

Assessment of Knowledge, Awareness, and Practice in Application of Laser in Dental Treatment among Dental Student – A Questionnaire Study

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Abstract

Aim: The aim of the study is to assess knowledge, awareness, and practice in the application of lasers in dental treatment among dental students. **Objectives:** The objectives of the study are to assess knowledge and awareness among dental students about the use of laser in dental treatment. **Methodology:** A descriptive study was conducted among dental students. A total of 425 students were included in the study. The information collected by the questionnaire included demographic details such as gender and year of education and questions to assess dental laser education and knowledge. The questionnaire was generated based on the different types of laser available and common applications of laser in different dental specialties. The first part of the questionnaire consisted of questions regarding the student's dental laser education and training in their institution. The second part consisted of the uses of laser and specialties. **Results:** Among the 425 study participants, 60.2% had adequate knowledge, 63.8% had adequate attitude, whereas only 48.2% only had adequate practice of light amplification by stimulated emission of radiation dentistry. **Conclusion:** Lasers need comprehensive training in both theoretical and applied. Incorporating laser education into undergraduate courses may provide students with an early opportunity to learn about and practising with lasers.

Keywords: Attitude, Awareness, Dental lasers, Knowledge.

INTRODUCTION

Maiman invented the LASER, which stands for "Light Amplification by Stimulated Emission of Radiation." A laser is a single wavelength of visible or infrared light characterized by collimation, coherency, and efficiency, with measurable velocity, amplitude, and wavelength of the generated wave photons.^[1]

In 1964, Stern, Sognnaes, and Goldman published the first report on laser applications in dentistry. Lasers, often referred to as "light scalpels," can be used independently or alongside various surgical procedures.^[2] The introduction of lasers marked a significant turning point in dentistry, leading to their routine use in clinical practice.^[3]

Since the 1980s, photonic therapy lasers have been used in periodontics, with the first reports of their use in periodontal surgery emerging in the 1990s. Periodontics lasers are categorized into high-power and low-power lasers. High-power lasers are employed in soft tissue or bone periodontal surgery, sulcular debridement of periodontal pockets, root

decontamination, and scaling and root planning.^[4] Periodontal laser applications include calculus removal (using Er and Er, Cr lasers), soft tissue excision, incision, ablation, root and implant surface decontamination, biostimulation, bacteria reduction, and bone removal (osseous surgery).^[5]

The most common periodontal lasers, such as semiconductor diode lasers, Nd (neodymium-doped: yttrium, aluminum, and garnet), Er (erbium-doped: yttrium, aluminum, and garnet), and carbon dioxide (CO₂) lasers, have wavelengths ranging

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from 635 to 10,600 nm. CO₂ lasers are particularly effective for soft tissue ablation and have been successfully used to de-epithelialize the mucoperiosteal flap during traditional flap surgery.^[6]

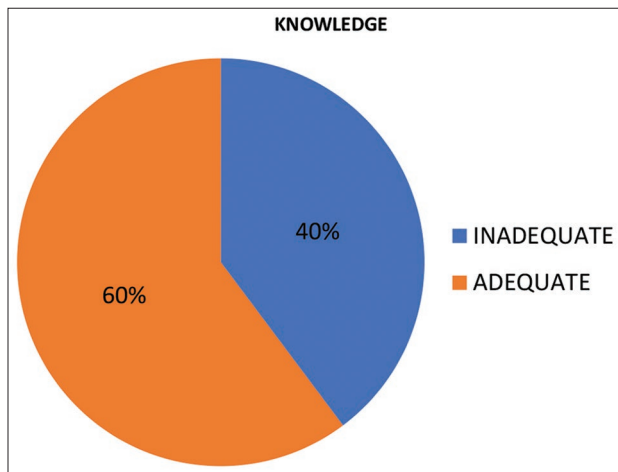


Figure 1: Assessment of knowledge of laser in dental treatment among dental students

