

The Ergonomic Challenges Students Face during Operative Dentistry Treatment

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ABSTRACT

Introduction: Students must possess good theoretical knowledge in order to perform correct clinical treatments with good prognosis and in safe conditions but merging theoretical knowledge and clinical practice in dental education is a challenge for both the training staff and the students. Up until now, no studies have been published in our country regarding the challenges faced by dental students in their clinical works performance for restorative dentistry and endodontic treatments.

Aim: The aim of this study was to assess the factors that may influence the performance of restorative and endodontic treatment procedures performed by 5th year dental students and their own perception on clinical work.

Materials and Methods: This was a cross-sectional study carried out in February 2020. A self-made questionnaire with 13 questions was distributed via e-mail link to 5th year dental students at the University of Medicine and Pharmacy Iuliu Hațieganu Cluj Napoca, Romania, Department of Conservative Dentistry, all 5th year dental student who had previously undergone two years of clinical training. One hundred eleven students were selected after applying the inclusion criteria that were, having two years of clinical training experience and having passed their theoretical ergonomics,

restorative dentistry and endodontics examinations. Descriptive Statistics were used for data analysis.

Results: The majority of the students 83% (n=92) encountered difficulties applying the rules of ergonomics related to posture. The most common causes that prevented students from applying the rules of ergonomics during the clinical work were challenges related to working in indirect vision (n=90), lack of help by an assistant during treatment (n=52), working time allocated being too short (n=50), lack of sufficient space around the unit (n=43). Regarding the theoretical level required for restorative cases diagnosis, treatment plan and treatment itself, 64% (n=71) of students claimed to have had the necessary theoretical knowledge in most cases they met and only 25% (n=28) could confidently treat all cases. Establishing the diagnosis and treatment plan for endodontic cases was difficult stage for 3.6% (n=4) of students, of average difficulty in the case of 81.1% (n=90) of students, while 15.3% (n=17) did not consider them difficult at all.

Conclusion: The results indicated that students had high levels of confidence in their theoretical knowledge when establishing the diagnosis and the treatment plan, but they encountered multiple challenges both with working ergonomically and with mastering the practical skills needed in different stages of the treatment.

Keywords: Dental students, Difficulties, Endodontics, Posture, Rubber dam, Self-perception

INTRODUCTION

Dentistry is considered by most students to be a difficult study program. Statistics say that 80% of students pursuing dental school feel that they were not adequately prepared for the course at the time of joining the faculty [1].

Students must possess good theoretical knowledge in order to perform correct clinical treatments with good prognosis and in safe conditions, but merging theoretical knowledge and clinical practice in dental education is a challenge for both the training staff and the students [2]. The application of the acquired theoretical knowledge in practice is imperative for a good diagnosis, treatment planning and treatment itself. This may be difficult to achieve in the absence of the necessary expertise. Moreover, a mutually satisfying dentist-patient relationship has many benefits including improved patient compliance and better therapeutic results. Lack of knowledge, clinical experience and communication skills may generate challenges for dental students in their first clinical years of training in restorative dentistry and endodontics [3].

Knowing and applying the rules of postural ergonomics to allow an optimal working position during clinical training is of utmost importance [4]. Roughly, one third of students suffer from musculoskeletal disorders of the head and neck due to incorrect working position, some studies reporting even higher percentages up to 71% [5,6]. When the principles of dental ergonomics are applied correctly, lead to a reduction in the prevalence of musculoskeletal

disorders among dentists [7]. However, it seems like students find it difficult to put these principles into practice.

Using a rubber dam may increase both the quality of the treatment and students' focus during treatment. Despite these, undergraduate students don't use it for all endodontic or restorative treatments [8]. Assessing the quality of endodontic fillings performed by undergraduate students, a previous study estimated that only 49% of monoradicular and 17% of pluriradicular treatments could be qualified as appropriate [9]. Similar studies report varying percentages in the evaluation of good quality treatment in posterior teeth, ranging from 24.2% to 46.6% [10-12]. These results are far from satisfactory, due to the limited clinical practice of students [13] and are influenced by multiple specific challenges, including: lack of clinical experience and practical craftsmanship, the high ratio of students/supervising-dentists; knowledge and observance of therapeutic protocols and existence of appropriate technical equipment [14]. Supervising dentists can help by using appropriate teaching methods [15].

All the factors above can significantly influence the way in which students perform clinical treatments in the spirit of respecting the principles of ergonomics and obtain qualitatively satisfactory treatments. Up until now only one previous study exists from North-East Romania regarding the general attitude and knowledge of dentists towards ergonomics [16]. Therefore, this study was carried out in North-West Romania. The aim of this study was to assess the factors that may cause difficulties or influence

the performance of students while working on restorative and endodontic treatments and to evaluate their own perception on their clinical work.

