

**Assessment of knowledge, attitude, practice of ergonomics musculoskeletal disorder among dental students in Chennai city.**<sup>1</sup>Dr. Sunil Kumar, BDS, Undergraduate Student, Tagore Dental College and Hospital.<sup>2</sup>Dr. Navin Bharathy, MDS, Senior Lecture, Department of Prosthodontics ,Tagore Dental College And Hospital.<sup>3</sup>Dr. Narasimman M, MDS, Reader of Department of Prosthodontics, Tagore Dental College and Hospital.<sup>4</sup>Dr. Rathinavel Pandian M, MDS, Reader of Department of Prosthodontics, Tagore Dental College and Hospital.<sup>5</sup>Dr. C. J. Venkat Krishnan, MDS, Head, Department of Prosthodontics, Tagore Dental College and Hospital.**Corresponding Author:** Dr. Sunil Kumar, BDS Undergraduate Student, Tagore Dental College and Hospital.**Citation of this Article:** Dr. Sunil Kumar, Dr. Navin Bharathy, Dr. Narasimman M, Dr. Rathinavel Pandian M, Dr. C. J. Venkat Krishnan, “Assessment of knowledge, attitude, practice of ergonomics musculoskeletal disorder among dental students in Chennai city”, IJDSIR- May - 2023, Volume – 6, Issue - 3, P. No. 386 – 393.**Copyright:** © 2023, Dr. Sunil Kumar, et al. This is an open access journal and article distributed under the terms of the creative common's attribution non-commercial License. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.**Type of Publication:** Original Research Article**Conflicts of Interest:** Nil**Abstract****Aim:** The aim of this study to assess and determine the knowledge, attitude, practice about ergonomics and musculoskeletal disorder among dental students in Chennai, India.**Methodology:** The list of Chennai's dental colleges was obtained. Using a convenience sampling technique, one dental school was chosen, and with the principal's approval, an online self-made questionnaire using a Google Form was sent to the estimated sample size of 361 dental students and they were asked to complete it. The study lasted for three months, and the resultant responses were recorded in Microsoft excel format, which formed the basis for the study's statistical analysis.**Results /Analytical statistics:** The validity and reliability of a self-administered questionnaire used in a

pilot trial with five dental practitioners were evaluated using Cronbach's alpha analysis, the value of Cronbach's alpha scale was 0.975, The degree of education and the year of the study were correlated using the Spearman coefficient, and the majority of the questions show a positive relationship with increasing year.

**Conclusion:** While most of the dental students in this study were aware of musculoskeletal disorders and dental ergo nomics, Even though there were lack of know ledge in second year and third year than other years. This study urges academic institutions to incorporate dental ergonomics into their curricula.**Keywords:** Ergo nomics, Musculo skeletal disorder, dental students and early retirement**Introduction**

Dental practice may result in physical injuries such as pain and dysfunction, muscular imbalance, neuro

muscular inhibition. Instead of one risk factor alone, the reason appears to be a combination of several risk variables. Poor ergonomics could be caused by prolonged static posture, repetitive movements, mental stress, mechanical stress, extrinsic stress, age, awkward positions, poor posture, poor postural muscle strength, poor flexibility, infrequent breaks, inappropriate selection and use of dental stools and magnification aids, vibration, cold temperature, and other factors. [1]

“A collection of multidisciplinary knowledge used to organize labor activities and other components of work is known as ergonomics. The main goal of ergonomic principles is to create a safe, healthy, and comfortable working environment for dental professionals. This will help to prevent health issues, which will increase productivity [2]

An MSD, according to the World Health Organization, is a chronic condition that doesn't manifest itself as an acute or momentary disturbance of the muscles, tendons, peripheral nerves, or vascular system. These disorders are considered as work-related when the workplace and work performance play an important role in the development of the disorder, even though this is only one of many contributing factors. [3].