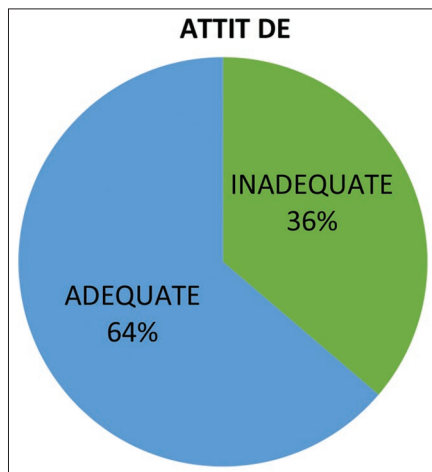


Figure 2: Assessment of awareness of laser in dental treatment among dental students

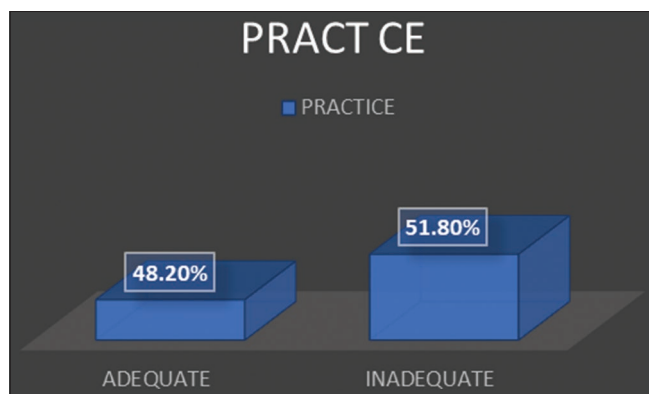


Figure 3: Assessment of practice of laser in dental treatment among dental students

New technologies are transforming dental practice, making treatments easier, simpler, and less painful for patients. This evolution necessitates that undergraduate students should be educated in these newer technologies.^[7]

Consequently, dental students should be well versed in the use of these advanced technologies. The purpose of this research was to ascertain the level of dental laser education and knowledge among dental students.

Aim

The aim of the study is to assess knowledge, awareness, and practice in the application of lasers in dental treatment among dental students.

Objectives

The objectives of the study are to assess knowledge and awareness among dental students about use of laser in dental treatment.

METHODOLOGY

A descriptive study was conducted among dental students. Informed consent was obtained before the distribution of questionnaire. A total of 425 students were included in the study. The information collected by the questionnaire included demographic details such as gender and year of education and questions to assess dental laser education and knowledge.

The questionnaire was generated based on the different types of laser available and common applications of laser in different dental specialties. The first part of the questionnaire consisted of questions regarding the student's dental laser education and training in their institution. The second part consisted of the uses of laser and specialties.

RESULTS

The knowledge, awareness, and practical application of lasers in dental treatment among dental students was assessed. The questionnaire was attempted by 425 participants in which 137 were males and 288 were females. Among the 425 participants, 319 from urban area and 108 from rural area were present.

Knowledge about LASER dentistry was analyzed. Qualification of study subjects was found to have statistically significant association to knowledge of participants on laser dentistry ($P=0.001$), with a significant OR = 1.9457, at 95% CI (1.2994, 2.9134). Male gender, those from urban area, and interns were found to have adequate knowledge of LASER dentistry than their counterparts, yet the association was not statistically significant.

Qualification of study subjects was found to have statistically significant association to attitude of participants on laser dentistry ($P=0.003$), with a significant OR = 1.855, at 95% CI (1.2330, 2.7913). Male gender, those from urban area were found to have adequate attitude on LASER dentistry than their counterparts, yet the association was not statistically significant.

Practice of LASER dentistry was analyzed. Male gender, those from urban area, and final year students were found to have adequate practice of LASER dentistry than their counterparts, yet the association was not statistically significant.

Sociodemographic profile of study participants

Among the 425 study participants, 137 (32.3%) were males and 288(67.8%) were females.

Among the 425 study participants, 317 (74.6%) were from urban area and 108 (25.4%) were from rural area.

Among the 425 study participants, 271 (63.8%) were interns and 158 (36.2%) were final-year students.

