

Knowledge, Awareness, and Practices about Ergonomics among Dental Postgraduate Students – A Cross Sectional Study

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Abstract

Introduction: The knowledge pertaining to ergonomics is vital for preventing musculoskeletal disorder. A proper work posture should be inculcated in dental clinical practice to prevent such health hazards.

Purpose: To evaluate knowledge and practices about ergonomics among postgraduate students.

Materials and Methods: A survey was conducted among the dental postgraduate students for the duration of 3 months. The questionnaire was validated and online Google forms were prepared and circulated among the postgraduate students of various dental institutes. Questionnaire was divided into three parts. Part 1 includes the demographic variables and knowledge towards ergonomics. Part 2 questions are related to awareness toward ergonomics. Part 3 being the practices of ergonomic principles by postgraduates. The resultant responses were recorded in Microsoft Excel format which formed the basic data for the study. The correlation between the source of information related to knowledge and practices about ergonomics was statistically evaluated using the Chi-square test. A *P* value < 0.05 was measured as statistically significant.

Results: On statistical analysis, there was a statistically significant correlation observed among the second and the third-year postgraduate students toward basic ergonomics compared to the 1st year.

Conclusion: Comprehensive understanding and awareness regarding the types of ergonomically equipped chairs for practicing in dental clinics among postgraduate was lacking. A proper emphasis on chair side exercise and training should be initiated to prevent any sort of musculoskeletal pains.

Key words: Ergonomics, Musculoskeletal Disorder, Postgraduates, Work posture, Ergonomic Assessment

INTRODUCTION

Dental practice requires knowledge and experience of dental procedures with greater precision and accuracy. That necessitates the dental operator's focus, concentration, and patience along with physical and mental resilience. In an ergonomic setting, performing a therapeutic approach and effective practice involve clear working conditions for the dentist and the assistant.

“Ergonomics” is defined as a collection of multidisciplinary knowledge applied to the organization of labor activities and elements that make up work. The key purpose behind the ergonomic principles is to establish a safe, healthy, and comfortable working atmosphere for dental practitioners, thereby preventing health problems which in turn improve productivity.^[1] When ergonomic principles are applied in dentistry, it aims to minimize cognitive and physical distress, prevent occupational diseases related to dental practice, and increase efficiency with enhanced quality and comfort for both the professional and patient.^[2]

Maintaining a proper posture imparts the dentist with more energy to work, reduced stress level, and increased comfort. It is understood that a “good” posture produces more working energy, lowers the stress level, increases comfort, and lowers the risk for therapeutic errors. A “bad”

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posture is known to cause fatigue, stress, and a negative attitude to work, high-risk for musculoskeletal disorders, and a poor job quality.^[2]

Musculoskeletal disorders are characterized by the presence of discomfort, and persistent pain in the joints, muscles, tendons, and soft parts, aggravated by repeated movements and prolonged awkward or forced body postures.^[3] Work-related musculoskeletal disorders are one of the primary occupational health risk affecting dentists.^[1] Studies demonstrate that among the wide range of musculoskeletal disorders, back pain is the most common among dentists.^[4] Incorrect working posture can potentially lead to loss of productivity and earning. Therefore, it is essential to install an appropriate working condition and magnification to improve visibility.^[5] Despite the huge risk to the health of dentist, as well dental students, they show unsafe work practices and lack basic ergonomics knowledge.^[6] Good ergonomic practice can prevent the dentist from early retirement.^[1]

Postgraduates undergo a complex educational experience in dental sciences. The residents of the entire specialty are expected to be trained well clinically on patients. All these factors add on to ergonomic circumstances. After a literature search was performed to find the topics pertaining to knowledge, attitude, and awareness among postgraduate toward ergonomics was at sparse. Hence, the objective of the present study is to evaluate the knowledge, attitude, and awareness of postgraduate students toward ergonomics and to compare the practices followed by different postgraduate across various dental institutes in day to day practice.