A questionnaire survey of early retired dentists from a British insurance company found that MSD were the major cause of ill health retirement at 55%. According to a recent study, musculoskeletal disorders were the primary cause of retirement for 189 dentists [4]. The latest report in the field of task and movement analyses found that dental work was largely characterized by unfavorable static postures of the neck, back and shoulders [5,6,7]. It has been reported that 64-93% of dentists and 70% of dental students suffer from WMSDs and additionally they are at risk of neurovascular and postural disorders [8].

Most of the dental students agreed that WMSDs are the common reason for early retirement to practice [9]. Furthermore, Garcia et al. 2015 found no relationship between dental student knowledge and practice in terms of ergonomic working posture [8]. The majority of students recognized the need for an adjustment period when moving from the pre-clinic to the clinic in terms of ergonomic posture requirements; however, some of them claimed that they were still unable to adapt because of the difference between the laboratory and clinic workstations [10]. This led to the development of a study to evaluate dental student knowledge, attitude, and practice in relation to ergonomics and musculoskeletal disorders in Chennai dental colleges.

### **Materials and methods**

In Chennai dental colleges, a cross-sectional survey of dental students was undertaken. After receiving ethical permission (IEC/ TDCH/ 021/ 2023, Code number 0703 2203), the study was carried out for a period of three months. This survey required a minimum sample size of 305 responses which was calculated by using G-power software, version 3.1.9. Convenience sampling was the sample approach employed.

### **Sample size**

The G-power software, version 3.1.9, was used to determine sample size,

- 5% is the level of significance,
- Power - 80%,
- 0.2 effect size,
- 305 participants total,
- 61 in each group.

### **Inclusion criteria**

- Dental students studying in Chennai dental colleges.
- Willing to provide consent for interview.

### **Exclusion criteria**

- Unwilling to provide consent for interview.

## Questionnaire

- ❖ First section consisted of informed consent, emphasized about the study and demographic details which include age, gender and year of the study.
- ❖ There were remaining 3 section and each 3-section consisted of 10 questions which were related to knowledge, attitude and practise.
- ❖ Each group comprised 61 members and was divided into five categories, ranging from second year to post graduate.

## Pilot study

- The self-made questions was sent to five dental professional to calculate the reliability and validity, Cronbach alpha scale was used to calculate the validity and reliability
- The value of Cronbach alpha scale was 0.97.

The self-administered questionnaire by using google form were distributed to the students through what's app and asked to complete it and responses were collected by Microsoft excel, 2016.

## Statistical analysis

The data from the questionnaire were obtained in the Microsoft excel, 2016 and further the descriptive and the inferential statistics were performed using IBM, SPSS (Statistical Package for Social Sciences) version 26.0. The inferential statistics for assessing the correlation between the degrees of education from second year to post graduate and their knowledge, attitude and practice on ergonomics and musculoskeletal disorders were assessed with the spearman correlation coefficient test. P value of  $\leq 0.05$  is considered to be significant.

## Results

This cross-sectional study demonstrates that there were an equal number of participants in each year from the second year to the postgraduate level, with a higher percentage of female participants (64.6) than male participants (35.4).

Figure 1: shows the distribution of study participants according to gender.

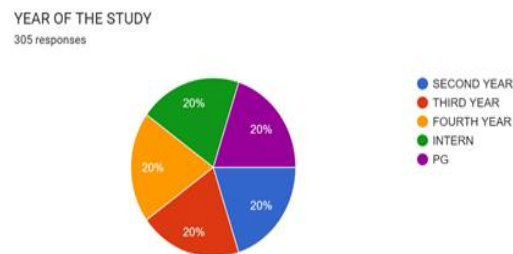


Figure 2: shows the distribution of study participants according to year of the study.

Table 1: Descriptive characteristics of the study population.

Variables	Description
Age (Mean $\pm$ S.D)	22.23 $\pm$ 2.48
Gender {n (%)}	
Male	108 (35.4)
Female	197 (64.6)
Degree of education {n (%)}	
Second year	61 (20)
Third year	61 (20)
Fourth year	61 (20)
Internship	61 (20)
Postgraduate	61 (20)

Each group had 61 people and was split into five groups, from postgraduate to second year. Female participants are higher than male participants.

