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Assessment of knowledge, attitude, and practice related to ergonomics among the students of three different dental schools in India: An original research

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Abstract:

BACKGROUND AND OBJECTIVE: Dental students and practitioners are frequently prone to work-related musculoskeletal disorders (WMSDs) due to the unawareness of ergonomic principles when practicing dentistry. The aim of this study was to assess the dental student knowledge, attitude, and practice toward ergonomics in three different dental schools.

METHODOLOGY: A cross-sectional study was conducted among 1166 dental students from three different dental schools of Andhra Pradesh, India, to assess knowledge, attitude, and practice regarding ergonomics. All the participants were provided with prestructured questionnaire form comprising 13 questions to know their knowledge, attitude, and practice related to ergonomics before and after providing guidelines on ergonomic principles.

RESULTS: The majority of the dental students appreciate that the most affected regions due to work-related disorders were back (475 before and 559 after instructions), neck (354 and 420), hand and wrist (205 and 117), and shoulder and elbow (132 and 70), respectively. Knowledge and practice scores of dental students (mean and standard deviation) regarding WMSDs before and after applying ergonomic principles were 3.92 ± 2.44 , 1.29 ± 1.67 and 5.81 ± 0.87 , 3.03 ± 0.60 , respectively.

CONCLUSION: The present study provides an insight into ergonomics for dental students during routine dental procedures. The knowledge, attitude, and practice related to ergonomics were satisfactorily increased among the participants. Thus, ergonomic education of the dental health-care personnel must be focused in all the educational institutions and at continuing dental health programs by delivering ergonomic principles both theoretically and practically and should be a part of the curriculum.

Keywords:

Attitude, dental students, ergonomics, knowledge, musculoskeletal disorders

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Introduction

Ergonomics is the scientific study of people and their working environment. Ergonomics was derived from a Greek word "Ergo" means work and "Nomos" means natural laws or systems. Ergonomics consequently is the science concerned with designing products and procedures for

maximum efficiency and safety (American Dental Association 2011).^[1]

Ergonomics in dentistry is defined as reduction in cognitive and physical stress, preventing occupational diseases, thereby improving efficiency, with better quality and greater comfort for both the practitioners and patients.^[1,2]

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Musculoskeletal disorder is the term that refers to the conditions that involve the nerves, tendons, muscles, and supporting structures of the body. When a specific job plays the main causative factor, then the term becomes work-related musculoskeletal disorders (WMSDs).^[2,3]

Dental professionals should have unique skills to perform different dental operative procedures. During these procedures, movements are repetitive and are restricted to the mouth. Working posture, long working hours, and the use of different types of instruments also play a factor to be considered among dentists while working. All the above factors consequently result in WMSDs among dentists.^[4,5]

Most of the clinicians and students often complain of uneasiness, discomfort, and lack of strength to work for long hours. Back pain, hand and wrist pain, and neck pain are the common problems associated with dental clinicians. The symptoms are definitely due to the lack of awareness in applying ergonomic principles while working.^[6,7]

In order to avoid these problems, one needs to gain awareness regarding ergonomic principles at institutional levels and also at continuous dental health programs. The maximum efficacy and safety will be achieved by providing education on ergonomics which then show a positive impact on long-term run of the profession.^[7,8]

Thus, the study aimed to assess the dental student knowledge, attitude, and practice toward ergonomics in three different dental schools, before and after providing instructions related to ergonomic principles.

Methodology

This comparative study was conducted between January 2017 and March 2018 in three dental institutions of Andhra Pradesh, India. Permissions were obtained from all the three institutional review boards before the start of the study.

All the 3rd and 4th year BDS students, interns, and 1st, 2nd and 3rd year postgraduates present during the course time of the study in the respective institutions, taken admission into a BDS and MDS course in the academic year 2013–2014 and completed at least 12 months of clinical exposure during the start of the study were included in the study. Students who were not willing to provide consent and preclinical students were excluded. A total of 1166 dental students were selected using convenience sampling, of which 835 were female and 331 were male, aged between 19 and 30 years.

The proforma was adopted from previously published studies^[5-8] and modified by taking care that it covered the basic principles in dental ergonomics. The proforma comprised of two sections. The first section collected to demographic details of the participants and the second part comprised 13 questions, of which seven were related to knowledge, three related to attitude, and three relevant to practice toward ergonomics. A pilot study was conducted among 90 students (30 from each dental school) to assess the feasibility and validity of the questionnaire. The observed Cronbach’s alpha was 0.75, which was acceptable.

The questionnaire was distributed among all the participants and data were collected. After collection of the baseline data, all the participants were provided with guidelines on ergonomics and the respective faculty in three dental schools had taken necessary steps to provide knowledge on how to apply ergonomic principles while treating dental patients.

