** | 229 (76.3) | 71 (23.7) | <0.0001 |

In second segment of study, total of 200 participants took part in study, comprising individuals with varying levels of clinical experience. This group included bachelor of dental surgery (BDS) and master of dental surgery (MDS) professionals, and postgraduate students. (Table 5).

**Table 5: Demographic data of the working professionals.**

| Variables | N | Percentages (%) | P value |
|---|---|---|---|
| **Gender** | | | |
| Male | 120 | 60 | 0.004 |
| Female | 80 | 40 | |
| **Profession** | | | |
| BDS | 40 | 20 | 0.0003 |
| Postgraduate | 80 | 40 | |
| MDS | 80 | 40 | |
| **Years of experience (in years)** | | | |
| <5 | 100 | 50 | <0.0001 |
| 5-10 | 65 | 32.50 | |
| >10 | 35 | 17.50 | |

Awareness regarding dental ergonomics and musculoskeletal disorder is significant among study population (Table 6).

**Table 6: Awareness regarding ergonomics among working professionals.**

| Questions | Yes, N (%) | No, N (%) | P value |
|---|---|---|---|
| **Are you aware about principle of dental ergonomics and muco-skeletal disorders?** | 156 (78) | 44 (22) | <0.0001 |
| **MSDs and poor knowledge about ergonomics are reasons for early retirement among dentists?** | 143 (71.5) | 57 (28.5) | <0.0001 |
| **Do you have idea about workplace simplification rule?** | 74 (37) | 126 (63) | 0.0002 |

Though having significant awareness operators shows poor application of ergonomic practice in their clinical practice (Table 7).

**Table 7: Attitude regarding ergonomics among working professionals.**

| Questions | Yes, N (%) | No, N (%) | P value |
|---|---|---|---|
| **Do you practice standing dentistry?** | 121 (60.5) | 79 (39.5) | 0.003 |
| **Have you designed your operatory keeping ergonomics in mind?** | 73 (36.5) | 127 (63.5) | 0.0001 |
| **Have you included stretch breaks into your daily practice?** | 83 (41.5) | 117 (58.5) | 0.016 |
| **Are you doing endodontic treatment using loops?** | 49 (24.5) | 151 (75.5) | <0.0001 |

Pain and fatigue which are the symptoms of musculoskeletal skeleton disorders which were found in study participants. Participants has experienced pain in neck, back and shoulder due to dental practice (Table 8).

**Table 8: History of musculoskeletal pain among working professionals.**

| Questions | Yes, N (%) | No, N (%) | P value |
|---|---|---|---|
| **Have you ever experienced pain in neck, back, shoulder due to dental practice?** | 146 (73) | 54 (32) | <0.0001 |
| **Do you feel fatigue at and of the day?** | 128 (64) | 72 (36) | 0.0001 |
| **Have you ever experienced pain in hand/wrist while working with vibrating instruments?** | 85 (42.5) | 115 (57.5) | 0.03 |

## DISCUSSION

In the present study, our aim was to investigate the awareness and practice of dental ergonomics among dental students and professionals. Dental ergonomics plays a crucial role in preventing MSDs among dental practitioners. We explored whether dental students are aware of the benefits of dental ergonomics and whether they believe it should be emphasized before entering the clinic. Additionally, we examined the level of ergonomic practice and any potential negligence among dental professionals, as inadequate ergonomic practices can contribute to the development of MSDs.

The findings from these various studies provide valuable insights into the awareness and implementation of ergonomics among dental professionals and undergraduate students. The discussion section will address key themes and implications derived from these studies.

The studies collectively highlight a significant variation in the awareness of ergonomics within the dental profession. Alyahya et al found that specialized professional dentists demonstrated a higher awareness of ergonomics compared to general practitioners and undergraduate students.[3] Galla et al reported that over 75% of dental practitioners were aware of the term ergonomics and its health hazards.[4] However, Almosa et al revealed that a substantial portion of their study participants, 70%, replied negatively when asked if they were familiar with dental ergonomics.[5] In this present study, only 51% of undergraduates are aware of dental ergonomics, while 78% of dental professionals are aware of dental ergonomics. This discrepancy in awareness emphasizes the need for educational interventions to ensure that all dental professionals are well-informed about the importance of ergonomics in their daily practice.

Despite an understanding of the benefits of assistive devices and suitable ergonomic procedures, Galla et al observed that dental professionals often fail to implement them in clinical practice.[4] This finding raises questions about the factors that hinder the translation of knowledge into action. Karthikayan et al reported that musculoskeletal pain was a prevalent issue among dental professionals, with 94.6% experiencing it during their BDS course.[6] In the study conducted by Gopinadh et al 73.9% of participants reported musculoskeletal pain, and among them, 30.4% experienced pain in more than one part of the body, comprising a total of 289 individuals.[7] In this present study, we find out that 73% of the working professionals who are part of this study have experienced pain in the neck, back, and shoulder due to dental practice. Kierklo et al found that 29% of the population has experienced pain in hand and wrist.[8] In this present study, 43% of working dental professionals have experienced pain in hand and wrist while working with vibrating instruments. The findings also indicated a lack of exercise habits among a significant proportion of dentists, which can further contribute to musculoskeletal issues. It is evident that there is a gap between awareness and effective implementation of ergonomic practices in the dental community, and this requires attention.

