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**KNOWLEDGE, ATTITUDE AND PRACTICE OF ERGONOMICS
AMONG POSTGRADUATE DENTAL STUDENTS - A CROSSECTIONAL
QUESTIONNAIRE STUDY**

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ABSTRACT

Introduction:

In dentistry, musculoskeletal disorders are more common because of prolonged sitting hours and chair positions. To prevent musculoskeletal disorders, ergonomics must be exercised in a correct manner. The successful application of ergonomics ensures higher productivity, prevention of illnesses and greater satisfaction among dentists. In contrast, unsuccessful application might result in work-related

musculoskeletal disorders (MSDs). Since postgraduate students are more exposed to cases in a college setting, they are more prone for musculoskeletal disorders.

Aim and objectives:

To assess the knowledge, attitude and practice of Ergonomics among postgraduate dental students by knowing their chair positions, time spent in clinical practice and musculoskeletal disorders.

Methodology:

A cross-sectional survey was conducted among 136 postgraduate dental students of different specialties. Each student was asked to fill self administered questionnaire regarding ergonomics. The questionnaire consisted of a total of 12 questions and circulated through google forms. The questionnaire gathered data on demographics, MSDs, work hours, working conditions, ergonomics awareness, etc. Software from SPSS version 20 was used to analyze the data. Chi-square test was used for comparison in mean scores.

Results:

It was found that 112 (82%) of the participants work more than 8 hours in clinical practice within the week and 85 (63%) of the participants reported neck pain, back pain and shoulder pain. Almost 122 (90%) of dental postgraduates were aware of correct ergonomic postures. Most of the participants, i.e., 114 (84%) wants ergonomics to be a part of dental curriculum.

Conclusion:

Musculoskeletal problems were quite common among dental students and professionals. The prevalence of bad posture emphasizes the need to emphasize ergonomic education even more.

Keywords: Risk factor(s), Practice management, Pain, Occupational Dentistry, Lifestyle(s), Evidence- based dentistry/health care

INTRODUCTION:

Occupational health hazards are widespread and getting worse in many different industries. One clear hazard is musculoskeletal dysfunction (MSD), which is a serious and expensive workplace problem [1]. Dentists are healthcare professionals expected to execute highly skilled tasks that involve extended periods of sitting. They inevitably have a higher chance of developing musculoskeletal disorders (MSDs) at work, which can be brought on by lengthy

workdays, incorrect posture, and repetitive, unnatural movements [2].

In Greek, 'Ergo' means work and 'Nomos' means natural laws or systems. Ergonomics can be defined as 'an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely' [3]. Ergonomics is the branch of science that deals with the knowledge of interactions between humans and other components of a system.

Ergonomics refers to the study and analysis of the anatomical and psychological aspects of human capabilities and limitations during professional employment. The location of the dental team, the working space design, the dental equipment, and the cooperation between the dentist and the dental assistant within four-handed dentistry are the ergonomic components of dentistry that need to be discussed in connection to the occupational environment [4].

World Health Organization defines musculoskeletal disorders as “disorders of the muscles, tendons, peripheral nerves or vascular system not directly resulting from an acute or sudden trauma” [5]. Pain and dysfunction in the hands, neck, and back are common symptoms of MSDs, which have a significant negative impact on an operator's productivity [6]. While occasional backaches and neck aches are not cause for concern, but ignoring persistent pain or discomfort might result in physiological damage or injuries over time, which could cause limitations that could end a career [7].

Dentistry profession naturally involves prolonged static postures (PSP). During clinical practice, it's usual to adopt awkward postures that entail leaning forward and repeatedly rotating the head, neck, and torso to one side. PSP causes stress on the muscles,

and because of the prolonged contraction and subsequent tiredness, the muscles are also vulnerable to ischemia. Damaged tissues are typically restored while you're sleeping or otherwise resting. However, because to insufficient rest times, the degree of injury surpasses the rate of healing, potentially resulting in muscle necrosis. The body adjusts by using a different muscle to maintain posture in an effort to shield the stressed area from more discomfort or damage. This is called "muscle substitution" [8]. A variety of MSDs may arise as a result of this self-sustaining loop, in which the tighter muscles get further tighter and the weaker muscles get even weaker.

