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## Assessment of knowledge, attitude and practices towards postural management during dental practices among dental students

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### Abstract

**Introduction:** Ergonomics is an applied science concerned with designing product and procedures for max efficiency and safety and concerns itself with improving the operator's efficiency and their working environment. The aim of this study was to assess the knowledge, attitude and practices towards postural management among dental students.

**Materials and Methods:** A study was conducted among the interns and postgraduate students. The structured, self-administered, close-ended questionnaire was designed to collect the data which consisted of four sections and comprised of 36 questions for assessing the knowledge, attitude and practices among these students towards postural management and to determine if a short chair-side lecture on postural management could improve their knowledge and attitude on this topic. A self-assessed checklist was used for evaluation of ergonomics which was filled by observing the participants in clinical setting.

**Results:** In this study, there were a total of 30 participants between 21-30 years of age. Before giving the knowledge, around 83.3% of the participants were aware of the importance of ergonomics in clinical dentistry and after giving knowledge, 96.7% of the participants became aware of the same. Only 43.3% of the participants followed correct dental chair position before imparting the knowledge which increased to about 63.3% after that.

**Conclusion:** The dental students maybe more prone to musculoskeletal disorders (MSD) and maintaining proper ergonomic principle in their early years of practice will prevent them from future chronic MSD.

**Keywords:** Dental Students, Ergonomics, Occupational Overuse Syndrome, Postural Management, Repetitive Stress Injury, Work-Related Musculoskeletal Disorders.

### Introduction

Ergonomics is a discipline of science concerned with understanding the interaction between humans and other elements of the system in order to optimize human well-being and system performance. The word "ergo" is derived from the Greek word "ergon" meaning work and "nomos" meaning laws-essentially meaning the laws of work or science of work. Ergonomics aims to optimize the interaction between the work and the worker<sup>[1]</sup>. Ergonomics is particularly relevant to preventive and occupational medicine, management of injuries relating to the musculoskeletal system and their rehabilitation<sup>[2]</sup>. It aids in understanding the limitations of people within the working area and find ways to perform effectively within the working environment<sup>[3]</sup>. Ergonomics in dentistry is defined as scaling down stress-both cognitive and physical, preventing occupational injuries leading to improved efficiency, better quality of care and greater comfort for the patient and practitioner. The term musculoskeletal disorder (MSD) refers to disorders of the musculoskeletal system to which the work environment significantly contributes to or musculoskeletal injuries that are worsened by repetitive injuries due to the workplace conditions. Work-related musculoskeletal disorders (WRMSD) are a common occurrence among dental professionals due to the work in restricted field, awkward and static positions, usage of excessive force, precise repetitive hand and wrist movements and limited visibility<sup>[4]</sup>.

WRMSD occur due to repetitive work activities which are normally not hazardous, but when tissue loading progressively exceeds its anatomical and physiological limits, have the capacity to turn dangerous. Such situations may cause overuse syndromes like Cumulative Trauma Disorder (CTD), Repetitive Strain Injuries (RSI), and Occupational Overuse Syndrome (OOS). CTD, RSI, and OOS are WRMSDs which are defined as micro traumatic events that build up in the body as a consequence of workplace characteristics that have the potential to turn into a serious injury or a MSD<sup>[5]</sup>. When repetitive injuries or tissue loading occurs, persistence of symptoms become recurrent and chronic in nature. In such situations, tissue healing gets impaired as repeated exposure to risk factors cause re-injury. Injuries as a result of WRMSD may be reduced or even prevented by the application of ergonomics in designing the equipment and instruments. Some studies negatively correlate musculoskeletal pain with the years of experience, thus hypothesizing that more experienced dentists avoid such postures by adjusting their workplace accordingly or that the dentists who experience severe MSD leave the profession. This therefore suggests that dental students maybe prone to manifest early signs of WRMSD<sup>[6]</sup>. Thus, good working knowledge of ergonomics is essential to maintain work efficiency and capacity for the duration of the work life of the dental professionals. The scope of ergonomics ranges from tactile, visual, auditory, and olfactory elements and the treatment environment (consisting of the patient chair, operator chair, operating light, instruments, both motor and hand driven instruments, and cabinetry) should be flexible. Good working posture, sufficient lighting, easy access to instruments and materials must be adapted and more importantly, inculcated in the dental professionals' right from the time they start their clinical work during their training years.<sup>3</sup> Therefore, the aim of this study was to assess knowledge, attitude, and practices of dental students towards postural management during dental practices among dental students.