MATERIALS AND METHODS

This was a cross-sectional study carried out in the Department of Conservative Dentistry at the University of Medicine and Pharmacy, Iuliu Hațieganu Cluj, Napoca, Romania, in February 2020 on dental students who had previously undergone two years of clinical training.

Inclusion and Exclusion criteria: One hundred eleven students were selected after applying the inclusion criteria: having two years of clinical training experience and having passed their theoretical Ergonomics, Restorative Dentistry and Endodontics examinations. No other exclusion criteria were applied.

The questionnaire was designed both by a dental student and by a university assistant from the Department of Conservative Dentistry with 10 years of experience. It was focused on identifying student difficulties during clinical work related to dental ergonomics, rubber dam management, level of theoretical knowledge, clinical problems, and administrative problems. The initial questionnaire draft was checked by a senior faculty member and modified according to the feedback. It contained two demographics questions regarding sex and age, and 13 main questions, with various designs: dichotomous (yes/no), Likert scale and single response multiple choice questions.

Students were assured of the anonymity and confidentiality of their survey responses. The questionnaire was distributed by e-mail via link form, in Romanian language. The online link for the questionnaire was given for completion for students on 10th Feb 2020 and it was closed on 24th Feb 2020.

STATISTICAL ANALYSIS

The results were tabulated using Microsoft Excel and descriptive statistics were used.

RESULTS

The questionnaire had 111 respondents in total. Thirty-seven of them were males and 74 were females. Ninety-seven students had ages which ranged from 20 to 25 years, while 14 of them had ages ranging from 26 to 35 years. The demographic details are presented in [Table/Fig-1].

Demographics	Total Number (n)	Percentage (%)
Age (years)		
20-25	97	87.3
26-35	14	12.7
Gender		
Male	37	33.3
Female	74	66.7

[Table/Fig-1]: Demographic of students (N=111).

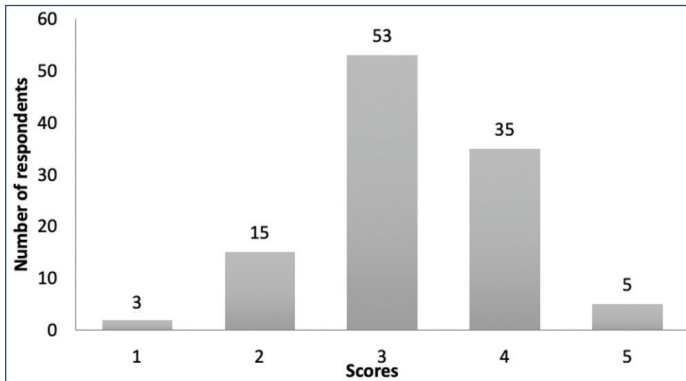
Posture and Ergonomics

The majority of the students 83% (n=92) encountered difficulties applying the rules of ergonomics related to posture and only 17% (n=19) had no problem in this field [Table/Fig-2]. For measuring the satisfaction reported by students regarding their own posture, the questionnaire had a Likert scale, with choices that ranged from 1-very dissatisfied to 5-very satisfied [Table/Fig-2]. Posture satisfaction scores can be seen in [Table/Fig-3].

Nr. Cr.	Question	Responses				
		Yes		No		
1	Do you encounter any difficulties in respecting the ergonomic principles for an ideal working posture? Yes/no	92		19		
2	On a 1 to 5 scale, how satisfied are you with your working posture? 1-very dissatisfied, 5-very satisfied	1	2	3	4	5
3	If yes, please choose from the following	3	15	53	35	5
3		1*	2*	3*	4*	
3		90	52	43	50	
4	Are there any patient-related causes that prevent you from applying the ergonomic rules for posture?	Never	Sometimes	Most of the times	Always	
4		19	76	14	2	
5	Please choose the frequent patient-related causes that prevent you from applying the ergonomics rules of posture while treating endodontic cases:	1**	2**	3**	4**	
5		67	27	6	11	
6	For treating maxillary teeth, how often do you work using indirect vision?	Never	Sometimes	Most of the times	Always	
6		4	55	39	13	
7	For treating mandibular teeth, how often do you work using indirect vision?	Never	Sometimes	Most of the times	Always	
7		33	64	12	2	
8	Do you encounter any difficulties in applying the rubber dam system?	Never	Sometimes	I don't use the rubber dam for endodontics treatments		
8		47	55	9		
9	How often did you think you had all the theoretical knowledge for treating and diagnosing the case?	In all cases	Most of the cases	Approximately half the cases	Sometimes	never
9		28	71	9	3	0
10	How would you evaluate the level of clinical difficulty of your previous restorative treatments?	Not difficult	Average difficulty	Difficult		
10		40	70	1		
11	How difficult is it for you to diagnose and establish a treatment plan for endodontic cases?	Not difficult	Average difficulty	Difficult		
11		4	90	17		
12	What was the factor that stopped you from obtaining the expected results from the treatment?	1***	2***	3***	4***	5***
12		11	53	19	17	11
13	Which activity secondary to the actual dental treatment do you feel is most time-consuming?	1****	2****	3****	4****	5****
13		18	32	12	38	11
1*	Inability to obtain optimal vision when working with the mirror	2***	Case difficulty level to high for my clinical experience			
2*	Lack of assistance while working	3***	Not enough guidance from the supervising dentist			
3*	Lack of sufficient space around the dental unit	4***	Poor choice and organisation of armamentarium before and during the procedure			
4*	Not enough time to complete the treatment	5***	No difficulties			

