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Dental laser education and knowledge among final year dental students at King Saud University in Riyadh, Saudi Arabia



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KEYWORDS

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Abstract *Aim of the study:* To assess the educational level and the knowledge of the final year dental students at King Saud University regarding the uses of laser in Dentistry.

Materials and methods: This cross-sectional, descriptive study was carried out at the College of Dentistry, King Saud University in Riyadh. A questionnaire was designed and answered by 94 final year dental students. The questionnaire consisted of 2 parts. First part was about dental laser education and the second one was about the knowledge of dental laser applications. The second part was subsectioned to 6 sections. Each section consisted of several items related to the uses of laser in 5 different dental specialties in addition to a section in laser protection. The analysis was performed by scoring 2 for a correct response, 0 for don't know response and -2 for an incorrect response. Students' knowledge scores were calculated and transferred to a scale ranged between 2 and -2. Score of ≥ 1 was considered as sufficient knowledge, while score of < 1 was considered as insufficient knowledge. Descriptive statistics of different items were assessed and analyzed using SPSS program.

Results: Most of the dental student (91.5%) reported that they did not have enough dental laser education. In general, the majority (76%) of dental students had insufficient knowledge regarding the uses of laser in Dentistry. Students' knowledge of the uses of dental laser in Oral Surgery and Operative Dentistry was better than their knowledge in Periodontic, Pediatric Dentistry/Orthodontic and Endodontic.

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Conclusion: Dental students at King Saud University had inadequate laser education and insufficient knowledge regarding the uses of laser in different specialties in Dentistry. More education about dental laser should be added to the curriculum of undergraduate program.

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1. Introduction

New science and technologies are already making their way into all aspects of dental practice and have changed the traditional approaches, which require that students and practitioners receive the necessary knowledge.¹ Dental laser is one of the most significant developments in modern dentistry. Lasers were introduced into the field of Dentistry in 1960s, with the hope of overcoming some of the drawbacks posed by the conventional methods of dental procedures.² Conventional methods of cavity preparation with low and high speed handpieces involve noise, uncomfortable vibrations and stress for patients.³ These disadvantages have led to a search for new techniques as possible alternatives for dental hard and soft tissue removal.³ Different laser devices and different wavelengths opened up various treatment options for diverse indications. Laser Dentistry is not assigned to a one particular field, and as a result the arch was extended from Conservative Dentistry over the Oral and Facial Surgery throughout Pediatric Dentistry. In addition to its uses in hard tissue preparation (bone and tooth preparation) and soft tissue surgery, laser treatment in combination with composite or glass ionomer restorations, or in the treatment of hypersensitive teeth are examples of different application areas.⁴⁻⁶ Furthermore, laser is important in canal disinfection and in behavior management in Pediatric Dentistry.^{7,8} In order to practice laser safely and effectively in different disciplines of Dentistry, it is essential to have a good knowledge of laser physics, laser operation, different types of laser and which type of laser is appropriate for each case.

In view of the increasing availability of new technologies in dental practices and the need for more education and training, this survey was conducted to assess the educational level and knowledge of the uses of laser in Dentistry among the final year dental students in College of Dentistry, King Saud University.

2. Materials and methods

Approval of the study was obtained from the Ethical Committee of the College of Dentistry Research Center at King Saud University (Reg. No. F0095). This cross-sectional, descriptive study was carried out at the College of Dentistry, King Saud University in Riyadh. A self-administered questionnaire consisting of 2 main parts was designed and administered voluntarily to all final year dental students (110 female and male students) at the end of their final year (2011/2012). The questionnaire was generated after extensive literature review of the dental laser types and common applications of laser in different dental specialties. The questionnaire was reviewed for content, clarity, bias, and the questions' adequacy to the study objective by a senior faculty. The first part of the questionnaire consisted of 10 items regarding the students' dental laser education and training. The second part consisted of 34 items in 6 sections. Each section contained several items related to the uses of laser in 5 different dental specialties [Oral Surgery (8

items), Endodontic (4 items), Periodontic (4 items), Operative Dentistry (10 items) and Pediatric Dentistry/Orthodontic (4 items)], in addition to some items in laser protection (4 items)]. The data were entered and analyzed using Statistical Package for Social Sciences 16 software (SPSS Inc., Chicago, Ill). Descriptive statistics [frequency, percentage, mean, standard deviation (SD)] of different items were assessed.