A washout period of 14 days was given following the intervention and data was collected using the same proforma to assess and compare their knowledge, attitude and practice toward ergonomics in dental institutions [Chart 1]. The data collected were entered in MicroSoft Excel spreadsheet and analyzed using the IBM SPSS Statistics for Windows, version XX (IBM Corp., Armonk, N.Y., USA) program and compared with Chi-square test ($P < 0.05$). The results were processed by age, gender, work experience, and their knowledge, attitude, and practice related to ergonomics.

Results

The results of the study demonstrate that knowledge and practice scores of dental students (mean and standard deviation) regarding WMSDs before applying ergonomic principles were 3.92 ± 2.44 and 1.29 ± 1.67 , respectively. Whereas, the knowledge (5.81 ± 0.87) and practice scores (3.03 ± 0.60) increased after the instructions [Table 1].

Table 1: Comparing the knowledge and practice scores regarding work-related musculoskeletal disorders before and after the instructions

Time	n	Mean	SD	P
Knowledge				
Before	1166	3.92	2.44	0.000
After	1166	5.81	0.87	
Practice				
Before	1166	1.29	1.67	0.000
After	1166	3.03	0.60	

SD=Standard deviation

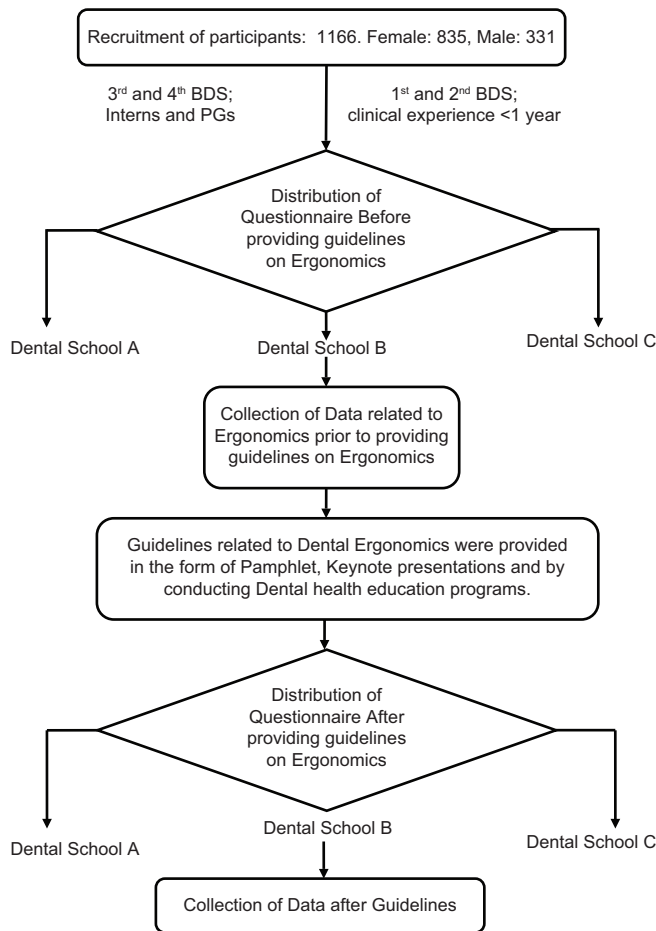


Chart 1: Flowchart sequence of methodology followed in three dental schools

The majority of the dental students appreciate that the most affected regions due to work-related disorders were back (475 before and 559 after instructions), neck (354 and 420), hand and wrist (205 and 117), and shoulder and elbow (132 and 70), respectively. Most of the dental students accepted that WMSDs are the common reason for early retirement to practice [Table 2].

There was a positive correlation (+0.737) between knowledge and practice scores among the study participants, which were found to be statistically significant. For every 1 unit increase in knowledge score, there is a 0.737 unit increase in practice score and vice versa [Table 3].

Intragroup comparison showed that there was a significant difference in both knowledge and practice scores before and after instructions across all the year dental students. Inter-group comparison showed that PGs had high knowledge and practice scores compared to interns, final years, and 3rd years. However, there was an increase in knowledge and practice scores among 3rd years, final years, and interns following the instructions [Table 4].

Table 2: Comparing the attitude regarding work-related musculoskeletal disorders before and after instructions

	Time		Total	P
	Before	After		
Most affected regions due to work-related disorders				
Back	475	559	1034	0.000
Neck	354	420	774	
Hand and wrist	205	117	322	
Shoulder and elbow	132	70	202	
Accept work-related disorders are the common reason for early retirement				
Yes	858	1100	1958	0.000
No	308	66	374	

Table 3: Correlation between knowledge and practice scores among the study participants

Parameters	Knowledge	Practice
Knowledge		
Pearson correlation	1	0.737**
P-value		0.000
n	2332	2332

**Highly significant (P<0.01)

After the instructions at institutional level, 92.7% of the study participants responded that ergonomics should be a part of curriculum.