MATERIALS AND METHODS

The present study is a cross-sectional questionnaire-based study which was conducted among the dental postgraduate students of various dental colleges across India for the duration of 3 months. Ethical clearance was obtained from the Institutional review board of KAHER'S KLE VK Institute of Dental Sciences and Hospital, Belagavi. A total of 240 postgraduates made up the sample for the study. The study objectives were explained and informed consent was obtained from the participants before the questionnaire through online forms. Participants who did not give their consent to participate in the study were excluded from the study. A self-prepared questionnaire was given to the participants in the format of online forms and they were asked to fill the questionnaire as per their convenience. If any problem arises while filling the questionnaire form, it was immediately solved by the investigator during the period of the study.

The questionnaire consists of 25 closed-ended questions and one open-ended question to evaluate their knowledge, awareness, and attitude toward ergonomics. The questionnaire was divided into two parts, first part contains the demographic details which include gender and professional background. Second part includes a general understanding of ergonomics, application of ergonomics in clinical practice, effective methods and tools in implementing proper ergonomics in clinical practice, and some suggestions related to ergonomics were also invited. The individual responses from each participant were recorded and tabulated on an excel template and subjected to statistical analysis to draw the conclusion from the resultant data. The data were analyzed and Cronbach's alpha coefficient was used to test the alpha value and reliability. Chi-square test was used to assess the relationship between demographic profile with the levels of knowledge, awareness, and attitude among postgraduate with a significance level of $P < 0.05$.

RESULTS

A total of 240 participants answered the questionnaire. As mentioned in Table 1, about 148 (61.67%) were female and about 92 (38.33%) were male. The highest number of subjects were from 1st year of MDS 113 (47.08%) followed by 3rd-year 67 (27.92%) and 2nd-year 60 (25.00%).

The distribution of questions and scores related to knowledge are shown in Table 2. While comparing the association between the gender and knowledge regarding the use of poor fitting gloves used in the dental procedure,

Table 1: Demographic details

Demographic profile	No of respondents	% of respondents
Gender		
Female	148	61.67
Male	92	38.33
Year of MDS course		
1 st year	113	47.08
2 nd year	60	25.00
3 rd year	67	27.92
Total	240	100.00

Table 2: Questionnaire regarding Knowledge toward ergonomics

Questions	Correct answers
What is the preferred position of operator while working in maxillary arch	84.17%
What is the preferred position of operator while working in mandibular arch	73.33%
Does poor fitting gloves hinder during your treatment procedure	79.17%
How ergonomics can be applied in dentistry	80.83%

there is a statistically significant difference found between them when calculated according to the Chi-square test, as shown in Table 3 ($P = 0.003$).

Subjects when asked questions related to awareness, about 121 (67.22%) female responders believed that emphasis regarding the equipment ergonomics is less in the present dental curriculum and a statistically significant difference was found between the subjects [Table 4] ($P = 0.004$). Furthermore, when questioned regarding the correct chair

positing while operating on the patient, 2nd- and 3rd-year postgraduates were more aware when compared to 1st-year postgraduates [Graph 1]. Of 240 male and female subjects, only 211 (87.92%) participants were aware of correct chair positing, nearly 2 (0.83%) participants were unaware of chair positing and unfortunately, 9 (3.75%) subject choose the option that correct chair positing does not matter to them. However, as such, there is no statistically significant difference found in the responses between male and female ($P = 0.1603$) [Graph 2].

Table 3: Association between gender and knowledge about ergonomics

Does poor fitting gloves hinder during your treatment procedure?	Male	%	Female	%	Total	%	Chi-square	P value
Yes	62	32.63	128	67.37	190	79.17	14.249	0.0030*
No	5	83.33	1	16.67	6	2.50		
Maybe	3	50.00	3	50.00	6	2.50		
Sometimes	22	57.89	16	42.11	38	15.83		