2.1. Scoring system

In the second part of the questionnaire, there were 34 items, each item having true, don't know and false options. The analysis was performed by scoring 2 for a correct response, 0 for don't know response and -2 for an incorrect response. Score calculation was performed according to the following equation:

$$\frac{(2X \text{ No. of responses}) + (0X \text{ No. of dont know responses}) + (-2X \text{ No. of responses})}{\text{Total No. of items}}$$

The scores of each student were added together giving a total overall knowledge score which could range between 68 and -68. Then the total overall score of each student was divided by the number of the items (34 items) and was transferred to a scale ranges between 2 and -2. The same procedure was applied separately for each specialty section [(total score in Oral Surgery/8 items),(total score in Endodontic/4 items), (total score in Periodontic/4 items),(total score in Operative Dentistry/10 items), (total score in Pediatric Dentistry/Orthodontic/4 items),(total score in laser protection/4 items)]. The mean of the students' scores was calculated to assess the level of their overall knowledge and their knowledge in each specialty. Score of ≥ 1 was considered as a cut point for the sufficient knowledge as it equals to 50% or more correct knowledge. Score of < 1 which equals to less than 50% was considered as insufficient knowledge as it towards no or incorrect knowledge.

3. Results

Ninety four dental students (38 female students and 56 male students) returned the questionnaires with a response rate of 85.5%. **Table 1** shows that about 87% of the respondents know what is laser. Only 8.5% of them thought that they had enough education about dental laser. About 11.7% had practiced dental procedures with dental laser outside the college. Most of the dental students has the interest in dental laser and would like to have more theoretical and practical education in this area (**Table 1**). In addition, the majority sought after special dental laser course in their undergraduate curriculum. **Table 1** also shows that their dental laser knowledge obtained mainly in Periodontic, Operative Dentistry and Oral Surgery undergraduate courses. The most known laser types among them were CO₂ and diode lasers (**Table 1**).

Regarding dental students' laser knowledge, **Table 2** shows the students' responses of each item in each section and the mean score of each section. The best score was obtained in

Table 1 dental students' response about their laser education and practice.

Items	No. of respondent students	percentage
<i>Gender</i>		
Female	38	40.4
Male	56	59.6
Know what is laser	82	87.2
Had enough dental laser education	8	8.5
<i>Hours of dental laser education</i>		
0 hr	24	25.5
1–3 hrs	54	57.4
> 4 hrs	16	17
Had previous dental laser practice	11	11.7
Had interest in dental laser	80	85.1
Need for more dental laser education	83	88.3
<i>Type of laser education needed</i>		
Theoretical	4	4.3
Practical	15	16
Both	69	73.4
No need	6	6.4
Need for dental laser undergraduate course	82	87.5
<i>Laser education in dental courses</i>		
Endodontics	12	12.8
Oral surgery	26	27.7
Pediatric dentistry/orthodontics	0	0
Periodontics	41	43.6
Operative dentistry	36	38.3
Others	5	5.3
<i>Known laser type</i>		
CO ₂	40	42.6
Er:Cr:YSGG	8	8.5
Diode	27	28.7
Er:YAG	22	23.4
Nd:YAG	14	14.9
Argon	23	24.5
None	31	33

laser protection section followed by Oral Surgery and Operative Dentistry sections (0.74, 0.7, 0.63, respectively) and the lowest was recorded in Endodontic, followed by Pediatric Dentistry and Periodontic sections (0.12, 0.14, 0.33). The mean scores of all students for each item are presented in Fig. 1 in descending order. The well-known information about the uses of dental laser was in caries removal. Fig. 2 shows that only 24% of them got ≥ 1 and had sufficient general knowledge of dental laser. About 50% of them had sufficient knowledge regarding the uses of laser in Oral surgery compared to 20% of them who had sufficient knowledge in Pediatric Dentistry/Orthodontic (Fig. 2).

4. Discussion

Adequate education, appropriate practice and sufficient knowledge are needed to utilize different dental technologies. Education at dental school is the most important source of professional knowledge for the dental students as they rely and depend on the information they are provided in dental school.⁹ This study provides a general view about dental laser education and knowledge among final year dental students at College of Dentistry, King Saud University. Most of the dental students know the term “laser”, however, this survey in general assessed some basic knowledge of dental students regarding the

uses of laser in dentistry. Their knowledge in laser physics, different wavelengths, different types of laser and which type of laser is most appropriate for each case were not assessed. The specific properties of the laser radiation and applications need to be understood in order to practice dental laser effectively and to evade therapeutic mistakes.