1**	Lack of cooperation with the patient (rushed patient, treatment session too long, high stress level of patient, patient not tolerating instruments in his mouth)	1****	Setting up the dental chair and the armamentarium to be used
2**	Patient's physical condition (inability to open the mouth, gag reflex, systemic diseases, allergies)	2****	Completing the paper-work
3**	Patient's body conformation (too tall, overweight)	3****	Scheduling patients and communicating with them
4**	Invalid answers- not indicating patient related causes	4****	Taking dental X-rays
1***	Not enough theoretical knowledge and not respecting all the treatment protocol steps	5****	There are no time consuming activities

[Table/Fig-2]: Questions and answers. (The students had the possibility to chose multiple reasons for their difficulties to respect the ergonomic principles)



[Table/Fig-3]: Posture satisfaction scores.

The most common causes that prevent students from applying the principles of ergonomics related to posture during clinical work were as follows: working in indirect vision (n=90), lack of help by an assistant during treatment (n=52), working time allocated being too short (n=50), lack of sufficient space around the unit (n=43) [Table/Fig-2].

Total 16 students (14.4%) reported that they were always or most of the times prevented from following the ergonomic principles due to patient-related causes, but the majority (68.46%, n=76) only face this problem sometimes [Table/Fig-2].

The most common patient-related challenges were: lack of patient cooperation (rushed patient, long-term treatment, high level of stress, low level of comfort, not tolerating the instruments used) (n=67); the patient's physical condition (inability of the patient to open the mouth, general illness, respiratory difficulties, vomiting reflex) (n=27); patient's stature (too tall, overweight) (n=6) [Table/Fig-2]. Regarding using indirect vision during treatments for maxillary and mandibular teeth, the results can be seen in.

Rubber Dam

When applying the rubber dam system, nearly half of the students (n=55) sometimes faced difficulties. Almost half (n=47) did not encounter difficulties and only a few (n=9) do not use the rubber dam system at all for clinical treatments [Table/Fig-2].

Case Analysis and the Treatment Protocol

Regarding the theoretical level required for restorative cases diagnosis, treatment plan and treatment itself, 64% (n=71) of students claimed to have had the necessary theoretical knowledge in most cases they met and only 25% (n=28) could confidently treat all cases [Table/Fig-2]. The clinical difficulty of previous restorative treatments reported by students can be seen in.

Establishing the endodontic diagnosis and the treatment plan was considered difficult by only 3.6% (n=4) of students, of average difficulty in the case of 81.1% (n=90), while 15.3% (n=17) did not consider it difficult at all.

There were also factors that prevented students from obtaining the expected results from the treatments. A 9.9% (n=11) of students reported that they didn't possess sufficient theoretical knowledge or didn't respect all the treatment protocol steps. A 47.8% (n=53)

considered the case to be too difficult for their clinical experience, while 17.1% (n=19) reported they lacked sufficient guidance from the supervising stage assistant. A 15.3% (n=17) could not properly choose or organise their instruments before and during the procedures, while 9.9% (n=11) reported that they faced no difficulties [Table/Fig-2].

Sometimes, difficult access to the posterior teeth, atypical internal anatomy or lack of time and experience can increase the treatment's level of difficulty. In the aforementioned cases, the students appreciate that they do not obtain the desired results, the treatments being too difficult for their clinical experience (3% of the respondents) [Table/Fig-2].

When questioned about the time dedicated to the adjacent and administrative activities related to dental treatments, the most time-consuming activity reported by students was completing the paper-work-28.8% (n=32), followed by taking dental X-rays-34.2% (n=38), setting up the dental chair and the armamentarium-16.2% (n=18) and lastly scheduling patients and communicating with them-10.9% (n=12). However, 9.9% (n=11) of the students reported that there are no timing consuming activities [Table/Fig-2].