Table 2: Correlation statistics between the degree of education and their knowledge, attitude and practice-based responses towards the ergonomics and musculoskeletal disorder

S.no	Correlated variables	Correlation Coefficient	Sig.
	<b>Degree of education</b>		
	<b>Practice based questions</b>		
1	Do you follow ergonomics according to dental procedure in your dental practice	.465**	.000
2	Do you follow exercise to manage musculoskeletal disorder?	.347**	.000
3	Do you use surgical loupes / dental microscope in your dental procedure?	.045	.435
4	Are you aware about carpal Tunnel syndrome, tendonitis, epicondylitis, bursitis, which caused due to poor ergonomics?	.506**	.000
5	What type of dental chair used in your dental practice?	.191**	.001
6	Are you aware about fixed body position, repetitive movements, Prolonged use of vibrating hand tools which causes musculoskeletal disorder?	.421**	.000
7	Do you follow four handed dentistry in your dental practice?	.364**	.000
8	Do you take break in between the dental procedure?	.261**	.000
9	What type of sitting position do you follow while treating patient in dental chair?	.339**	.000
10	Have you previously diagnosed for musculoskeletal disorder?	-.242**	.000
	<b>Attitude based questions</b>		
1	Do you think single handed dentistry is one of the reasons that causes musculoskeletal disorder (MSD)?	.223**	.000
2	Is it necessary to follow ergonomics while treating patient?	.372**	.000
3	Does the instruments in good condition (like sharp instruments rather than blunt/ dull instrument) Helps to reduce chair side working time?	.295**	.000
4	Do you think adequate break between the treatment is necessary to reduce musculoskeletal disorder (MSD)?	.218**	.000
5	Do you think lower back pain is caused due to the poor ergonomics	.304**	.000
6	Do you think naked eye is enough for precise dental treatment procedure?	.151**	.008
7	Do you think Improper patient Chair position is one of the reasons that causes Musculoskeletal disorder	.251**	.000
8	Do you think Poor knowledge about procedure technique is one of the reasons that causes Musculoskeletal disorder	.139*	.015
9	Do you think paying more attention Is necessary for ergonomics in Dentistry?	.296**	.000
10	Do you think modifying the workplace as per your likelihood will reduce fatigue?	.110	.056
	<b>Knowledge based questions</b>		

1	Which patient position is the effective way by which operator achieves neutral posture?	.199**	.001
2	Which clock range is referred to as transfer zone in right-handed dentist?	.146*	.011
3	What type of the vision is optimal to follow for inaccessible areas while treating patient?	.144*	.013
4	What is the intensity ratio between dental operatory light and room lighting?	.146*	.011
5	What is the syndrome associated in musculoskeletal disorder?	.206**	.000
6	Carpal tunnel syndrome is caused due to compression of	-.040	.491
7	What is the optimal positioning of oral cavity for general dental practice?	.298**	.000
8	What is the light line position for optimal illumination?	.296**	.000
9	What is the ideal operator clock position range for right-handed dentist?	.377**	.000
10	Which clock range is referred as assistant zone for right-handed dentistry?	.283**	.000

Spearman correlation coefficient test was used for significance testing.

\*\*Correlation is significant at the 0.01 level

\*Correlation is significant at the 0.05 level (2-tailed).

The level of education from second year to postgraduate was tested for correlation with all other knowledge, attitude and practice-based questions related to musculoskeletal disorders and ergonomics.

Among which the positive responses were coded with higher values when compared to the negative responses in knowledge and practice-based questions. And in attitude-based section 4-point Likert scale is used to obtain the responses.

Spearman correlation coefficient test was used for significance testing which reveals that the majority of responses shows a positive correlation with increasing year.

In practice section Q.NO 3 has negatively correlated with degree of education. In knowledge section Q.NO 6 had negatively correlated with degree of education.