Dental ergonomics has become more popular as a result of attention being paid to MSDs and potential links to the dental profession. This applied science focuses on creating workstations, dental tools, products, and processes that are as safe and effective as possible. Its overarching goal is to assist the dentist in maintaining proper operational posture, hence preventing or reducing the occurrence of work-related MSDs [9].

Postgraduate students in dental sciences encounter a challenging educational process. A high level of clinical patient training is anticipated of all speciality residents. These additional considerations increase the

ergonomic conditions. Literature search on topics pertaining to knowledge, attitude, and awareness among postgraduates toward ergonomics was at sparse. Therefore, the objective of this survey was carried out to evaluate knowledge, attitude and practice of ergonomics among post-graduate students about proper ergonomic practice.

METHODOLOGY:

It was a cross sectional questionnaire-based study conducted among post graduate dental students. This study followed the STROBE guidelines protocol. Study comprised of 136 post-graduate students. Samples size of 135 was calculated using G power computer program. A clearance from the Institutional Ethical Committee was acquired before the study got started. Study period was 6 months. Informed consent were taken for the study. The inclusion criteria are the postgraduate dental students of different specialities. The exclusion criteria are medical students, undergraduates, general practitioners. Our objective was to assess the knowledge, attitude and practice of Ergonomics among postgraduate dental students by knowing their chair positions, time spent in clinical practice and musculoskeletal disorders. Each student was asked to fill self administered questionnaire regarding ergonomics. The questionnaire consisted of a total of 12

questions and circulated through google forms. The patient responses were assessed primarily in terms of frequency distribution of various “Yes/No” answers (**Table 1**).

Procedure:

Study was conducted in Department of Periodontology, SVDC Puducherry. A set of questions were prepared by mutual discussion within the department. The questionnaire used by previous studies were used as starting point of discussion and were adapted accordingly. Questions were based upon chair positions of operator, time spent in clinical practice and musculoskeletal disorders. External and Internal validation of questions done. Questionnaire will be circulated through google forms and responses will be obtained. Responses will be statistically analyzed. No followup as it is only a response questionnaire.

Statistical Analysis:

Statistical analysis was performed by using descriptive and inferential statistics using chi-square test for single proportion. Software used in the analysis was SPSS version 20 software. $p < 0.05$ is considered as level of significance.

Results:

56 postgraduates are upto the age of 25 and 79 postgraduates are above the age of 25 (**Graph 1**). 75(55%) male postgraduate students and

60(44%) female postgraduate students participated in the study (**Graph 2**). 57(42%) postgraduate students were pursuing first year MDS, 42(31%) postgraduate students were pursuing second year MDS and 36(26.6%) postgraduate students were pursuing third year MDS (**Graph 3**).

From the results (**Graph 4**), it was found that 82% of the participants works more than 8 hours in clinical practice within the week. 57% of the participants work with an assistant. More than 90% of the participants adjust operator chair or patient chair for visibility and support. 86% of the participants are aware of different operating positions for different quadrants. 67% of the participants take breaks during lengthy procedures. 80% of the participants already know that ergonomics play a vital role in dentistry. Only 44% of the participants feel numbness in their fingers while performing the procedure and the other 56% participants doesn't feel numbness in their fingers while performing procedure. 63% of the participants reported neck pain, back pain and shoulder pain. 10% of the participants have systemic diseases related to orthopedic or metabolic disorders. 46% of the participants are aware of stretching exercises that can be done in clinical hours. 31% of the participants take analgesics to relieve pain and it seems like most of the participants doesn't

feel like taking analgesics. More than 84% of the participants want ergonomics to be a part of dental curriculum.

