

## ORIGINAL ARTICLE

# ATTITUDE TOWARDS ERGONOMICS AND PRINCIPLES AMONG HOUSE SURGEONS AND POSTGRADUATE TRAINEES: A SURVEY

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## ABSTRACT

**Background:** Ergonomics plays a crucial role, customizing the work environment to promote health, efficiency, and safety while reducing potential occupational risks. The objective of this article was to assess the perspectives and attitudes of house surgeon and postgraduate trainee concerning ergonomics and its underlying principles.

**Materials & Methods:** A cross-sectional survey involving 170 house surgeons and postgraduate trainees in operative dentistry was conducted at the Department of Operative Dentistry, Rawal Institute of Health Sciences, and other institutes in Pakistan. The study utilized a questionnaire adapted from previous studies to assess attitudes toward ergonomic principles in dental practice. Descriptive statistics were computed.

**Results:** With a mean age of  $23.2 \pm 2.7$  years, participants showed varied attitudes toward basic ergonomics principles, with 20.00% agreeing on applicability in a clinician's position. The majority supported ergonomic design for accessibility (71.76%), chair height adjustment (50.59%), and using ergonomically designed stools (66.47%). While opinions were divided on lightweight instruments, a significant majority (75.88%) agreed on the effectiveness of sharp instruments in reducing forces. Regarding ergonomics, microbreaks, exercises, and the dental curriculum, most favored incorporating microbreaks (81.18%), and there was consensus on the insufficient current ergonomics education (69.41%) and the need for it in the curriculum (64.71%).

**Conclusion:** Dental professionals hold diverse views on ergonomics, with consensus on factors like accessibility and the importance of sharp instruments. Positive sentiments surround ergonomic tools. There's a collective belief that ergonomics should be part of the curriculum, emphasizing the need for increased awareness and education in dentistry.

**KEY WORDS:** Ergonomics; Musculoskeletal Disorders; dental students; post graduate trainees; Posture.

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## INTRODUCTION

In dentistry, a profession demanding precision and visual acuity, practitioners engage in daily tasks that involve a forceful grip on instruments and prolonged exposure to physical factors, potentially leading to musculoskeletal disorders.<sup>1</sup> Acknowledging the need for improvement, the integration of ergonomics, defined as the study of human-system interactions,

becomes imperative.<sup>2</sup> The focus of dental ergonomics is to optimize the work environment, emphasizing practitioners' health, improving work efficiency, ensuring safety, and mitigating occupational hazards. A key aspect involves advocating for neutral postures, whether sitting or standing, to align and balance the body, thus minimizing stress on joints during routine dental procedures.<sup>3</sup>

Dentists commonly adopt a forward-bent posture during patient examinations and procedures, which may contribute to musculoskeletal disorders. Symptoms include pain, fatigue, numbness, joint stiffness, shoulder pain, and hand/wrist issues. Studies by Sarwar et al,<sup>3</sup> and Zahoor et al.<sup>4</sup> highlight the prevalence of such disorders among dentists, with pain being a frequent complaint. They emphasize static posture, particularly head and neck flexion, trunk rotation, and raised shoulders, as significant contributors to musculoskeletal issues in the dental profession.

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Namwongsa et al.<sup>5</sup> utilized the 'Rapid Upper Limb Assessment' method to assess the potential risk of upper limb Musculoskeletal Disorders (MSDs) among dental students. Their analysis led to the conclusion that dental students face a high likelihood of developing upper limb MSDs in the future. This emphasizes the urgency of implementing preventive measures and interventions to address the ergonomic factors contributing to the elevated risk of musculoskeletal issues among dental students.

A majority of dental professionals (84.6%) experienced Work-Related Musculoskeletal Disorders (WMSD) in the past year, with a higher prevalence in females (87%) than males (80%). WMSD correlated with increased daily and weekly working hours, especially for those exceeding 5 hours per day and 30 hours per week. Professionals with 2-5 years of experience post-graduation had a higher prevalence. While 70.1% engaged in physical activity, only 12.7% had satisfactory ergonomic knowledge. Notably, those practicing yoga showed a lower WMSD incidence (77.0%) than those involved in other physical activities (84%).<sup>6</sup> According to Udoye, 70% of students of dentistry declare disorders after only 3 years of studies.<sup>7</sup>

Promoting positive attitudes toward ergonomics is crucial for dental students. Interventions in physical, cognitive, and organizational aspects are recommended to prevent issues arising from a lack of ergonomic awareness. Raising awareness at institutional and community levels through dental health programs is essential. Understanding current attitudes among dental students and practitioners is key to providing effective ergonomic education, ensuring long-term benefits for the profession's efficacy and safety.