Most of the students were not aware about following MSDs in (fig 3), already very few people had diagnosed with MSD in (fig 4), most of the students were not using surgical loupes and dental microscope in (fig 5), In fig 6 shows most of the students were agreed to need more attention towards ergonomics in dentistry.

Figure 3: bar graph shows most of the students were not aware about following MSDs

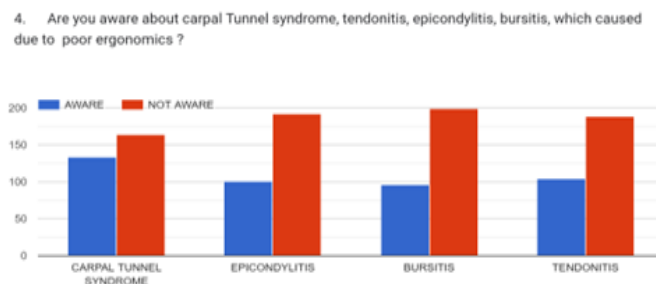
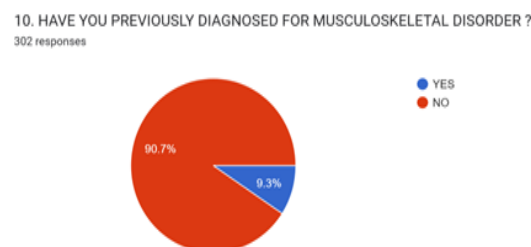


Figure 4: pie chart shows already few students (9.3%) diagnosed with MSD most of the yes response recorded from post graduate students.



3. DO YOU USE SURGICAL LOUPES / DENTAL MICROSCOPE IN YOUR DENTAL PROCEDURE ?

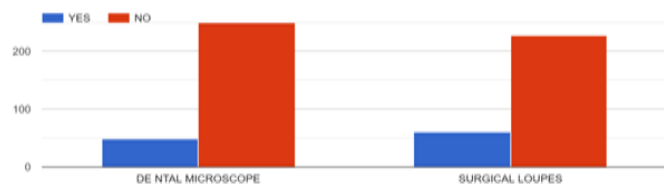


Figure 5: bar graph shows most of the students were not using dental loupes and dental microscope

9. Do you think paying more attention is necessary for ergonomics in Dentistry ?

305 responses

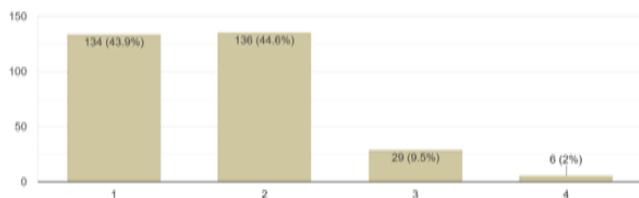


Figure 6: bar graph shows most of the students were agreed to give more attention to the ergonomics in academic curricula (1- strongly agreed, 2- Agreed, 3- disagreed, 4- strongly disagreed)

## Discussion

In this study the majority of students who answered, had knowledge that improved with degree of education, even though a small portion of the questions in this study (such as the use of a dental microscope, using surgical loupes, and MSD conditions) had insufficient student knowledge and practice.

According to standards set by the Dental Council of India, clinical experience for dental students began in their third year of study. In third year, dental students began performing general dentistry treatments like scaling, restorations, extractions, and prosthetic tooth replacement without the aid of a dental assistant. All auxiliary tasks, including keeping the work environment sanitary, manipulating dental materials, and processing X-rays, were carried out solely by the students. It could cause MSDs in a variety of body parts, depending on the surroundings and the type of work they did. [11]

There was distinction between the clinical training workstation and the preclinical training workstation. This was due to the fact that the workstation in a laboratory was restricted to a fixed bench, lighting, and a dental stool, as opposed to a clinic, which has a dental chair, dental stool, lighting, a dental unit, an auxiliary table, and other components. As a result, treating patients in their mouths was more stressful for students than treating a preclinical dental mannequin because of the adaptation difficulty [12, 13,14] and 70% of dental students, regardless of gender, suffered pain during third year [15]

In this study female students are higher than the male students this is because female students were more interested in this study. Our investigation found that little knowledge about carpal tunnel syndrome, tendonitis, bursitis, epicondylitis which is identical to the study done by Hamid Reza Farpour.et al.,2021.