The studies collectively suggest that educational interventions are essential to bridge the gap between awareness and implementation of ergonomic principles in dental practice. Almosa et al found that 93% of participants replied negatively to questions about attending lectures or courses on dental ergonomics and the prevention and treatment of work-related MSDs.[5] However, more participants were aware of MSDs. In the present study, 88% of dental students replied negatively regarding attending any course related to dental ergonomics. In their interventional study, Alaa et al evaluated and educated 40 right-handed dental students aged 20-25 years on ergonomics in dentistry, utilizing a questionnaire administered before and after the educational program.[9] The study revealed a statistically significant difference ($p<0.001$) in knowledge, attitude, and practice between the (Before) and (After) groups, both in females and males. This highlights the need for targeted educational programs that emphasize the significance of ergonomics and MSDs prevention in dental education.

### *Limitations*

The single centre study may limit the generalizability of findings due to regional variations in dental practices. Utilizing a cross-sectional design, the research lacks the ability to establish causation and observe changes over time. Reliance on self-reported data, coupled with sample composition and potential social desirability bias,

highlights limitations in accurately assessing ergonomic awareness and practices among dental professionals.

## CONCLUSION

The research highlights a notable disparity in understanding dental ergonomics among students and professionals, indicating a gap between knowledge and its application. Targeted educational efforts are urgently needed to address this gap, stressing ergonomic principles in dental training to prevent work-related musculoskeletal issues. By tackling these issues, we aim to enhance practitioners' well-being, diminish musculoskeletal pain, and ensure quality care delivery, fostering a healthier, sustainable dental profession.

## ACKNOWLEDGEMENTS

Author would like to thanks to Dr. Anvi Shah (Reader, department of paediatric and preventive dentistry, Ahmedabad dental college, and hospital, Ahmedabad), Dr. Devdatt Sharma (Reader, department of paediatric and preventive dentistry, Ahmedabad dental college, and hospital, Ahmedabad), Dr. Parth Chhabria (Senior lecturer, department of paediatric and preventive dentistry, Ahmedabad dental college, and hospital, Ahmedabad) for their guidance throughout the research. Also, to Dr. Vaishnavi Agarwal (Post graduate student, department of paediatric and preventive dentistry, Ahmedabad dental college, and hospital, Ahmedabad) and Dr. Sowjanya Rajesh (Post graduate student, department of paediatric and preventive dentistry, Ahmedabad dental college, and hospital, Ahmedabad) for their constant support in this study.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Gupta A, Bhat M, Mohammed T, Bansal N, Gupta G. Ergonomics in dentistry. Int J Clin Pediatr Dent. 2014;7(1):30.
2. Valachi B, Valachi K. Mechanisms leading to musculoskeletal disorders in dentistry. J Am Dent Assoc. 2003;134(10):1344-50.
3. Alyahya F, Algarzaie K, Alsubeh Y, Khounganian R. Awareness of ergonomics and work-related musculoskeletal disorders among dental professionals and students in Riyadh, Saudi Arabia. J Phys Ther Sci. 2018;30(6):770-6.
4. Galla A, Chowdhry A, Bagga A, Moradia L, Tadikonda AN, Pentapati KC, Mysore NK. Dental practitioners' knowledge, attitudes, and practices of ergonomics-a cross-sectional web-based survey. Acta Bio Med. 2022;93(2).
5. Almosa NA, Zafar H. Assessment of knowledge about dental ergonomics among dental students of King Saud University, Riyadh, Kingdom of Saudi Arabia. J Contemp Dent Pract. 2019;20(3):324-9.
6. Karthikeyan GR, Balaguhan B, Mathanmohan A, Deepak V, Indrapriyadharshini K, Devar MN. Insights into knowledge, attitude and perception about dental ergonomics and work-related musculoskeletal disorders (MSD) among dental professionals at Chengalpet District, Tamil Nadu, India: a cross-sectional study. Int J Occup Saf Health. 2022;12(1):1-7.
7. Gopinadh A, Devi KN, Chiramana S, Manne P, Sampath A, Babu MS. Ergonomics and musculoskeletal disorder: as an occupational hazard in dentistry. J Contemp Dent Pract. 2013;14(2):299.
8. Kierklo A, Kobus A, Jaworska M, Botuliński B. Work-related musculoskeletal disorders among dentists-a questionnaire survey. Ann Agric Environ Med. 2011;18(1):79-84.
9. Alaa E, Younis SH. Assessment of an ergonomics interventional educational program on knowledge, attitude, Practice and behavior among a group of Egyptian dental students. Egypt Dent J. 2020;66(1):623-32.

**Cite this article as:** Solanki H, Sodani V, Sarvaiya B, Chauhan K, Shah R. Assessment of awareness, attitude, knowledge and application towards dental ergonomics and musculoskeletal disorder among dental students and professionals in Ahmedabad. Int J Community Med Public Health 2024;11:899-903.