The objective of this study was to assess the perspectives and attitudes of house surgeon and postgraduate trainee concerning ergonomics and its underlying principles

## MATERIAL AND METHODS

This cross-sectional survey was carried out on 170 house surgeons (HS) and postgraduate trainees (PGT) at the Department of Operative Dentistry, Rawal Institute of Health Sciences, and extended to other PGTs in operative dentistry from various institutes in Pakistan. Through online Google Forms. The survey spanned three months, from September 1, 2021, to January 1, 2022, and received approval from the institute's ethical committee.

House surgeons were individuals with a BDS degree undergoing a one-year internship, while postgraduate trainees were those in FCPS training. A questionnaire, adapted from previous studies,<sup>8, 9</sup> was used to assess the attitude of HS and PGT towards ergonomics principles in dental practice. The sample size of 170 was determined with a 95% confidence level and 7% margin of error, considering

the awareness about ergonomics to be 68.5% based on a previous study.<sup>10</sup>

A Google Form was shared with PGT and HS in operative dentistry departments across Pakistan, instructing them to complete the questionnaire at their convenience. Collected responses were carefully managed, with the investigator promptly addressing any issues encountered during the study period. Participants who did not provide consent were excluded from the study.

To enhance clarity, the questionnaire was structured into four segments. Part 1 covered demographic details, Part 2 delved into basic attitudes towards ergonomics, Part 3 explored attitudes regarding exercises and micro-breaks, and Part 4 sought suggestions from participants concerning timely changes in the dental curriculum. Every response was accurately documented, resulting in a total of 170 responses from the subjects and achieving a response rate of 93.25%.

The data were analyzed using SPSS version 23. Descriptive statistics were computed for categorical data such as demographics and questionnaire responses in terms of frequency and percentages, while age was analyzed in terms of mean and standard deviation (SD).

## RESULTS

The mean age of the participants was  $23.2 \pm 2.7$  years. The qualification of participants shows that House Officers were 38 (22.35%), followed by postgraduate trainee FCPS (n=117, 68.82%), and the least were MPhil/MS Postgraduate trainees (n=3, 1.76%). (Fig 1)

**Table 1** summarizes the attitudes of 170 participants regarding their knowledge of basic ergonomics principles. In terms of the applicability of ergonomic principles in a clinician's position, 20.00% agreed, while 50.59% disagreed. Regarding the link between musculoskeletal disorders (MSD) and wrong equipment ergonomics, 16.47% agreed, 48.24% disagreed, and 23.53% strongly disagreed. The impact of poor-fitting gloves on MSD received agreement from 58.82% of participants, and proper operating light positions were deemed critical by 11.76%. Surgical loupes and digital operatory microscopes were perceived as helpful in maintaining a neutral position (64.71%).

Table 2 presents the attitudes of 170 participants towards ergonomics, microbreaks, exercises, and the dental curriculum. A substantial majority (81.18%) agreed that operative procedures should incorporate multiple microbreaks to mitigate excessive muscle fatigue. Notably, 22.94% reported utilizing chair side exercises in their practice. Furthermore, 64.71% emphasized the need for increased focus on improper equipment ergonomics related to musculoskeletal disorders (MSD) in the curriculum, while 31.76% strongly agreed

**Table 1: Attitude towards Questions on knowledge of basic ergonomics**

Characteristic	N = 170
Ergonomic principal is applicable clinician's position	
Agree	34 (20.00)
Disagree	86 (50.59)
No idea	16 (9.41)
Strongly agree	5 (2.94)
Strongly disagree	29 (17.06)
MSD are not link to wrong equipment ergonomics?	
Agree	28 (16.47)
Disagree	82 (48.24)
No idea	4 (2.35)
Strongly agree	16 (9.41)
Strongly disagree	40 (23.53)
Is dental chair ergonomics irrelevant for maintaining the operator's neutral position?	
Agree	4 (2.35)
Disagree	97 (57.06)
No idea	4 (2.35)
Strongly agree	7 (4.12)
Strongly disagree	58 (34.12)
Accessibility and visibility during the procedure?	
Agree	122 (71.76)
Disagree	6 (3.53)
No idea	5 (2.94)
Strongly agree	37 (21.76)
Operator chair height be adjusted to prevent knee strain?	
Agree	86 (50.59)
Disagree	38 (22.35)
No idea	16 (9.41)
Strongly agree	22 (12.94)
Strongly disagree	8 (4.71)
Ergonomically designed stools can revents low back pain?	
Agree	113 (66.47)
Disagree	2 (1.18)
No idea	48 (28.24)
Strongly agree	7 (4.12)
Light weight instruments do not help to reduce MSD?	
Agree	33 (19.41)
Disagree	91 (53.53)
No idea	13 (7.65)