As reported by the majority of students, only 3 hrs was the average time for dental laser education they got during their study in the full 6 year dental college program. This reflects that inadequate knowledge in dental laser applications was related to insufficient education. In addition, this result reveals that our dental students are dependent on the education and practice they have in the college as a source for their knowledge, such as other dental students in different country.⁹ Majority of the students showed the interest in dental laser, sought after more education and 11.7% of them had the chance to practice dental laser outside the college which reflects their attitude towards the discovery of new technology. Most of the information about dental laser was provided in Periodontic, Oral Surgery and Operative Dentistry courses, due to the increased implementation of different lasers since its discovery in soft tissue surgical procedures and caries removal. However, the new implementations of dental laser such as in Orthodontic or Pediatric Dentistry were not considered or even mentioned in these courses. CO₂ laser was the most

Table 2 Dental students' response about their dental laser knowledge.

Items	Correct No. (%)	Do not know No. (%)	Incorrect No. (%)	Mean (SD)	Section mean score (SD)
<i>Operative dentistry</i>					
Dental laser can be used for/to					
Lessen the need for local anesthesia	27 (28.7)	28 (29.8)	39 (41.5)	-0.26 (1.66)	
Eliminate the noise of the handpiece	69 (73.4)	16 (17.0)	9 (9.6)	1.28 (1.29)	
Caries prevention	36 (38.3)	39 (41.5)	19 (20.2)	0.36 (1.5)	
Caries detection	53 (56.4)	27 (28.7)	14 (14.9)	0.83 (1.4)	
Caries removal	71 (75.5)	17 (18.1)	6 (6.4)	1.38 (1.1)	0.63 (0.67)
Enamel etching	22 (23.4)	59 (61.7)	14 (14.9)	0.17 (1.2)	
Removal of smear layer	35 (37.2)	55 (58.5)	4 (4.3)	0.66 (1.1)	
Composite curing	30 (31.9)	48 (51.1)	16 (17)	0.30 (1.3)	
Dentin desensitization	37 (39.4)	51 (54.3)	6 (6.4)	0.66 (1.2)	
Whitening the teeth	51 (54.3)	35 (37.2)	8 (8.5)	0.91 (1.3)	
<i>Oral surgery</i>					
Dental laser can be used for/to					
Frenectomy	43 (45.7)	36 (38.3)	15 (16)	0.6 (1.4)	
Bone recontouring	39(41.5)	42 (44.7)	13 (13.8)	0.55 (1.38)	
Soft tissue curettage	54 (57.4)	34 (36.2)	6 (6.4)	1.1 (1.2)	
Surgical treatment of large vascular lesions	31 (33)	52 (55.3)	11 (11.7)	0.43 (1.2)	0.70 (0.68)
Reducing swelling and discomfort	32 (34)	53 (56.4)	9 (9.6)	0.49 (1.2)	
Bleeding arrest	55 (58.5)	34 (37.2)	4 (4.3)	1.1 (1.1)	
Accelerating wound healing	47 (40)	36 (38.3)	11 (11.7)	0.77 (1.3)	
Eliminating suturing and dressing	42 (44.7)	42 (44.7)	10 (10.6)	0.68 (1.3)	
<i>Periodontic</i>					
Dental laser can be used for					
Calculus detection	13 (13.8)	67 (71.3)	14 (14.9)	-0.02 (1.0)	
Calculus removal	21 (22.3)	58 (61.7)	15 (16)	0.13 (1.2)	0.33 (0.75)
Periodontal pocket disinfection	30 (31.9)	50 (53.2)	14 (14.9)	0.34 (1.3)	
Gingivectomy and crown lengthening	52 (55.3)	32 (34)	10 (10.6)	0.89 (1.3)	
<i>Endodontic</i>					
Dental laser can be used for					
Diagnosis of pulp vitality	26 (27.7)	47 (50)	21 (22.3)	0.11 (1.4)	
Direct and indirect pulp capping	15 (16)	58 (61.7)	21 (22.3)	-0.13 (1.2)	0.11 (0.90)
Drying of the root canal	15 (16)	62 (66)	17 (18.1)	-0.04 (1.1)	
Root canal disinfection	32 (34)	53 (56.4)	9 (9.6)	0.49 (1.2)	
<i>Pediatric dentistry/orthodontic</i>					
Dental laser can be used for					
Pulpotomy in primary teeth	19 (20.2)	68 (72.3)	7 (7.4)	0.26 (1.0)	
Pulpectomy in primary teeth	12 (12.8)	72 (76.6)	10 (10.6)	0.04 (0.97)	0.14 (0.80)
Behavior management in children	28 (29.8)	57 (60.6)	9 (9.6)	0.4 (1.1)	
Etching enamel for orthodontic bracket	12 (12.8)	64 (68.1)	18 (19.1)	-0.13 (1.1)	
<i>Laser protection</i>					
Dental laser					
Cannot be used with alcohol based materials	14 (14.9)	73 (77.7)	7 (7.4)	0.15 (0.93)	
Cannot be used with oil based lip products	10 (10.6)	76 (80.9)	8 (80.9)	0.04 (0.87)	0.74 (0.60)
May damage cornea and burn retina	43 (45.7)	48 (51.1)	3 (3.2)	0.85 (1.1)	
Skin and eyes should be protected when using laser	60 (63.8)	33 (35.1)	1 (1.1)	1.26 (1.0)	