DISCUSSION:

Ergonomics is the discipline of fitting workplace conditions and job demands to the capabilities of the working population. When applied to dentistry, ergonomics aims to reduce mental and physical strain, prevent occupational disorders associated with dentistry, increase productivity, and provide both the dentist and the patient with better quality and comfort. In the recent dental literature, MSD related terminologies are cropping up with an increased frequency, and its reported prevalence rate is remarkably high. It has been detected among dentists worldwide that low back problems are the most prevalent, followed by problems of the hand and wrist, neck and shoulders with more than one-third requiring medical care for MSDs and also requiring extended leave from their practice [10]. To preclude the occurrence or to diminish the progression of MSD, self-recognition, and identification by the dentists in relation to their own postures, practicing position, equipment usage pattern is the first critical step. Such recognition will aid in avoiding or neutralizing these risk factors, declining the possibility of needless reduction of professional career in clinical practice [11].

According to Yamalik *et al*, gender is strongly associated with chronic complaints and seeking medical help. Women experience poorer general health and seek medical care. In the present study it was found that male suffered more from MSD as compared to females it could be due to females pay more attention to their health and well-being [12]. The percentage of dentists in the age group above 25 years showed less MSD as compared to those in the age group below 25 years, this could be due to the fact that older patients take up less patients due to increasing age or with the increase in the number of years of practice have developed better coping measures [13]. Majority of the participants work more than 8 hours within a week which makes them more susceptible to occupation-induced musculoskeletal disorders because lack of a proper physical exercise or a leisure activity before or after the complex and skilled nature of professional work [14]. It is ergonomically advised that four-handed dentistry is the most encouraging way to provide dental services because it minimizes unnecessary physical movements of the operator and speeds up the procedures. 57% of the participants work with an assistant (i.e., they practice four-handed dentistry). According to Finkbeiner *et al.*, four-handed dentistry has been shown to significantly lower stress (2000, 2001) in their

studies. The count was higher compared to the study done by Shetty *et al.* where only 27% of the dentists practiced four handed dentistry [15].

The dental chair is one of the most fundamental of all equipment in delivering optimal dental treatment. Haddad *et al.* recommended introduction of ergonomically designed chairs early in student training before the development of wrong postures. To perpetuate the neutral position, the distance between operator's eye level and patient's mouth should be approximately 12–16 inches [16]. This study gives an insight in this regard, more than 90% post graduates were aware that the chair height must be adjusted so that patient's mouth should be at operator's elbow level and 86% of the postgraduates are aware of different operating positions for different quadrants.

67% of the participants take breaks during lengthy procedures which implies that postgraduates know that long working hours without breaks can increase the operators pain [17]. Scheduling micro breaks regularly shows less discomfort among operators as it replenishes and nourishes the stressed structures. Muscle contraction and pain is seen to be elevated especially in the trapezius muscle due to stress. Hence appropriate stress reduction techniques need to be followed [18].

More than 80% of the participants are aware that ergonomics play a vital role in dentistry and they want ergonomics to be part of their dental curriculum. This result was same as the study carried out by Batra *et al* and Hora *et al* and higher count as compared to the studies done by Kanteshwari *et al.* and Gupta *et al.* which concludes only 50% of the respondents were familiar of ergonomics and 59.6% in another study done by Gopinadh *et al.*

44% of the participants feel numbness in their fingers while performing the procedure because the operator gives more force to the hand during the procedure and it is associated with disorders like Carpal tunnel Syndrome, Cubital tunnel syndrome, De Quervain's disease, Tenosynovitis [19]. 63% of the participants reported neck pain, back pain and shoulder pain which can lead to myofascial pain syndrome. 10% of the postgraduates have systemic diseases related to orthopedic or metabolic disorders which will be a triggering factor for them to develop pain while doing clinical work. Shoulder region pain can lead to rotator cuff problems, thoracic outlet syndrome and tendonitis "Trigger points" in the muscles and restricted motion are some of the symptoms seen [20]. Thermal, mechanical and chemical treatments to reduce pain and restore muscle function and 46% of the participants are aware of stretching exercises

that can be done in clinical hours to reduce pain. 31% of the participants take analgesics to relieve pain which means the pain is unbearable and they are in compulsion to take medications. Strict followup of ergonomic principles can avoid this problem which will be a betterment to the dentists.