Discussion

Adopting healthy life-style is an important aspect, and it comes only through education. The dental profession is the one where you see many work-related disorders affecting many of the clinicians. These disorders affect different regions of the body, such as lower back, neck, hand, fingers, wrist, arms, elbows, and shoulders, and this results in the leading cause for their absence from professional work. Disorders affecting muscles, tendons, ligaments, and bone are mainly due to the higher exertion of mechanical force during dental operating procedures.^[9,10]

In dental profession, these problems are due to the repetitive movements within the small place and also long-standing exertion of forces during dental procedures will result in work-related problems. The number of exposures and the total time of exposures are important factors in WMSDs Short-term and long-term loadings due to the dental surgical procedures will result in acute and chronic disorders, respectively, thus affecting the overall occupational life. To prevent the unnecessary fatigue or to diminish the exertion forces used during dental work, it is wise to know about dental ergonomic principles.^[11,12]

All the three dental schools had given the instructions to the students after obtaining the attitude, knowledge, and practice related to ergonomics. Guidelines or principles

Table 4: Intra and inter-year comparison of knowledge and practice scores among the study participants

Years	Knowledge	Knowledge after instructions	Practice before instructions	Practice after instructions	P
Third					
n	344 ^{a,A}	344 ^a	344 ^{b,B}	344 ^{b,B}	0.000
Mean	3.4128	5.8634	0.7064	2.9651	
SD	2.28915	0.72558	1.35025	0.46317	
Final					
n	311 ^{a,A}	311 ^a	311 ^{b,B}	311 ^{b,B}	0.000
Mean	3.0096	5.8296	1.0997	3.0096	
SD	2.72087	0.83852	1.70191	0.59831	
Interns					
n	280 ^{a,A}	280 ^a	280 ^{b,B}	280 ^{b,B}	0.000
Mean	4.7214	5.8250	1.4464	3.0821	
SD	2.00918	0.79068	1.74462	0.63107	
PGs					
n	231 ^{a,A}	231 ^a	231 ^{b,B}	231 ^{b,B}	0.000
Mean	4.9610	5.6883	2.2294	3.1342	
SD	2.02662	1.18240	1.57541	0.73081	
P	0.000	0.131	0.000	0.0000	

Knowledge=^{a,A}Refers intergroup and intragroup significance, ^AIntragroup significance, Practice=^{b,B}Refers intergroup and intragroup significance. SD=Standard deviation

of ergonomics were mainly based on the following factors: operator chair position instructions, patient chair position guidelines, selection of working instruments with modified design, training of the dental personnel, and using magnification systems.^[5,13]

In this study, the knowledge and practice scores of dental students were increased after applying ergonomic-related instructions than before in all the three different colleges of all the year students.

In this study, there was a difference in the opinion among the participants before and after the instructions. Furthermore, 244 participants have changed their opinion regarding WMSDs after applying ergonomic principles. Inter-group comparison showed that PGs had high knowledge and practice scores compared to interns, final years, and 3rd years. Intra-group comparison showed that there was a significant difference in both knowledge and practice scores before and after instructions across all the years. However, there was an increase in knowledge and practice scores among 3rd years, final years, and interns following the instructions.

The main objective of ergonomics in dental profession is to prevent the symptoms of work-related musculoskeletal disorders. Education related to ergonomic principles at institutional level and in continuing dental programs plays a vital role in improving the quality of dental professional life.^[14,15]

This study will help the dental students and professionals to recognize the risks for musculoskeletal disorders at the earliest and modify their work design and environment.

Limitations of the study

Although we have assessed the knowledge, attitude and perception, we did not assess the implementation of the gained knowledge of the students on clinical practice.

Advantages by knowing ergonomic principles and future perspectives.

Although the ergonomic principles will help in reducing the risk of developing WMSDs, still many of the dental professionals facing the problems related to ergonomics. In order to overcome these problems, the following are the futuristic changes that need to explore in detail to know the advantages in dental ergonomics.

1. Use of zero concept or proprioceptive derivation concept: Much research work is yet to come on this concept where the dental chair is modified and flat-bed or PD support is used
2. Selection of ergonomically friendly equipment: Dental professionals should get to know which instruments the best suit for their physical capabilities in order to reduce fatigue during the usage of instruments
3. Continuing dental education programs: There is a lack of dental education regarding ergonomics and WMSDs before the clinical exposure of dental students in almost all the institutions.

Conclusion

WMSDs can be prevented by modifying the work environment, including the design of working tools and equipment, and by organizing training programs in educational institutions and by conducting dental health programs. The successful application of principles of dental ergonomics will not only increase the productivity

but also decrease the unwanted injuries or illness among dental profession.

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Conflicts of interest

There are no conflicts of interest.

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