

Measuring Dentist's Awareness and Knowledge About Application of Photobiomodulation In Restorative Dentistry and Endodontics

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ABSTRACT

Study Design: Cross-sectional

Objective: This study aimed to assess the dentist's awareness and knowledge about the application of Photobiomodulation in restorative dentistry and endodontics.

Methods: A cross-sectional study was carried out on a total number of 300 dental surgeons (Male=150; Female=150) was participated in the study with age ranges from 20- to 55-year-old to know the knowledge, attitude, and perception among dentists about the application of Photobiomodulation in restorative dentistry and endodontics. Convenience sampling method was followed in this study. The Questionnaire was given and data was collected from dental surgeon. The data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS 20). A P-value of less than 0.05 was considered to be statistically significant.

Results: The majority of participants, 267(89%) were said that they using dental Photobiomodulation therapy (lasers) in your practice. 255(85%) agreed that they have received proper training to use dental lasers. Of the 300 dentists investigated, when asked about the various applications of Photobiomodulation in restorative dentistry and endodontics procedures, following are the response of participants to direct pulp capping (26%), dentinal hypersensitivity (21%), teeth bleaching (36%), postoperative sensitivity in restorations (5%) and regenerative endodontic procedures (12%).

Conclusions: In conclusion, dental laser education is an important aspect of a dentist's training and ongoing professional development. It enables dentists to stay current with technology, offer advanced treatment options to their patients, and provide safer and more efficient dental care.

Keywords: Knowledge, Photobiomodulation therapy, Lasers, Questionnaire, Dentist, Restorative and endodontics, Saudi Arabia

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INTRODUCTION

Photobiomodulation (PBM), also known as low-level light therapy, has emerged as a non - aggressive method of treatment with different programs across different health fields. This treatment utilizes precise frequencies of dark and thermal light-weight to cause biological actions in cells and tissues, which form the basis of its therapeutic consequences. The photochemical stimulation of cells by PBM produces various biochemical substances, including adenosine triphosphate (ATP), reactive oxygen species (ROS), calcium ions, and more. These biochemical responses contribute to cellular proliferation, differentiation, and migration, making PBM a promising approach in dentistry and beyond¹. Research on Photobiomodulation therapy (PBM) began in the 1960s, and early studies demonstrated its potential in various dental specialties. Over the moment, the field of dentistry has recognized the numerous perks of PBM, leading to its increasing consolidation into scientific exercise. PBM is now a well-established modality in dental care, with ongoing research seeking to uncover its advantages in endodontics and other dental specialties^{2,3}. "Photobiomodulation"(PBM) accurately reflects the broad spectrum of electromagnetic wavelengths involved in low-power treatments. PBM may act on specific cells in both a photo stimulatory and photoinhibitory manner, which have healing effects. To harness the power of lasers safely and effectively in different medical disciplines, a strong knowledge of light mechanics, functioning, and the different types of lasers is necessary. Proper knowledge ensures that the appropriate variety of lasers is chosen for each specific case, optimizing treatment outcomes⁴. The productive software of PBM in medicine has been made possible by the expanding availability of new medical solutions and the rising demand for education and teaching. Lasers, in particular, play a significant part in numerous dental methods, including apicectomy, therapies, and executive medicine. Lasers have become essential tools in soft and hard tissue management, offering precision and effectiveness⁵.