The lack of inculcating the ergonomics in the study curriculum in India necessitates that the dental faculty to make prudent efforts in creating awareness of the importance of dental ergonomic principles. The attainment of this cognizance can be obtained at any time however early assimilation of knowledge and internalization of dental ergonomic principles might prevent their suffering from work related MSD. This study highlights upon the challenges and difficulties enduring in completing the decades-long paradigm shift to prevention and the important role to be played by the dental education community in this process. Altering the existing attitude of the faculty, students, and the dental professionals towards ergonomics is crucial in this rewarding transformation.

CONCLUSION:

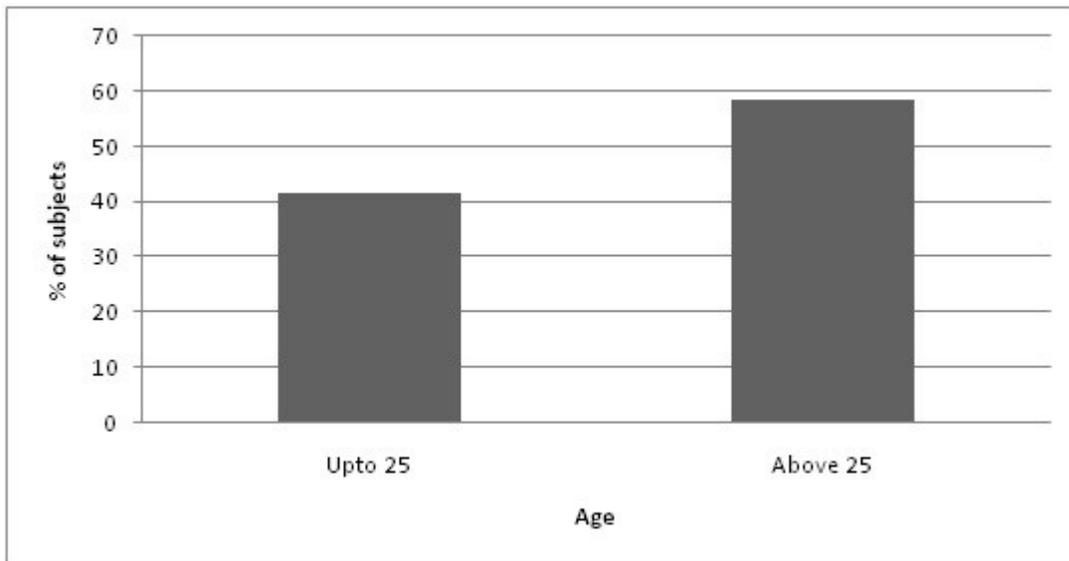
High productivity and the prevention of illnesses and injuries are guaranteed by effective ergonomics application. On the other side, a failed application may result in MSDs that are related to the workplace. If you have

ergonomic stress symptoms or find risk factors, it's imperative that you get medical help right once. Our dental practice should begin implementing proper ergonomics, and we should be able to witness the results right away in the form of less fatigue and enhanced productivity. The majority of students are knowledgeable of ergonomics and its effects. They also observed that the majority of them are not practicing four-handed dentistry and are not adhering to its applications and other factors that facilitate its reduction. This is due