SD = standard deviation.

known type of lasers among the dental students as it is one of the oldest laser and the most widespread use for soft tissues in medicine and dentistry.¹⁰⁻¹²

Apparently, this study showed that the more education the students had, the more knowledge they gained. Dental students had more laser education in Oral Surgery and Operative Dentistry courses and consequently had more knowledge about the uses of dental laser in these areas such as soft tissue surgery and caries removal. However, this is not true about Periodontic as the students had more education in Periodontic and had less knowledge. This might be related to that the items in Periodontic section included non-surgical periodontal procedures such as

calculus detection and removal by laser, where the education they had was mainly about surgical periodontal procedures which resulted in declining the scores. Many applications of laser in Dentistry were not familiar to the students as these applications are recently reported in the literature and proved its efficiency. Majority of the students did not know about the uses of laser in Endodontic like root canal disinfection and diagnosis of pulp vitality.^{7,13} In addition, most of them were not familiar with its applications in Pediatric Dentistry such as pulpotomy and pulpectomy.¹⁴ Nearly 40% of the students had acceptable information about protection against laser. If the dental laser is decided to be added to the curriculum,

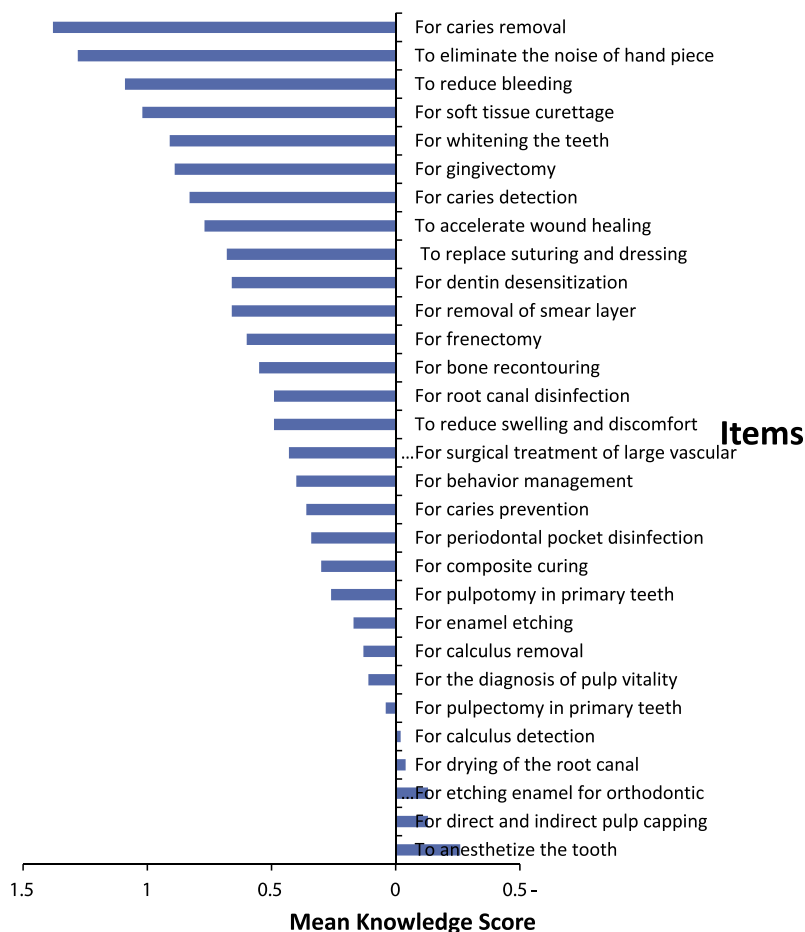
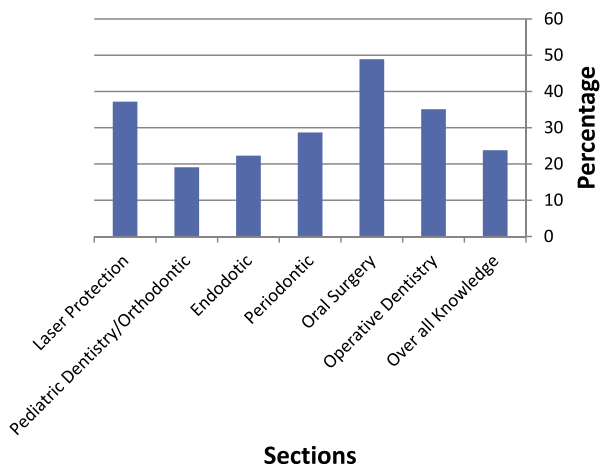