Photobiomodulation (PBM) has emerged as a valuable alternative to traditional analgesics and anti-inflammatory drugs in dental care. It can perform a crucial function in various aspects of dental, including Postoperative Endodontic Pain. PBM may help relieve surgical problems, improving the victim's entire practice and restoration. PBM's advantages in endodontic operation extend to that procedure, which helps with pain relief, disinfection, and enamel formation. PBM has a claim in renewable endodontics because it helps with cell regeneration and repair. Level of Anesthetic: PBM properly affects the depth of anesthesia, enhancing persistent comfort during medical procedures. Direct Pulp Capping: PBM can be utilized in strong tissue-ending treatments, contributing to the protection of tooth tissue. Tooth Hypersensitivity: PBM's ability to reduce dentin sensitivity is valuable in managing tooth hypersensitivity⁶. Due to its potential to improve dental pulp tissue regeneration, laser-induced photobiomodulation therapy (PBMT) has attracted attention. PBMT's advantageous properties, such as pain, disinfection, and dentin sensitivity reduction, status it as an important adjunctive therapy in endodontics. The mitochondrial respiratory chain, a major reactive oxygen species (ROS) source, absorbs the red and near-infrared light produced during PBMT⁷⁻⁹. This absorption triggers the production of ROS, nitric oxide, ATP, and cyclic adenosine monophosphate (cAMP), initiating a cascade of cellular events that promote stem cell proliferation and tissue regeneration¹⁰. Photobiomodulation therapy (PBM) has emerged as a valuable tool in modern dentistry, offering a non-invasive and practical approach to various dental procedures. As the study continues to discover its probable benefits, PBM's role in endodontics and various tooth specialties will likely develop further. Dentists may be informed about the latest progress in PBM to provide their sufferers with the best possible care and enhance their overall periodontal care expertise.

Therefore, this study aims to assess the dentist's awareness and knowledge about the application of Photobiomodulation in restorative dentistry and endodontics.

METHODS

A cross-sectional study was carried out on a total number of 300 dental surgeons (Male=150; Female=150) was participated in the study with age ranges from 20- to 55-year-old to know the knowledge, attitude, and perception among dentists about application of Photobiomodulation (PBM) therapy in restorative dentistry and endodontics. Written informed consent was obtained from the participants after explaining to them the purpose of the study. The sampling method included in the study is a simple random sampling method. Ethical approval [IRB/ KKUCOD/ETH/2022-23/053] for performing the survey was obtained from the Scientific Research Committee of King Khalid University, College of Dentistry.

The questions were designed and were circulated through online google forms among dental surgeons practicing in the Abha region of Saudi Arabia. The questionnaire was formulated, which comprised of two parts: The first portion included the questions related to the demographic information of participants, such as age, gender and level of education. The other part of the questionnaire comprised of 10 questions with 'yes' and 'no' pattern, and the multiple-choice question was prepared, and piloting was done. Questionnaire was tested for reliability and validity.

A self-administered structured questionnaire originated and was tested among a comfort sample of 20 dental surgeons. These were interviewed to get feedback on the entire acceptability of the study when it comes to length and language clearness; in accordance with their feedback, the queries were corrected. Encounter validity was furthermore assessed before the start of research. Both descriptive and analytical statistical dimensions were used to describe the primary variables by SPSS 18 (IBM Corporation, Armonk, NY, USA) software.

RESULTS

A total of 300 (150 males and 150 females) parents responded to the questionnaire. 88% of study subjects were of 20-30 years, 7% of study subjects were of 31-40 years, 5% were of 41-50 years, and 0% were >50 years [Table 1]. The levels of education of dentists were bachelor (81%) and master (29%) were recorded in this study. The responses of Saudi dentists towards knowledge about application of Photobiomodulation in restorative dentistry and endodontics were shown in Table 2. The majority of participants, 267(89%) were said that they using dental Photobiomodulation therapy (lasers) in their practice. 255(85%) agreed that they have received proper training to use dental lasers. Of the 300 dentists investigated, when asked about the various applications of Photobiomodulation in restorative dentistry and endodontics procedures, following are the response of participants to direct pulp capping (26%), dental hypersensitivity (21%), teeth bleaching (36%), postoperative sensitivity in restorations (5%) and regenerative endodontic procedures (12%). When the question was asked regarding the best reason to use the lasers in the clinic, nearly half of the participant (52%) said for its minimally invasive procedure. Response of Saudi dentists to the question: Which laser gives highest efficiency in pulpotomy? is shown in Figure 1. Majority (95%) of participants agreed that lasers can remove caries better and conservatively than conventional methods like hand piece. Patients' response to lasers were positive response as agreed by the practicing dentists. Majority (93%) of them agreed that education related to lasers are needed to be included in the curriculum of undergraduate students

and maximum dentists also agreed that its mandatory to use protection while using laser treatment.