### Materials and Methods

A study was conducted among the interns and postgraduate students in Pune, a metropolitan city of Maharashtra. The aim of this study was to assess the knowledge, attitude and practices among these students towards postural management and to determine if a short chair side lecture on postural management could improve their knowledge and attitude on this topic. The input parameters for sample size calculation using G\*power software version 3.1.9.2 (Heinrich Heine University, Düsseldorf) was as follows: 80% power of study, alpha error 0.5, effect size 0.8 and degree of freedom 5. The calculated sample size was 24. The convenient sampling technique was used in study. The final considered sample size for study was 30. A questionnaire was prepared, language used was English. The questionnaire was pretested and validated among 20 subjects to check the reliability and variability, and these subjects were not included in the final analysis. The structured, self-administered, close-ended questionnaire was designed to collect the data which consisted of four sections and comprised of 36 questions. There was two weeks gap between before and after analysis. The

duration of the study was about three weeks. The first section consists of demographic data such as name, age, gender, education. The second section included questions related to assess the knowledge of the participants. The third section consisted attitude based questions and the final section included clinical practice based questions. The reliability statistics were calculated and the Cronbach Alpha was 0.602. The questionnaire was designed on Google form (Google LLC, Mountain View, California United States) and the link was distributed among the participants via email, Whatsapp, and other social media platform. A self-assessed checklist was used for evaluation of ergonomics which was filled by observing the participants in clinical setting. The data collected was entered into spread sheet in (Microsoft excel, 2016). Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) 23.0 version software (IBM Chicago, Illinois, United States). The p-value was set at 5%.

### Results

In Table 1, there were a total of 30 dental students participated in the study. The age group varied between 21 to 30 years. Out of 30 participants 8 participants were male and there were 22 female participants. Majority of participants were interns (24) and remaining (6) were postgraduate students. In Table 2, 83.3% of the participants were aware of the importance of ergonomics in clinical dentistry and after giving knowledge 96.7% of the participants became aware of the same. About 83.3% of the participants were aware of the correct right-handed operator position and after giving knowledge 96.7% of the participants became aware of the same.

In Table 3, around 40% of the participants were aware of the term RSI and after giving knowledge 96.7% participants became aware of it. Before giving knowledge 56.7% participants knew about MSD and after it 100% of the participants became aware of it. In Table 4, before giving knowledge 43.3% of the participants followed correct dental chair position and after that 63.3% of the participants started following correct dental chair position. 20% of the participants were sought medical advice for MSD and after giving knowledge, 53.3% of the participants were sought medical advice. In Table 5, before giving knowledge 76.6% of the participants used proper illumination and after that 90% of the participants used proper illumination. Before giving knowledge only 6.6% of the participants stretched during breaks and after it 80% of the participants stretched during breaks.

**Table 1:** Demographic Details of Study Participants (N=30)

Sr. no.	Demographic details	Responses	Number (N)	Percentage (%)	Total N (%)
1	Age (in years)	15-20	0	0	30 (100)
		21-25	27	90	
		26-30	3	10	
2	Gender	Male	8	26.7	30 (100)
		Female	22	73.3	
3	Education	Undergraduate	0	0	30 (100)
		Intern	24	80	
		Postgraduate	6	20	