Figure 1 Mean knowledge score of all students per item in descending order.



Sections

Figure 2 Percentage of dental students who got ≥ 1 in each section.

students should know about the precautions that must be taken to protect themselves and their patients, including the use of correct wavelength, laser safety glasses, proper face masks and face shields, and use of high-speed oral evacuation equipment.

It is apparent that our dental students would like to have dental laser units available at the College for their training. Dental laser was discovered in the mid of 1960s and proved its efficiency at the late of 1990s, yet till now it is not implemented in the undergraduate dental curriculum neither theoretically nor practically.^{2,15} Actually, laser units are available in the College of Dentistry, King Saud University; however, they are only accessible for faculty and postgraduate students. Although the American Dental Academy’s Commission on Dental Accreditation does not include laser education in its accreditation standards for dental education programs¹⁶, new knowledge and technologies should be integrated into the undergraduate dental curriculum. Proposed educational standards for laser are available since 1993.¹⁷ Dental students should have the chance to learn and practice new technologies as most of the new dentists utilize the materials and technologies they were exposed to and worked with in their dental schools. A survey by American Dental Academy revealed that only 3.5% of dentists surveyed used lasers in their practice. This small percentage may be due, in part, to the ability to achieve equivalent clinical results with less expensive traditional methods.¹⁸ However, nowadays, the number of dentists who are adopting laser technology is rapidly increasing, the number of companies that are manufacturing and advertising different dental lasers is growing each day and most importantly, a growing number of patients are beginning to learn

about and, therefore, seek out, dental offices where laser procedures are performed.¹⁹ More than 17 dental schools in the US have lasers in their schools and teach laser procedures to their undergraduate dental students.¹⁹ As a model, at New York University, College of Dentistry, they allow undergraduate students to use laser in Prosthetic, Orthodontic, and Honors Esthetic to give the students the opportunity to use laser technology before they graduate.²⁰

The continuous development of the dental curriculum presents a major challenge to faculty, administrators, and the students because of the high cost, overloaded schedule, increased clinical training, and changing scenery of teaching.¹ Furthermore, there is a need of personnel with sufficient training/experience in both basic and clinical sciences to support the effective application and/or integration of new technologies into curriculum planning, implementation, and assessment processes.¹ Hopefully, with the construction of new buildings and development of new curriculum at College of Dentistry, King Saud University these days, new knowledge and technologies will approach all aspects of dental practice and will modify traditional methods to new technologies in diagnosis, prevention, treatment and many procedures in practical and clinical Dentistry.

5. Conclusion

Dental students at King Saud University had inadequate laser education and insufficient knowledge about the uses of laser in different dental disciplines. Undergraduate dental students need to be provided with appropriate dental laser education supported by practical experience.

Conflict of interest

None declared.

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