Strongly agree	5 (2.94)
Strongly disagree	28 (16.47)
Sharp instruments help reducing excessive forces	
Agree	129 (75.88)
Disagree	13 (7.65)
No idea	9 (5.29)
Strongly agree	17 (10.00)
Strongly disagree	2 (1.18)
Knurling of instruments results in poor grasp	
Agree	46 (27.06)
Disagree	72 (42.35)
No idea	35 (20.59)
Strongly agree	6 (3.53)
Strongly disagree	11 (6.47)
Precise angulation of manual instruments area relevant?	
Agree	123 (72.35)
No idea	2 (1.18)
Strongly agree	45 (26.47)
Poor fitting gloves can results in MSD?	
Agree	100 (58.82)
Disagree	34 (20.00)
No idea	10 (5.88)
Strongly agree	18 (10.59)
Strongly disagree	8 (4.71)
Proper operating light positions not critical factor	
Agree	20 (11.76)
Disagree	92 (54.12)
No idea	8 (4.71)
Strongly agree	6 (3.53)
Strongly disagree	44 (25.88)
Surgical loupes and digital operatory microscope helps in neutral position ?	
Agree	110 (64.71)
Disagree	10 (5.88)
No idea	6 (3.53)
Strongly agree	44 (25.88)
Ergonomically designed are not effective in reducing muscle fatigue?	
Agree	6 (3.53)
Disagree	86 (50.59)
No idea	14 (8.24)
Strongly agree	2 (1.18)
Strongly disagree	62 (36.47)

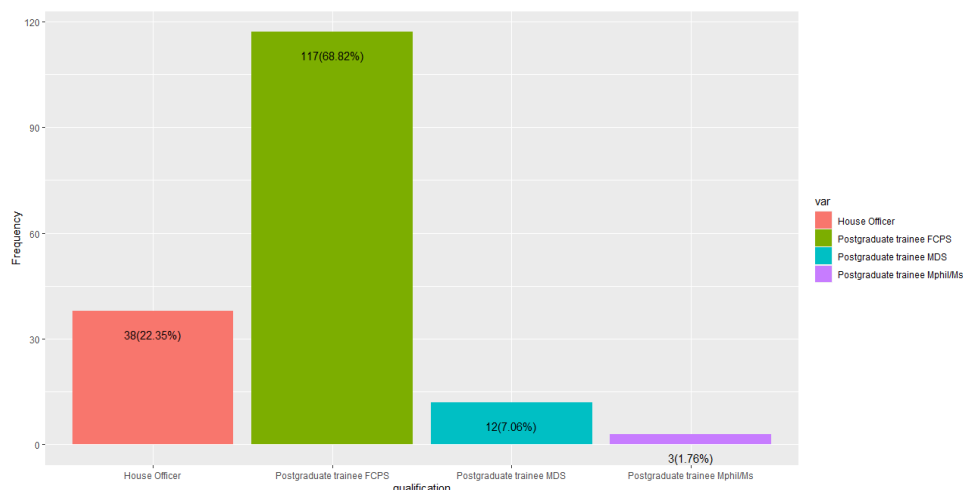


Fig 1: Distribution of qualification

Table 2: Attitude regarding ergonomics related to micro breaks, exercises and dental curriculum

Characteristic	N = 170
Operative procedures should take multiple micro-breaks to reduce excessive muscle fatigue?	
Agree	138 (81.18)
Disagree	3 (1.76)
No idea	7 (4.12)
Strongly agree	17 (10.00)
Strongly disagree	5 (2.94)
Have you used chair side exercises in practice?	
39 (22.94)	
ergonomics educatio is less in present dental curriculum	
Agree	118 (69.41)
Disagree	12 (7.06)
No idea	8 (4.71)
Strongly agree	32 (18.82)
Do you think ergonomics separate entity in the syllabus ?	
Agree	111 (65.29)
Disagree	5 (2.94)
No idea	6 (3.53)
Strongly agree	48 (28.24)
Improper equipment ergonomics related MSD should be emphasized in curriculum	
Agree	110 (64.71)
No idea	4 (2.35)
Strongly agree	54 (31.76)
Strongly disagree	2 (1.18)

## DISCUSSION

Developing the habit and instinct to adopt ergonomic work postures is a vital aspect of the training for dental students, with the aim of preventing musculoskeletal disorders (MSDs) and enhancing the longevity and efficiency of their careers.<sup>11</sup> The integration of ergonomic principles into regular dental practice is crucial for students to refine their procedural approaches, minimize physical health risks during patient care, and ensure a consistent standard of high-quality performance and patient safety. Unfortunately, the widespread neglect of ergonomics in dental education is evident, as many countries omit it from the curricula for both undergraduate and postgraduate students.<sup>12</sup> Consequently, recent graduates often grapple with musculoskeletal issues that impede their early career performance, as their body postures and handling techniques in dentistry do not adhere to ergonomic principles. The emphasis on procedural mastery rather than posture during skill acquisition contributes to the formation of detrimental habits.<sup>13</sup>