$P < 0.05$

Table 4: Comparison between gender and awareness about equipment Ergonomics

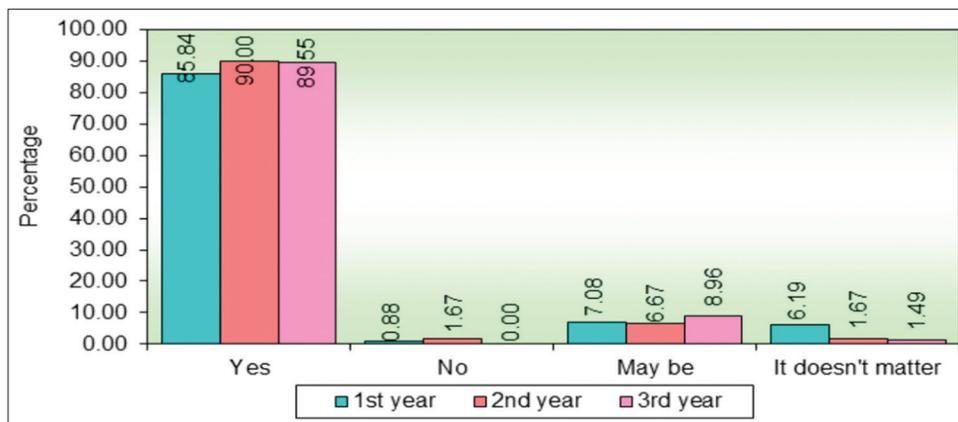
Emphasis about equipment ergonomics is less in the present dental curriculum	Male	%	Female	%	Total	%	Chi-square	P value
Don't know	25	51.02	24	48.98	49	20.42	11.191	0.0040*
No	8	72.73	3	27.27	11	4.58		
Yes	59	32.78	121	67.22	180	75.00		
Total	92	38.33	148	61.67	240	100.00		

$P < 0.05$

Table 5: Association of gender and attitude about Ergonomics

Do you prefer taking rest in between the procedures?	Male	%	Female	%	Total	%	Chi-square	P value
Yes	40	33.06	81	66.94	121	50.42	10.881	0.0040*
No	26	60.47	17	39.53	43	17.92		
Sometimes	26	34.21	50	65.79	76	31.67		
How do you prefer to work?								
Depends on procedure	38	32.76	78	67.24	116	48.33	12.110	0.0070*
Sitting	25	45.45	30	54.55	55	22.92		
Standing	7	22.58	24	77.42	31	12.92		
All of above	22	57.89	16	42.11	38	15.83		

$P < 0.05$



Graph 1: Association between year of MDS course and awareness about the correct chair positioning while operating a patient

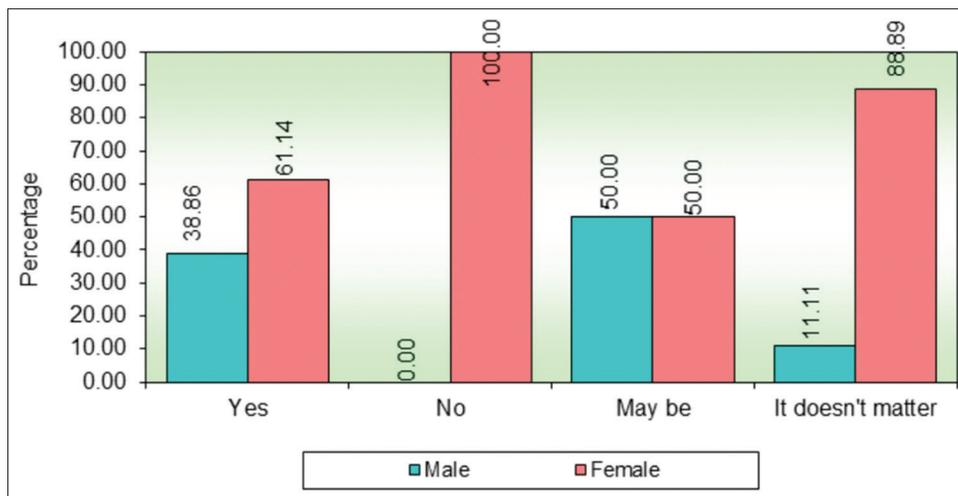
Distribution of questions related to attitude, as shown in Table 5. Using the Chi-square test, a statistically significant difference was found between male and female subjects ($P = 0.004$) when enquired if the subject prefers taking rest in between the dental procedure. Most of the respondents, 116 (48.33%) prefer working according to the dental procedure performed by them in dental clinics, 55 (22.92%) subjects preferred to sit and perform the routine dental procedures, 31 (12.92%) subjects prefer to stand and perform the dental procedure.