Table 1: Distribution of study sample according to age, gender and level of education

GENDER	n (300)	%
Male	150	50%
Female	150	50%
AGE		
20-30 years	264	88%
31-40 years	21	7%
41-50 years	15	5%
>50 years	0	0%
EDUCATIONAL LEVEL		
General Dentist	213	71%
Specialist	87	29%

Table 2: Response of dentists towards knowledge about application of Photobiomodulation in restorative dentistry and endodontics

QUESTIONNAIRE	Total (n)-	%
	300	
Q1. Have you been using dental Photobiomodulation therapy (lasers) in your practice?		
Yes	267	89%
No	33	11%
Q2. Have you received proper training to use dental lasers?		
Yes	255	85%
No	45	15%
Q3. Which of the following are the applications of Photobiomodulation in restorative dentistry and endodontics?		
Direct pulp capping	78	26%
Dentinal hypersensitivity	63	21%
Teeth bleaching	108	36%
Postoperative sensitivity in restorations	15	5%
Regenerative endodontic procedures	36	12%
Q4. Which of the following is a BEST REASON TO USE Photobiomodulation in restorative dentistry and endodontics?		
Minimally Invasive	155	52%
Not Harmful for Surrounding Tissues	64	21%
No anesthesia Needed	66	22%
Increased productivity	7	2%
All of the Above	8	3%
Q5. Lasers can remove caries better and conservatively than hand piece.		
Yes	285	95%
No	15	5%
Q6. What is the response from patients regarding the use of Photobiomodulation Therapy		
Positive	195	65%
Negative	69	23%
Unsure	36	12%
Q7. Do you know that Photobiomodulation Therapy gives any side effect after treatment		
Yes	204	68%

No	96	32%
Q8. Which laser gives highest efficiency in pulpotomy?		
Carbon	58	19%
Diode	155	52%
Er:yag	66	22%
Helium	21	7%
Q9. Do you think that theoretical and practical, laser education is needed?		
Yes	279	93%
No	21	7%
Q10. Any protection required while undergoing laser treatment		
Yes	300	100%
No	0	0%

n = Number; % = Percentage

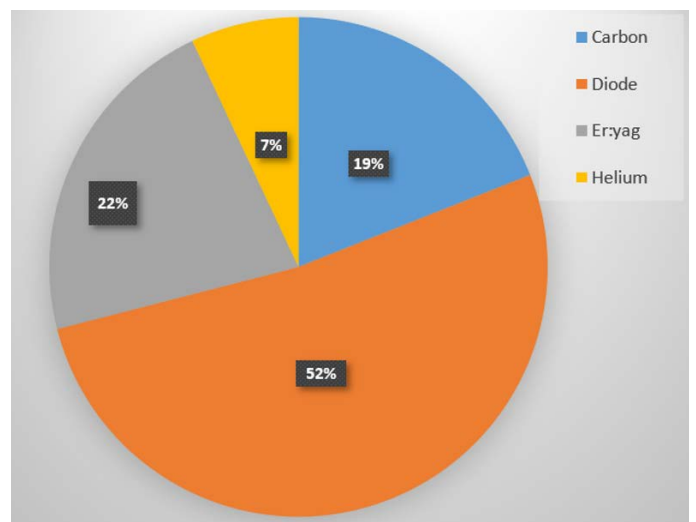


Figure 1: Response of Saudi dentists to the question 'Which laser gives highest efficiency in pulpotomy?'