DISCUSSION

This study evaluated the answers of 111 students with two years of clinical training who answered a questionnaire regarding the challenges encountered while performing restorative and endodontic treatments and their compliance with the principles of ergonomics while working.

The majority of students 83% (n=92) found it hard to comply with the rules of ergonomics related to position and posture during clinical treatments. A similar study by Garcia P et al., showed that 62.1% of the students report having difficulties in adopting ergonomic postures due to the types of treatment required and the regions of the mouth being treated, confirming that ergonomical difficulties are common amongst students [17].

Students most often associated ergonomic challenges with working in indirect vision using the mirror (n=90), the lack of assistance by a colleague as an assistant during treatment (n=52), the too short duration of the working period (n=50) and the lack of sufficient space around the dental unit (n=43). Present study indicated that the main reason for not applying the principles of ergonomics was due to difficulty in working in indirect vision, a skill which, in student's opinion, is insufficiently mastered by them.

This is an aspect addressed by another study that suggested the introduction of indirect vision training as early as possible [18]. Good indirect vision skills are demonstrated to improve head and shoulder posture, as well as back posture and contribute to the prevention of rounded shoulder [19]. Moreover, using magnification systems, like dental loupes or the dental operative microscope is shown to significantly improve the posture, but unfortunately students don't use them during clinical work [20].

Some patient-related factors (rushed patient, low instrument toleration, inability to open the mouth, respiratory difficulties, sensitive vomiting reflex, patient's stature) can sometimes prevent students from achieving good ergonomics as indicated by 15.3% of students.

Some of the identified causes are related to patient education including communication gaps or reluctance, induced especially by the lack of patients' habituation with the rubber dam system and the discomfort of sitting in a horizontal position. Moreover, statistics shows that operator experience improves patient compliance [21]. Patient compliance may be a transitory problem which can be solved by gaining experience and may also be related to patient's satisfaction. Regarding the satisfaction of patients treated by dental students, Azimi S et al., identified a close link between student gender, patient education level and patient satisfaction level [22].

Although isolation is of major importance for the prognosis of a treatment, the rubber system has been less used in endodontics in the past in Romania [8]. According to the results of this study, almost all students used the rubber system in all cases (n=102; 91.89%) but half of them (n=55) stated that they encountered difficulties in positioning the clamp and the foil on difficult teeth or do not have the appropriate tools or enough experience. The reasons for reluctance stated by students are related to the extension of working time and the patients' preference to be treated without a dam. These reasons are also identified in other similar studies [23-25]. However, these studies showed that patients perceived an increase in comfort when treated with dam isolation and the average application time is short, ranging from less than 2 minutes in the case of experienced physicians to 4-5 minutes in the case of students [23-25].

A quarter of the students considered that they possessed the theoretical knowledge necessary to establish the diagnosis, treatment plan and implementation of the operating protocol in all treated cases. Two-thirds reported feeling confident in almost all cases. Even so, most of them (n=71; 63.96%), declare to frequently ask the supervising dentist for advice because they consider themselves not having the necessary experience to find satisfactory answers on their own and develop rational treatment plans. This may indicate a difficulty in applying the theoretical knowledge in decision making situations or a low level of self-confidence of the students. This is in agreement with Alrahabi M, who found that students felt more or less confident while treating endodontic cases depending on the stage of the treatment, feeling more confident when preparing the access cavity and during the restauration of the treated tooth than when instrumenting the tooth canals [26]. Moreover, the students/supervisor-dentist ratio of 9:1 is a favourable one, aiding students to easily interact with the supervisor. In a statistical study conducted in 28 dental schools in Germany in 2008, Sonntag D et al., indicated a numerical ratio of students supervising-dentists between 9/1 and 30/1 [27]. The number of hours of preclinical practical training varied between 12 and 60.

More than half of the students rated their cases as being of little or medium difficult level. These results are showing a high level of confidence from the students, compared to similar studies published in the literature [28,29]. These studies revealed lower levels of confidence in solving endodontic cases, but in such cases, the notion of referring more difficult ones to the specialists appears to be better understood by the students.

Limitation(s)

Possible limitations to this study were the relatively narrow group of targeted students, since only students in their year of study were included. It might not accurately reflect the situation of students in their final year of university. Another limiting factor was that sample of students was taken from the students studying at the same university, so findings may not correspond with other universities studies.

CONCLUSION(S)

The results indicated that students encountered multiple challenges both with working ergonomically and with mastering the practical skills needed in different stages of the treatment. They showed high levels of confidence in their theoretical knowledge and with establishing the diagnosis with a treatment plan, but most of them struggle when it comes to adopting an ergonomic working posture.

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