Of 240 postgraduates, most of the postgraduates work for more than 2–4 h daily. The average time taken by 2nd- and 3rd-year students for routine dental treatment was more than 2–4 h [Graph 3]. When the compared association between gender and average time taken by them for routine dental treatment, no statistically significant difference was found between them [Graph 4] ($P = 0.4800$).

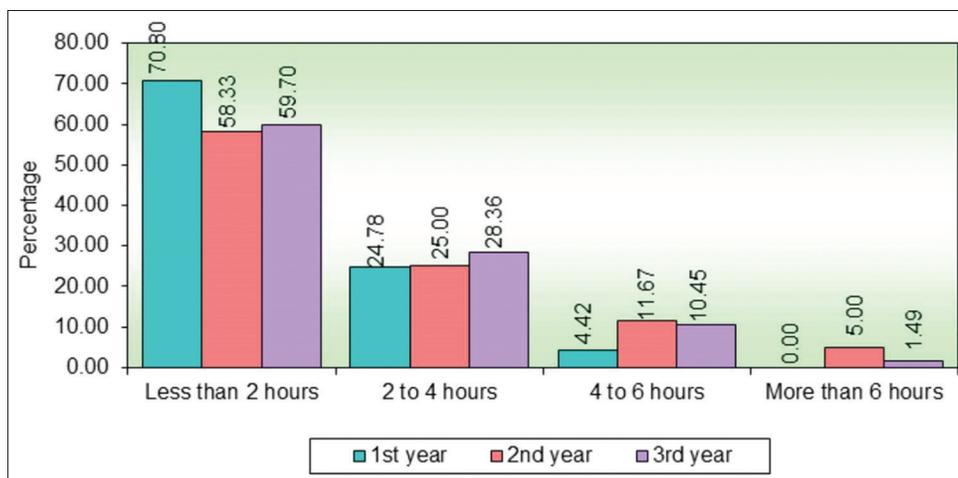
DISCUSSION

Maintaining good body postures helps to reduce the energy expenditure, improves function, and protects the individual from an occupational hazard.^[7] When applied to dentistry, ergonomics aims reducing the cognitive and physical stress, prevent occupational conditions linked to the practice of dentistry, and increases the performance, with improved quality and superior comfort for both the dental professionals and the patients.

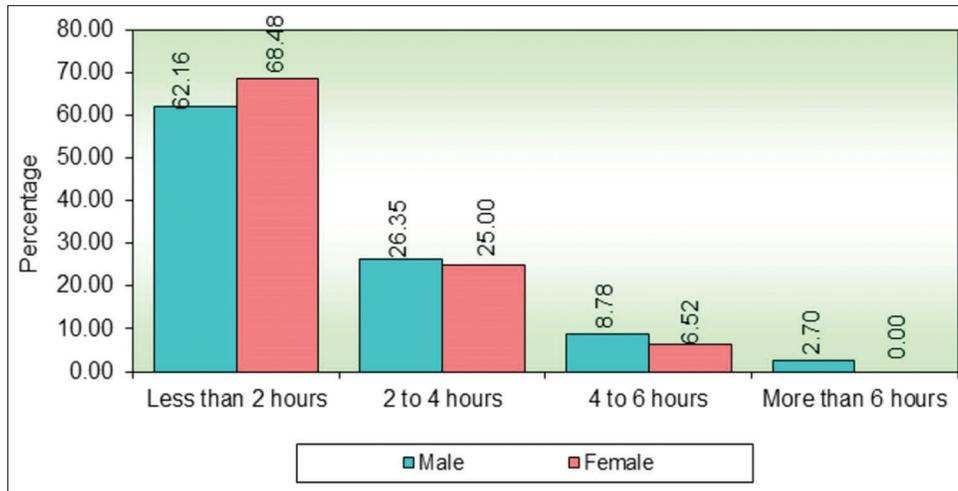
In the recent dental literature, musculoskeletal injuries related terminologies have arisen with an increased frequency. A symptom for musculoskeletal pain includes pain, swelling, tenderness, numbness, and loss of strength. Mechanism of musculoskeletal pain includes prolong static posture of the human body which initiates pain, causes injury, and ceases the workflow. To prevent the occurrence of musculoskeletal injuries, self-contemplation and



Graph 2: Association between gender and awareness about the correct chair positioning while operating a patient