**Table 2:** Knowledge Related Questions’ Responses of Study Participants (N=30)

Sr. no.	Questions	Responses	Number (N)		Percentages (%)		Total N (%)
			Before	After	Before	After	
1	Are you aware of the term ergonomics?	Yes	23	30	76.7	100	30 (100)
		No	7	0	23.3	0	
2	Which among the following are TRUE ergonomics principles?	Work in neutral postures and at proper height	1	0	3.35	0	30 (100)
		Reduce excessive force and motions	1	0	3.35	0	
		Minimize fatigue, static load and pressure points	0	0	0	0	
		Provide clearance and keep everything in reach	0	0	0	0	
		All of the above	28	30	93.3	100	
3	Do you know the importance of ergonomics in clinical dentistry?	Yes	25	29	83.3	96.7	30 (100)
		No	5	1	16.7	4.3	
4	Which are the preferred operating positions for a right handed operator?	7’o clock, 9’o clock, 11’o clock	25	29	83.3	96.7	30 (100)
		5’o clock, 3’o clock, 1’o clock	3	0	10	0	
		10’o clock, 2’o clock, 6’o clock	0	0	0	0	
		Don’t know	2	1	6.7	4.3	
5	Which are the preferred operating positions for a left handed operator?	5’o clock, 3’o clock, 1’o clock	17	26	56.7	86.7	30(100)
		7’o clock, 9’o clock, 11’o clock	3	2	10	6.7	
		10’o clock, 2’o clock, 6’o clock	4	1	13.3	3.3	
		Don’t know	6	1	20	3.3	
6	Which of the following statements regarding the direct rear position is TRUE?	It refers to the 12’o clock position	4	0	13.3	0	30(100)
		Working areas are the lingual surfaces of the mandibular anterior teeth	1	0	3.35	0	
		Both of the above	22	30	73.3	100	
		Don’t know	3	0	10	0	
7	Which of the following statements are TRUE?	Level of teeth being treated should be at the same as the operators elbow	25	30	83.3	100	30(100)
		Level of teeth being treated should be above the level of operator’s elbow	2	0	4.17	0	
		Level of teeth being treated should be below the level of the operator’s elbow	2	0	4.17	0	
		Don’t know	1	0	0.8	0	
8	Why is the sitting position for operator preferred?	To relieve stress on operator’s legs	2	0	6.7	0	30(100)
		To support the operator’s back	1	0	3.3	0	
		Both a and b	27	30	90	100	
		Don’t know	0	0	0	0	
9	The function of finger rests is:	Stabilize the hand	0	0	0	0	30(100)
		Stabilize the instrument	5	0	16.7	0	
		Both a and b	25	30	83.3	100	
		Don’t know	0	0	0	0	
10	Finger rests are:	Intraoral	1	0	1.7	0	30(100)
		Extra oral	2	0	8.3	0	
		Both	27	30	90	100	
11	Which of the following statements regarding vision and illumination is TRUE?	Indirect vision is obtained using mouth mirror	27	30	90	100	30(100)
		Indirect illumination is not obtained using mouth mirror	0	0	0	0	
		Indirect vision and indirect illumination are never used simultaneously	2	0	8.3	0	
		Don’t know	1	0	1.7	0	

**Table 3:** Attitude Related Questions’ Responses of Study Participants (N=30)

Sr. no	Questions	Responses	Number (N)		Percentage (%)		Total N (%)
			Before	After	Before	After	
1	Are you aware of the term “Occupational overuse syndrome (OOS)” /” Repetitive strain injuries (RSI)”?	Yes	12	29	40	96.7	30(100)
		No	18	1	60	3.3	
2	Are you aware of the relationship between improper posture and musculoskeletal disorders (MSD)?	Yes	17	30	56.7	100	30(100)
		No	13	0	43.3	0	
3	Do you think doing small stretching exercises in between appointments and regular everyday exercise/yoga reduces the risk of developing musculoskeletal disorders (MSD)?	Yes	28	29	93.3	96.7	30(100)
		No	2	1	6.7	3.3	
4	Ergonomics should be included in the BDS/UG curriculum	Strongly agree	24	29	80	96.7	30(100)
		Agree	6	1	20	3.3	
		Neutral	0	0	0	0	

		Disagree	0	0	0	0	
		Strongly disagree	0	0	0	0	
5	Finger rests reduce muscle stress and prevent injury due to muscle fatigue.	Strongly agree	11	20	36.7	66.7	30(100)
		Agree	18	10	60	33.3	
		Neutral	1	0	3.3	0	
		Disagree	0	0	0	0	
		Strongly disagree	0	0	0	0	
6	Sitting position for operator is preferred in modern dentistry for overall operator ease and comfort	Strongly agree	8	17	26.7	56.7	30(100)
		Agree	15	13	50	43.3	
		Neutral	7	0	23.3	0	
		Disagree	0	0	0	0	
7	Adequate illumination of the working field helps in preventing eye injury in the long term.	Strongly agree	11	19	36.7	63.3	30(100)
		Agree	14	11	46.7	36.7	
		Neutral	4	0	13.3	0	
		Disagree	0	0	0	0	
8	There is a strong correlation between improper posture and musculoskeletal disorders (MSD)	Strongly agree	14	24	46.7	80	30(100)
		Agree	14	6	46.7	20	
		Neutral	2	0	6.7	0	
		Disagree	0	0	0	0	
		Strongly disagree	0	0	0	0	