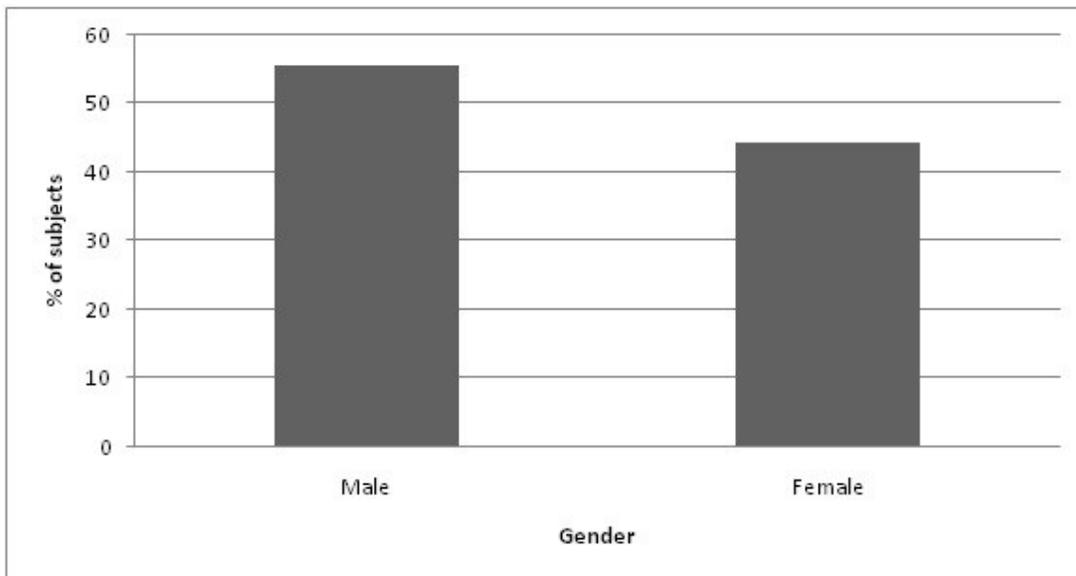
to practice with uncertain positions that involve excessive neck bending, prolonged sitting, and standing. To get the best results—less weariness and greater productivity—during clinical work, one should implement sound ergonomic principles. Promoting occupational health training and preventative programs for ergonomic postures is crucial. Changes in bad posture practices and the use of equipment that promotes healthy posture should be prioritized.

Table 1: Close ended questions

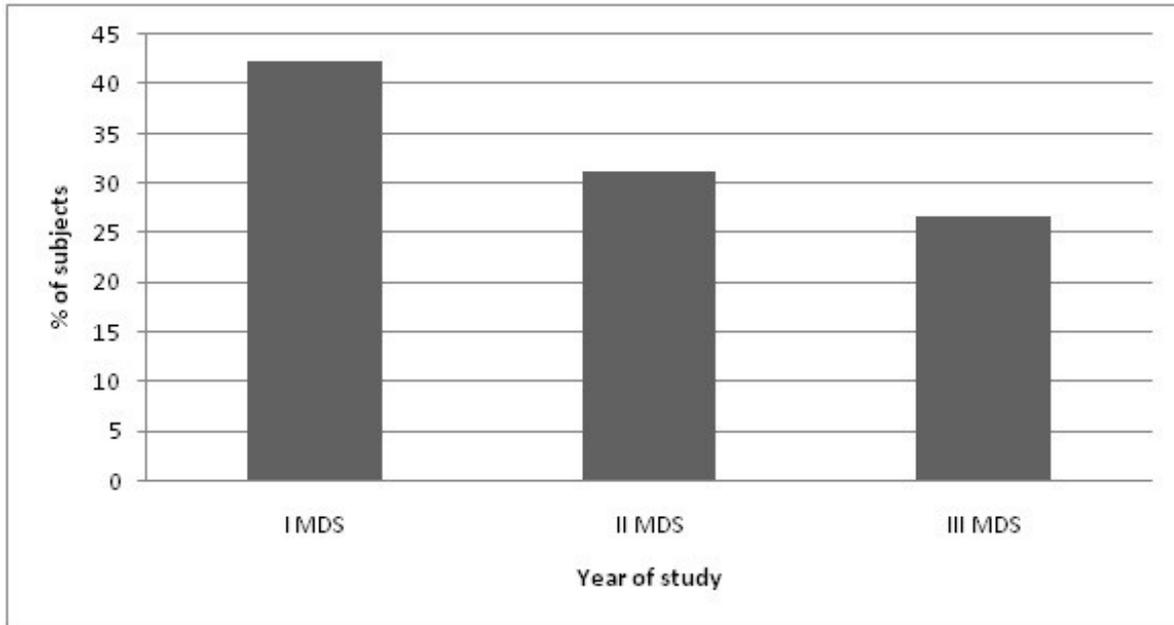
	N	%	
Do you spend more than 8 hours in clinical practice within a week?	Yes	111	82.22
	No	24	17.78
Do you work with an assistant?	Yes	77	57.04
	No	58	42.96
Do you adjust the operator chair or patient chair for visibility and support?	Yes	122	90.37
	No	13	9.63
Are you aware of different operating positions for different quadrants?	Yes	117	86.67
	No	18	13.33
Do you take breaks during lengthy procedures?	Yes	91	67.41
	No	44	32.59
Do you think Ergonomics play a major role in dentistry?	Yes	109	80.74
	No	26	19.26
Do you feel numbness in your fingers while performing a procedure?	Yes	60	44.44
	No	75	55.56
Do you often experience back pain or neck pain or shoulder pain after performing the procedure?	Yes	85	62.96
	No	50	37.04
Do you have any systemic disorders related to orthopedic or metabolic diseases?	Yes	14	10.37
	No	121	89.63
Are you aware of stretching exercises that can be done in clinical hours?	Yes	63	46.67
	No	72	53.33
Do you take any analgesics to relieve pain?	Yes	42	31.11
	No	93	68.89
Do you want Ergonomics to be a part of dental curriculum?	Yes	114	84.44
	No	21	15.56