In a previous study, researchers discovered that a significant majority, specifically over 92%, of the dentists surveyed had experienced musculoskeletal disorders (MSDs). The study's conclusion highlighted a direct correlation between the limited implementation of ergonomic practices in the work environments of dentists and the high prevalence of MSDs within this professional group. Essentially, the findings underscored that the lack of attention to ergonomics significantly contributes to the occurrence of musculoskeletal issues among dentists, emphasizing the urgency of addressing and incorporating ergonomic principles into dental practices.<sup>14</sup> This issue is further substantiated by a separate study conducted in Sindh Karachi in 2017, which independently reported a notable and concerning prevalence of musculoskeletal disorders among

dentists. The convergence of findings from distinct studies and regions emphasizes the widespread nature of the problem, suggesting that a lack of ergonomic considerations in dental workplaces poses a substantial risk to the physical well-being of dental professionals.<sup>15</sup> In this study, 48% of practitioners reject the idea that musculoskeletal problems are not connected to equipment ergonomics. This indicates a positive outlook, emphasizing their belief that ensuring proper ergonomics is necessary to prevent musculoskeletal disorders.

The study underscores that a sedentary lifestyle and long working hours contribute to increased musculoskeletal issues among dental practitioners. It recommends multiple microbreaks during operative procedures to reduce muscle fatigue, a suggestion supported by 78.7% of respondents. Previous research notes extended work hours and low physical activity levels among participants. While practitioners express positive attitudes and average knowledge about ergonomics, various studies reveal a gap in applying ergonomic principles in daily dental practice. Despite willingness, practitioners often struggle to effectively implement these principles.<sup>9, 14, 15</sup>

The current study highlights a concerning trend, with 77.3% of respondents neglecting chair-side breaks, indicating prolonged work periods without rest for dental professionals. A comparison with a previous study underscores the severity, revealing 27.5% worked without breaks, 38.2% had one break, and 6.1% took breaks after each patient.<sup>9</sup> Another study in Indian dental colleges found practitioners had knowledge and positive attitudes toward breaks but failed to implement them effectively.<sup>16</sup>

The study on dental ergonomics in 2015 revealed that more than half of the participants support the idea of adjusting operator chair height for optimal posture, and about one third believe that using new ergonomic stools can prevent low back pain. Dentists who exclusively practice in a seated position reported experiencing more severe low back pain.<sup>17</sup> The study underscored the significance of adjusting the operator stool before the patient's chair to prevent posture issues, noting that a common mistake is adjusting the patient's chair first. Comparison with standard chairs in the study showed they reduced lumbar lordosis and increased strain on the spine.<sup>18</sup> Furthermore, 54.7% of respondents disagreed with the notion that dental chair ergonomics is unnecessary for maintaining the operator's neutral position, underscoring the importance of ergonomic considerations in dental practice.

Dentists' occupational activities, involving frequent hand use and repetitive forces on the wrists, pose a risk of musculoskeletal disorders (MSDs). The current study indicates varied opinions on the impact of instrument knurling, with 40% disagreeing and highlights the importance of precise hand instrument

angulations according to 72% of respondents. The repetitive nature of dental work increases the risk of MSDs in the hands.<sup>19</sup> Ergonomic measures, such as magnification, are acknowledged for reducing the risk of MSDs by improving vision.<sup>20</sup> Dentists' perspectives on the criticality of proper light positions vary (50.7% disagree), while 64% recognize the benefits of surgical loupes and digital microscopes. Stretching exercises are recommended for dentists, emphasizing the need for simplicity and low intensity.

## CONCLUSION

Dental professionals reveals diverse perspectives on the applicability of ergonomic principles. While opinions differ on the linkage between musculoskeletal disorders, wrong equipment ergonomics, and dental chair relevance, there is consensus on the importance of factors like accessibility during procedures and the role of sharp instruments. Positive sentiments surround the effectiveness of ergonomic stools and the benefits of surgical loupes and digital microscopes. Dental professionals consider that ergonomics should be the part of curriculum. The findings emphasize the need for increased awareness and education on ergonomic practices in dentistry to foster a more uniform adoption of these principles among practitioners.

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#### CONFLICT OF INTEREST

Authors declare no conflict of interest.

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#### AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	FM, RQ
Acquisition, Analysis or Interpretation of Data:	FM, RQ, FK
Manuscript Writing & Approval:	FM, RQ, FK

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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