**Table 4:** Practice related questions’ responses of study participants (n=30)

Sr. no.	Questions	Responses	Number (N)		Percentage (%)		Total N (%)
			Before	After	Before	After	
1	Which is your dominant hand while practicing dentistry?	Right	28	28	93.3	93.3	30(100)
		Left	2	2	6.7	6.7	
2	What kind of dental practice do you follow?	Sitting	8	8	26.7	26.7	30(100)
		Standing	1	1	3.3	3.3	
		Both	21	21	70	70	
3	Does your clinical workplace follow ergonomics principles?	Yes	11	11	36.7	36.7	30(100)
		No	19	19	63.3	63.3	
4	Do you have enough space at your workplace?	Yes	14	14	46.7	46.7	30(100)
		No	16	16	53.3	53.3	
5	Do you have sufficient light for clear vision at your workplace?	Yes	18	17	60	56.7	30(100)
		No	12	13	40	43.3	
6	If you practice sitting dentistry, is the operator’s stool ergonomically regulated for your individual needs?	Yes	11	10	36.7	33.3	30(100)
		No	19	20	63.3	66.7	
7	While operating, how accessible are your instruments from your operating position?	Readily accessible, within arm’s reach and with a straight line access	8	9	26.7	30	30(100)
		Accessible, no straight line access but within close reach	18	19	60	63.3	
		Accessible, no straight line access, with excessive turning required causing strain over prolonged operating time	4	2	13.3	6.7	
8	Have you experienced pain during or after using vibratory instruments (high speed air rotor, scalers etc.)?	Yes	22	22	73.3	73.3	30(100)
		No	8	8	26.7	26.7	
9	How often do you follow correct dental chair /patient’s position and operator’s position?	Always	13	19	43.3	63.3	30(100)
		Sometimes/Often	15	11	50	36.7	
		Rarely	2	0	6.7	0	
		Never	0	0	0	0	
10	Have you experienced musculoskeletal pain after long operating time before?	Yes	27	27	90	90	30(100)
		No	3	3	10	10	
11	How often do you experience pain in shoulders, back, extremities etc.?	Always	15	14	50	46.7	30(100)
		Sometimes/Often	10	11	33.3	36.7	
		Rarely	5	5	16.7	16.7	
		Never	0	0	0	0	
12	Where do you experience pain most commonly?	Neck, back and shoulders	26	26	86.7	86.7	30(100)
		Hands and wrists	4	4	13.3	13.3	

		Feet	0	0	0	0	
		Hips	0	0	0	0	
13	If you have previously experienced musculoskeletal pain, have you taken medical advice for the same?	Yes	6	16	20	53.3	30(100)
		No	24	14	80	46.7	