Knowledge, attitude, and practice of LASER dentistry among study subjects

Among the 425 study participants, 60.2% had adequate knowledge, 63.8% had adequate attitude, whereas only 48.2% only had adequate practice of LASER dentistry.

Table 7 determinants of knowledge about LASER dentistry have been analyzed. Qualification of study subjects was found

to have statistically significant association to knowledge of participants on laser dentistry ($P = 0.001$), with a significant OR = 1.9457, at 95% CI (1.2994, 2.9134). Male gender, those from urban area, and interns were found to have adequate knowledge of LASER dentistry than their counterparts, yet the association was not statistically significant.

Table 8 determinants of attitude about LASER dentistry had been analyzed. Qualification of study subjects was found to have statistically significant association to attitude of participants on laser dentistry ($P = 0.003$), with a significant OR = 1.855, at 95% CI (1.2330, 2.7913). Male gender, those from urban area were found to have adequate attitude on LASER dentistry than their counterparts, yet the association was not statistically significant.

Table 9 determinants of the practice of LASER dentistry have been analyzed. Male gender, those from urban areas, and final year students were found to have adequate practice of LASER dentistry than their counterparts, yet the association was not statistically significant.

Table 1: Gender distribution

Gender	Frequency	Percentage
Male	137	32.2
Female	288	67.8
Total	425	100.0

Table 2: Resident distribution

Place of residence	Frequency	Percentage
Urban	317	74.6
Rural	108	25.4
Total	425	100.0

Table 3: Qualification distribution

Qualification	Frequency	Percentage
Intern	271	63.8
Final year	154	36.2
Total	425	100.0

Table 4: Assessment of knowledge

Knowledge	Frequency	Percentage
Inadequate	169	39.8
Adequate	256	60.2
Total	425	100.0

Table 5: Assessment of attitude

Attitude	Frequency	Percentage
Inadequate	154	36.2
Adequate	271	63.8
Total	425	100.0

Table 6: Assessment of practice

Practice	Frequency	Percentage
Inadequate	220	51.8
Adequate	205	48.2
Total	425	100.0

Table 7: Determinants of knowledge about laser dentistry

Variable	Adequate n (%)	Inadequate n (%)	Chi-square df=1	P-value
Gender				
Male	83 (60.6)	54 (39.4)	0.01	0.919
Female	173 (60.1)	115 (39.9)		
Place of residence				
Urban	193 (60.9)	124 (39.1)	0.219	0.64
Rural	63 (58.3)	45 (41.7)		
Qualification				
Intern	179 (66.1)	92 (33.9)	10.563	0.001*
Final year	77 (50)	77 (50)		

*p < 0.05 (significant)

Table 8: Determinants of attitude on laser dentistry

Variable	Adequate n (%)	Inadequate n (%)	Chi-square, df=1	P-value
Gender				
Male	90 (65.7)	47 (34.3)	0.325	0.568
Female	181 (62.8)	107 (37.2)		
Place of residence				
Urban	204 (64.4)	113 (35.6)	0.187	0.665
Rural	67 (62)	41 (38)		
Qualification				
Intern	187 (69)	84 (31)	8.884	0.003*
Final year	84 (54.5)	70 (45.5)		

*p < 0.05 (significant)

Table 9: Determinants of practice of laser dentistry

Variable	Adequate n (%)	Inadequate n (%)	Chi-square df=1	P-value
Gender				
Male	68 (49.69)	69 (50.4)	0.159	0.690
Female	137 (47.6)	151 (52.4)		
Place of residence				
Urban	153 (48.3)	164 (51.7)	0.00	0.983
Rural	52 (48.1)	56 (51.9)		
Qualification				
Intern	121 (44.6)	150 (55.4)	3.851	0.050
Final year	84 (54.5)	70 (45.5)		