Deliberato.et al., in his study (2002) divided the musculoskeletal disorder into two groups where the pathophysiology of Dort influences in each group. These groups are.

1. Compressive neuropathies: where the nerve is compressed by some structure through which it travels, in the vast majority affect the limbs. Within this group, we can highlight the thoracic outlet syndrome, syndrome of the longus, syndrome of the round pronator, carpal tunnel syndrome, syndrome of previous interosseous syndrome, and cubital canal syndrome and channel of gut on
2. Tendonitis and tenosynovitis are inflammatory conditions that weaken tendons and their sheaths as a result of demands. Among these conditions, De Quervain's disease, trigger finger, lateral epicondylitis, tendonitis bicipital, supra-thorny tendinitis, and tendonitis of the distal biceps are notable.



In our investigation, the majority of dental students were unaware about tendonitis. According to Livia Maria dos Santos Landi. et al., 2016 most of dental students were diagnosed with Tendonitis due to regular use of wrist in flexion position when performing procedures for tooth extraction and restoration, which caused headaches and complained of numbness in the state. The prevalence of CTS has increased significantly during the past 20 years. Several professions were linked to CTS, including those in the health professions, dentist, office and administrative assistance. [18] The lack of knowledge regarding carpal tunnel syndrome among Chennai dental students was cause for caution.

Utilizing magnification equipment like loupes and surgical microscopes were options to alleviate ergonomic concerns in dentistry, which is another crucial finding of this study. These devices enhance eyesight and provide the ability to change or choose the working distance based on the operator's physical needs.[19,20] In this study, the majority of preclinical students and interns did not use dental loupes or dental microscopes, and some postgraduate students agreed that they had previously been diagnosed with MSD and almost all students were agreed that more attention was needed in ergonomic dentistry curriculum, which was similar to the study conducted by Patricia Petro milli Nordi Sasso Garcia et.al.,

### Limitation

This study's potential limitations include the fact that it was conducted during a stressful time for students, the university exam period, and the need for higher sample sizes.

### Conclusion

MSDs have a complicated etiology (posture, positioning, muscle imbalance, dental equipment, stress), and treating the cause has been shown to be more beneficial

than treating the symptoms. Despite the fact that the majority of the dental students in this survey were aware of dental ergonomics and musculoskeletal illness, there were more knowledge gaps between the second and third years of dental school than other years. This study recommends that educational institutions should include dental ergonomics in their curriculum. Graduate and undergraduate students should receive ergonomics-related program courses.

### Reference

1. Ketkar, G. N. and Malaiappan, S. (2020) "Knowledge Attitude and Practice of Ergonomics and Musculoskeletal Disorders as an Occupational Hazard among Periodontists in India – A Questionnaire Based Survey", Journal of Pharmaceutical Research International, 32 (20), pp. 162–183. doi: 10.9734/jpri/2020/v32i2030739.
2. Deolia S, Dubey S, Chandak A, Patni T, Padma war N, Sen S. Application of ergonomic postures during routine dental procedures in a private dental institute. Dent Med Res 2018; 6:41-5
3. Identification and control of work-related diseases: report of a WHO expert committee. World Health Organ Tech Rep Ser 1985;174: 7-11.
4. Brown J, Burke FJ, Macdonald EB, Gilmour H, Hill KB, Morris AJ, et al. Dental practitioners and ill health retirement: causes, outcomes and re-employment. Br Dent J. 2010;209(5): E7.
5. McNee C, Kieser JK, Antoun JS, Bennani H, Gallo LM, Farella M. Neck and shoulder muscle activity of orthodontists in natural environments. J Electro myography Kinesiol. 2013; 23(3):600–7
6. Ohlendorf D, Erbe C, Hauck I, Nowak J, Hermanns I, Ditchen D, et al. Restricted posture in dentistry - a kinematic analysis of orthodontists. BMC Musculoskeletal Disord. 2017;18(1):275.