**Table 5:** Checklist Used For Evaluation of Ergonomics (N=30)

Sr.no	Evaluation criteria	Observations seen	Number (N)		Percentage (%)		Total N (%)
			Before	After	Before	After	
1	Use of proper illumination	Yes	23	27	76.6	90	30(100)
		No	7	3	23.4	10	
2	Overall visibility of operating area	Yes	20	26	66.6	86.6	30(100)
		No	10	4	33.4	13.4	
3	<b>Finger rest placed</b>						
	Intraoral	Yes	17	25	56.6	83.3	30(100)
		No	13	5	43.4	16.7	
	Extra oral	Yes	21	10	70	33.4	30(100)
No		9	20	30	66.6		
4	<b>Patient /chair position</b>						
	Chair position correct	Yes	13	28	43.3	93.3	30(100)
No		17	2	56.6	6.7		
5	<b>Type of dental practice while operating on patients</b>						
	Sitting	Yes	21	21	70	70	30(100)
		No	9	9	30	30	
	Standing	Yes	11	11	36.6	36.6	30(100)
No		19	19	63.3	63.3		
6	<b>Operator position</b>						
	Is elbow level of operator same as level of chair?	Yes	9	25	30	83.3	30(100)
		No	21	5	70	16.7	
	Is the orientation of operator correct?	Yes	16	27	53.3	90	30(100)
		No	14	3	46.7	10	
Leg position (thighs parallel to the floor and feet planted to the floor) correct?	Yes	7	17	33.3	89.4	30(100)	
	No	14	2	66.6	10.5		
7	<b>Accessibility to instruments</b>						
	Readily accessible	Yes	10	11	33.4	36.6	30(100)
No		20	19	66.6	63.4		
8	<b>Operating time</b>						
	Duration of operating time (<30minutes)	Yes	14	6	46.6	20	30(100)
		No	16	24	53.3	80	
	Duration of operating time (>30minutes)	Yes	16	24	53.3	80	30(100)
		No	14	6	46.6	20	
Number of breaks taken (1 time)	Yes	27	22	90	73.3	30(100)	
	No	3	8	10	26.7		
Number of breaks taken (>1)	Yes	4	8	13.3	26.7	30(100)	
	No	26	22	86.6	73.3		
Number of times operator gets up from chair (1-3 times)	Yes	21	18	70	60	30(100)	
	No	9	12	30	40		
Number of times operator gets up from chair(>3times)	Yes	9	12	30	40	30(100)	
	No	21	18	70	60		
Does the operator stretch during breaks	Yes	2	24	6.6	80	30(100)	
	No	28	6	93.4	20		
9	Dominant hand used	Yes	28	30	93.3	100	30(100)
		No	2	0	6.7	0	
10	Is the operator using the correct chair in accordance with the dominant hand?	Yes	28	30	93.3	100	30(100)
		No	2	0	6.7	0	

**Discussion**

Ergonomics is an applied science concerned with designing product and procedures for max efficiency and safety. Ergonomics concerns itself with improving the operator's efficiency and there working environment.<sup>8</sup> Proper ergonomic design takes into consideration the workers capability and limitations to ensure that the operator and the work station

complement each other to work in unison to prevent RSI which may develop overtime and lead to WRMSD<sup>[8]</sup>. Dental professionals work in restricted fields, requiring them to sit in an awkward and static position, carry out repetitive wrist and hand movements use excessive force, strain on their vision to visualize the narrow/restricted working field.

This study highlights the established facts that WRMSD is a

concerned for students in their training years and despite the advantages of ergonomics it is still a much-disregarded subject from both an academical and practical point of view. As of yet ergonomics is yet to be included in Bachelor of Dental Surgery curriculum according to the Dental council of India guidelines therefore the knowledge of ergonomics is imparted in a non-formal way and thus arises the need for evaluation of awareness attitude and practices towards the principle of ergonomics among dental students. The finding of this study report that 6.67% of the participants have an adequate knowledge of ergonomics, around 80% have fair knowledge, and 13.34 % have poor knowledge scores in the before part of the study. After the short chair-side lecture, the participants were asked to fill the questionnaire again after a period of two weeks, and the new questionnaire reported that 73.34% of the participants had good knowledge score, 26.67% of the participants had adequate knowledge score and there were no participants scoring in the lower knowledge score ranges. Barlian *et al.* reported results about good knowledge scores to be at 52.6%<sup>[12]</sup>. Shri vardhan *et al.* reported a high knowledge of 52%<sup>[13]</sup>. Madhan and Chaudhary *et al.* conducted a study regarding the overall awareness of ergonomics in dentistry among dental students reported lower scores around 19%<sup>[14]</sup>. The limitation of this study was the small size population considered. Hence, the study can be done using a large population with different variables of topic in various locations of India.

### Recommendations

1. Educate dental students regarding ergonomics and inculcate in them the habit of following proper ergonomic principles.
2. Dental students must be made aware of the consequences of not following proper ergonomic principles and how it may lead to WRMSDs which will decrease their quality of life in the long term.

### Conclusion

The proper use of ergonomics should be inculcated in the dental practitioners since their training years so as to prevent WRMSDs and maintain healthy work-life during the course of their practices.

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