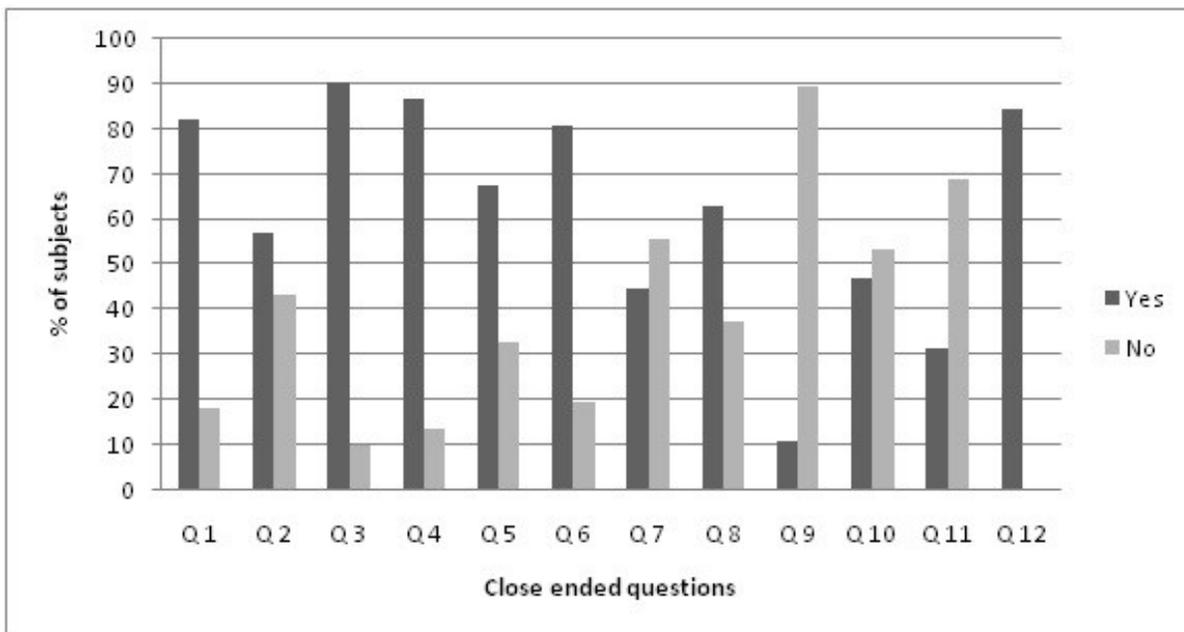
Graph 1: Showing the age of participants



Graph 2: Showing the gender of participants



Graph 3: Showing the year of study of participants



Graph 4: Showing the answers marked by participants

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