Graph 3: Association between the year of MDS course and average time taken for routine dental treatment



Graph 4: Association between the gender and average time taken for routine Dental treatment

recognition by the dentists in relation to their own postures, practicing positions, and equipment usage pattern is the first critical step. Such identification will aid in avoiding these risk factors.^[8]

In the Indian context, where the number of practicing dentist is increasing, there is a continuous prevalence of musculoskeletal injuries.^[4] Ergonomics has always been neglected as a knowledge and attitude point of view, as well it is not the part of dental curriculum in undergraduate as well as postgraduate as proposed by Dental Council of India.^[9] As a result, the knowledge of ergonomics is dissipated using informal means only.^[4] This necessitates the evaluation of knowledge, awareness, and practices toward ergonomics among postgraduate students during their routine dental procedures. Therefore, the current cross-sectional questionnaire study was conducted to assess the postgraduates regarding the ergonomic principles and has uncovered interesting and hidden areas of this dynamic field. In our study, we found that about 62.50% of responders were aware of the ergonomic principles.

When noticed, the majority of the respondents (80.83%) applied ergonomics to dentistry as instruments, equipment, and work posture. This, in general, demonstrates that postgraduate students understand ergonomics as something important, which may benefit their health in the near future.^[10] Many postgraduates did recommend that the ergonomic should be supervised by the professors specializing in the area during their clinical activities.

The use of operating stool is complex and is misunderstood among the postgraduates. Dental professionals sit for more than 80–100% of the day in a chair with weak lumbar support and inadequate adjustability, which predisposes them to lower back pain.^[11] In our study, about 43.01% of

postgraduate were unaware of the saddle and triple-shaped ergonomically designed stool.

Following a correct work posture is fundamental in delivering optimal dental treatment.^[12] About 78.75% of respondents in our study had a proper knowledge of the operator's positing while working in maxillary as well as mandibular arch.

In the present study, about 50.42% responders preferred taking microbreaks in between the procedures and which improved their work productivity and about 25% of the responders did practice chairside exercise in between the procedures. Certain chair side exercise was emphasized by *Shipra Gupta* such as un-twister, trunk rotation, and reversal exercises that can be practiced as microbreaks to improve the working efficiency.^[13]

Rhodej *et al.* emphasized the use of proper size and fit gloves does influence hand comfort.^[14] It has been sited that the use of improper gloves does cause carpal tunnel syndrome.^[15] The risk factor prevailing this condition is the repetitiveness of work, mechanical stress, posture, temperature, and vibration.^[16] In this study, when queried, about 79.19% responded that the use of ill-fitting gloves does hinder the treatment procedure.

Long-term maintenance of poor posture can result in chronic muscle pain. Standing involves a different group of muscles, alternating two positions allows one group to rest and the workload is shifted to another group of muscles. Practicing alternative methods between standing and sitting can be an effective tool in reducing fatigability.^[17]

Many of the participants in our study were right-handed. A correct seating position is between 9'o clock to 12'o clock

for a right-handed operator, whereas for the left-handed operator, 3'o clock to 12'o clock position is preferred.^[18]

Many responders in our study did agree that working in an incorrect posture can affect in the long run. Hence, a proper postural parameter should be followed. Sitting in an upright symmetrical position, legs slightly apart, and forearms lightly elevated ensures a correct working posture.

In our study, it was found that many of the postgraduates were interested in learning about the recent ergonomic posture through various platforms. Many of them recommended for live demonstrations, workshops, and training to reduce work fatigability. Few responders also mentioned that the ergonomics should be a part of the daily curriculum and should be included as a syllabus in undergraduate as well postgraduate. Further studies must be conducted among the postgraduate on practical training workshops to prevent the early establishment of postural vices.

CONCLUSION

Four-handed dentistry is an ergonomically efficient way to provide good dental care, leading to an increase in efficiency and productivity of a person in improving the workability toward dental treatment.^[19]

Our study concluded that there is an acceptable level of knowledge and awareness found regarding ergonomics in various dental institutes. The attitude of participants regarding ergonomics is appreciable. Postgraduates should work toward the proper establishment of ergonomic posture in clinics and should influence others too in practicing dentistry in an effortless way.

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