DISCUSSION

Education from the dental college is indeed a crucial foundation for aspiring dentists. It equips them with the fundamental knowledge and skills needed to practice dentistry effectively. Dental education encompasses various aspects of oral health, including traditional dental techniques, emerging technologies, and specialized fields like dental laser education. Dental laser education is an essential component of modern dental training, as lasers have gained popularity in various dental procedures. Many dental schools have integrated dental laser education into their curriculum to ensure that future dentists are exposed to this technology^{11,12}. This inclusion typically covers the basics of laser physics, safety protocols, and practical applications in various dental procedures. This study provides a general view about dental laser education and knowledge among dentists. This survey only assessed some basic knowledge of dentists regarding uses, advantages, effects of laser. Many dentists (89%) reported that they are using dental Photobiomodulation therapy (PBM) in their practice. 255 (85%) agreed that they have received proper training to use dental lasers. Of the 300 dentists investigated, when asked about the various applications of Photobiomodulation in restorative dentistry and endodontics procedures, following are the response of participants to direct pulp capping (26%), dentinal hypersensitivity (21%), teeth bleaching (36%), postoperative sensitivity in restorations (5%) and

regenerative endodontic procedures (12%). Hence this shows that more the education the dentists had, the more knowledge they gained about laser. As technology evolves, dentists must stay updated with the latest advancements in dental lasers. Many dentists pursue continuing education courses and workshops to deepen their knowledge and skills in this area. Dental lasers offer several advantages, such as reduced pain, shorter recovery times, and more precise treatment¹³. Dentists need to be knowledgeable about these benefits to make informed decisions about incorporating lasers into their practice. Patients often seek out dentists who offer advanced and less invasive treatment options. Dentists with knowledge of dental lasers can meet these expectations and provide a higher level of patient care. Dental laser education should also cover safety measures and regulatory requirements. Dentists must understand how operate lasers safely and within the legal framework¹⁴.

The vast majority of participants in the study stated that they were impressed by using laser. For various medical procedures, we asked them to select between traditional and laser treatment, and we discovered that respondents preferred laser therapy to conventional care. Lasers can provide treatment without the need for needles and high-speed hand pieces causing less intra and post-operative discomfort to the children Furthermore, there is less need for behavioural management therapies in case of lasers assisted therapy¹⁵. Laser etching is a successful etching alternative to acid etching. Laser etching provides a successful debonding of the brackets from the enamel surface without causing fractures¹⁶. The training regarding PD therapy via lectures and workshops is important as it enables understanding of key concepts in order to make an individual expert undertake its use in research projects, produce knowledge by scrutinizing/interpreting the results. They can also practice it in their clinics after training under the supervision of an expert therapist. Regarding the safety of lasers, majority of students had a knowledge of using safety protocol during laser procedure. For the safety of the dentists and patients, it is of paramount importance to educate students of laser safety measures¹⁷. Most of the dentists depend on information and training provided during their undergraduate courses. So, the introduction of basic laser courses in undergraduate curriculum might increase the popularity of this new technology. Dental practitioners received training after their completion of graduation through seminars/ workshops of did not receive training continuous professional development (CPD) regarding the use of PBM to acquire adequate skills for clinical practice¹⁸. But outmost the level of self-perceived knowledge of dental practitioners was inspiring, which might be attributed to the involvement of the graduating students in research activities making them learn regarding the use of PBM in dental setup²³⁻²⁶. A study conducted by Yadav et al. (2018) revealed that 21% of Indian dental practitioners had received laser treatment training¹⁹. Another investigation in Iran reported a small percentage of 3% dentists receiving training to use dental lasers²⁰. Ongoing research and development in dental lasers continue to expand their applications and effectiveness. Dentists who are well-informed about these developments can make more informed choices about adopting new laser technologies in their practice.

CONCLUSION

In conclusion, dental laser education is an important aspect of a dentist's training and ongoing professional development. It enables dentists to stay current with technology, offer advanced treatment options to their patients, and provide safer and more efficient dental care. Dentists who prioritize education and training in dental lasers are better equipped to meet the evolving needs and expectations of their patients while ensuring their safety and well-being.

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Competing Interest: None

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