DISCUSSION

Laser applications, soft-tissue surgery CO₂, Nd: YAG, diode, Er: YAG, and Er,Cr: YSGG lasers, are widely recognized as instruments of value in this kind of surgery. Laser surgery is better than conventional mechanical surgery in that ablation, decontamination, and hemostasis are easier to achieve and there is the possibility of less operative and post-operative pain. Nevertheless, this serves as a reminder of the potential of deeply penetrating lasers to cause thermal injury to underlying tissues. The Er: YAG laser has been considered an effective and safe instrument for treating esthetic periodontal procedures because of precise ablation capacity which acts with minimal residual thermal effect.^[8]

A large number of students knew the use of lasers in oral surgery and periodontics as their major role was the use of lasers in soft tissue procedures. Training and inclusion of lasers in the curriculum at the undergraduate level would greatly enhance our understanding and awareness of the numerous benefits of lasers. The cheaper production of laser equipment in India would definitely result in lower cost of treatment and more patients would opt for laser dental treatment. This will in turn lead to more and more number of dentists buying laser machines to their clinics.^[9]

Determining the knowledge about LASER dentistry, it was found that qualification of study subjects was found to have statistically significant association to knowledge of participants on laser dentistry. Male gender, those from urban area, and interns were found to have adequate knowledge of LASER dentistry than their counterpart. In the present study, 40% of students demonstrated inadequate knowledge about lasers. This finding aligns with Bordea *et al.*'s report, which identified the deficiency of lectures on lasers in dentistry as the primary reason for the students' insufficient knowledge and the limited access of dental lasers.^[3]

According to Harini *et al.*, questionnaire was given to 70 dentists in Tanjore from which 28 dentists (17 male and 11 female dentists) came out with positive responses. Only 35% of dentists had practiced laser dentistry before. Most of the dentists had interest in dental laser. Their dental laser knowledge obtained mainly in periodontics, oral surgery, and endodontics.

The most known laser types among them were Nd: YAG, diode lasers. The well-known information among dentists about the dental laser is the laser application in gingivectomy and crown lengthening.^[10] While in this study around (68%) male gender, those from urban area (48%) and final year students (54%) were found to have adequate practice of LASER dentistry than their counterparts. The higher proficiency level among students in laser dentistry compared to their counterparts could be attributed to several factors such as education and training, access to resources, and technological advancements.

In the present study, qualification of study subjects was found to have statistically significant association with attitude of participants on laser dentistry ($p=0.003$), with a significant 95% whereas in a study conducted by Avhad *et al.*, 93.6% students were aware of dental lasers. This study reveals that most students possess only a moderate understanding of lasers and their applications in dentistry. It also indicates that students primarily rely on their college education for acquiring knowledge in this area.^[11]

Al-Jobair conducted a study involving 94 dental students (38 female and 56 male), achieving a response rate of 85.5%. The results indicated that approximately 87% of the respondents were aware of lasers, but only 8.5% felt that they had sufficient knowledge about dental lasers. Furthermore, only 11.7% had practiced dental procedures using lasers.^[12] In comparison, with this study with 425 participants found that 60% of the students had adequate knowledge, 64% had a positive attitude, but only 48% had adequate practice regarding the use of lasers in dentistry. This suggests that inadequate knowledge about dental laser applications is likely due to insufficient education.

Therefore, it is advised that the use of dental lasers should be included in the curriculum along with the use of laser safety goggles, appropriate face masks and shields. Undergraduate dental students need to be provided with appropriate dental education supported by practical experience.

CONCLUSION

This study underscores the importance of a well-rounded educational approach to laser dentistry. While dental students exhibit foundational knowledge and positive attitude toward laser applications, there is a pressing need for more extensive practical training and exposure. By addressing these gaps, dental education programs can better prepare students to embrace and implement laser technology in their professional careers, ultimately enhancing patient care and advancing the field of dentistry. Continuous feedback from students and regular updates to the curriculum based on technological advancements and clinical practices will ensure that dental education remains relevant and effective in training future dental professionals.

Limitations

The limitation of our study was the self-reporting bias. The study was limited to dental students. More research is needed

to assist in the more effective and rapid integration of this technology into dental college curricula. Follow-up surveys may track the adoption of these innovations and the benefits that come with them.

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