7. Sakzewski L, Naser-ud-Din S. Work-related musculo skeletal disorders in dentists and orthodontists: a review of the literature. *Work* (Reading, Mass). 2014; 48 (1): 37–45.
8. Gharekhani S, Tirgar A, Seyyed M, Gholinia H. An interventional ergonomics program assessment of dental students. *Biosci. Biotech. Res. Comm.* 2016 Dec 25; 9(4): 814-20.
9. Kumar PM, Sahitya S, Penmetsa GS, Supraja S, Kenga Daran S, Chaitanya A. Assessment of knowledge, attitude, and practice related to ergonomics among the students of three different dental schools in India: Original research. *J Educ Health Promot.* 2020 Oct 30; 9:266. doi: 10.4103/ jehp. jehp\_208\_20. PMID: 3328 2971; PMCID: PMC7709776.
10. Hallak JC, Ferreira FS, de Oliveira CA, Pazos JM, Neves TDC, Garcia PPNS. Transition between preclinical and clinical training: Perception of dental students regarding the adoption of ergonomic principles. *PLoS One.* 2023 Mar 9;18(3):e0282718. doi: 10.1371/ journal. Pone .0282718. PMID: 36893155; PMCID: PMC 9997885.
11. Anu V, Babu AS, Kumar PM. Insights about dental ergonomics among dental students: The need of the hour to recommend dental ergonomics in academic curriculum. *Journal of Advanced Oral Research.* 2018 May; 9(1-2):49-54.
12. Haralur SB, Al-Malki AE. Student perception about efficacy of preclinical fixed prosthodontic training to facilitate smooth transition to clinical context. *Journal of Education and Health Promotion.* 2014; 3:73. pmid: 250 77166
13. Hell EAV, Kuks JB, Schönrock-Adema J, van Lohuizen MT, Cohen-Schotanus J. Transition to clinical training: influence of pre-clinical knowledge and skills, and consequences for clinical performance. *Med Educ.* 2008 Aug;42(8):830–7. pmid:18564098
14. Prince KJ, Boshuizen HP, van der Vleuten CP, Scherpbier AJ. Students’ opinions about their preparation for clinical practice. *Med Educ.* 2005 Jul; 39 (7): 704–12. pmid:15960791
15. Rising DW, Bennett BC, Hursh K, Plesh O. Reports of body pain in a dental student population. *The Journal of the American Dental Association.* 2005 Jan 1;136 (1): 81-6.
16. Far pour HR, Nasiri A, Sadighi A, Dehghanian KS, Ahmed F, Taghrir MH, Al-shami E, Al-naggar K. Assessment of Knowledge, Attitudes, and Practice (KAP) Among Dentists toward Carpal Tunnel Syndrome in Shiraz, Iran.
17. dos Santos Landim LM, Lopes JM, de Sousa GF, de Oliveira SM, Vieira AC, Batista HM, Fachine EM. The Musculoskeletal Difficulties in Dental Professionals. *Amadeus International Multidisciplinary Journal.* 2016 Oct 18;1(1):14-37.
18. Aljunaid N, Alzahrani A, Hegazy A, Altassan K. Demographic and Occupational Risk Factors of Carpal Tunnel Syndrome among Dental Students in their Final Year at King Abdulaziz University, Jeddah, Saudi Arabia. *Int J Occup Hyg.* 2021;13(4):300-312.
19. Arens DE. Introduction to magnification in endodontics. *J Esthet Restor Dent* 2003; 15:426-39.
20. von Arx T, Hunenbart S, Buser D. Endoscope- and video -assisted endodontic surgery. *Quintessence Int* 2002; 33(4):255-9.
21. Garcia PP, de Araujo Gottardello AC, Presoto CD, Campos JA. Ergonomic work posture in undergraduate dentistry students: Correlation between theory and practice. *Journal of Education and Ethics in Dentistry.* 2015 Jul 1;5(2):47.