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Knowledge of Dental Practitioners about Light Curing units in Saudi Arabia

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Abstract

Objective: The aim of this study was to investigate Saudi dentists' knowledge of light-curing units in clinical use, technical features of their light-curing units, and safety awareness.

Materials and Methods: A pre-coded questionnaire was sent electronically to all dentists (n = 407) in various regions of Saudi Arabia, total of respondent were (n = 354).

Results: 76% of the respondents are using light-emitting diode light-curing units. Almost half (49.2%) are currently working in the central region of Saudi Arabia. The majority of the respondents (88.7%) were unaware of the intensity value of their light-curing unit. A total of 73.7% stated that they do not do routine maintenance of their light-curing units. 70.3% of the dentists were averting their eyes while using the light-curing units. Almost one-third of the practitioners were not using adequate eye protection against blue light. The odds of using adequate eye protection were significantly higher among young dentists ($p < 0.01$). For the majority of the respondents (87.6%), their understanding of the term "depth of cure" fell between "familiar" to them and "could explain it to others". Majority of dentists in this group do not have regular maintenance of their light-curing unit.

Conclusions: This study revealed considerable variations in levels of knowledge about light-curing units among Saudi dentists working in various regions in Saudi Arabia. Concluding that the dentists needs more education about the light curing units.

Keywords: Light-Curing Unit, Resin, Intensity, Depth Of Cure, LED

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Introduction:

Dental caries are one the most common diseases in the Kingdom of Saudi Arabia1. One of the initial and most popular treatments for dental caries is the placement of dental restorations. Tooth colored light-cured filling materials are the first choice for both patients and doctors due to the high current esthetic demands[2,3]. Resin materials today contain photoinitiators in primers that require absorption of optical radiation in the wavelength range of 350–500 nm to harden the resin restoration[4–6]. Light-curing units (LCUs) are used to transmit the proper light radiation to the resin to promote polymerization.

Four main types of LCUs are used in the clinic: quartz-tungsten-halogen (QTH), light-emitting diode (LED), plasma arc (PAC), and argon-laser units. The most popular of these are QTH and LED units[7–12].

Factors that can affect the energy transmitted to the resin restorations by LCUs include the light intensity, broad emission spectrum, and the wavelength range. Sufficient light intensity from the LCU must be controlled and checked to achieve proper results in the clinic. Inadequate light intensity will lead to inadequate polymerization of the resin, microleakage, and subsequently increased bacterial accumulation. This scenario will eventually lead to caries that will compromise the bond strength and the shade of the restoration[13]. Other factors that might affect resin polymerization are the duration of the delivery of light to the resin and the distance between the curing tip of the LCU and the resin surface14. Increased light exposure ensures increased depth of cure, increased conversion or polymerization, and increased hardness[13]. Proper placement and angulation of the tip of LCU is crucial to ensure proper polymerization[15]. The blue light, emitted from LCUs can cause eye damage[16,17], and one of the most frequent injuries in dental clinic is to the eyes, for the dentist, dental assistant,

or even the patient whose are exposed to the light from LCUs[18].

Sufficient knowledge and understanding of the above-mentioned factors will enable proper usage of the LCUs to transmit the correct amount of energy (8–50 J/cm2) to the resin and to prevent injuries[19–21]. The aim of this study was to evaluate the knowledge level of dental practitioners in Saudi Arabia about LCUs.

Materials and Methods:

Questionnaire: A questionnaire, set up on the web survey system Survey Monkey, was sent electronically to dentists in Saudi Arabia, including interns, general practitioners, specialists, and consultants in various specialties. The questionnaire was sent through multiple channels, including the Saudi Dental Society data base, various dental colleges, social media, and personal contacts. Information collected from each respondent included his/her age, gender, nationality, whether they graduated from a private or governmental, Saudi or non-Saudi dental college (Bachelor degree), their current position working in the governmental sector, private sector, or academic sector, the place of their work (central, western, northern, southern, or eastern region), and their year/s of experience. The participants were asked several questions related to LCUs, such as the type of LCU used, output intensity of the LCU, whether they follow the manufacturer's instructions to determine the exposure time, whether they keep their eyes on the tooth and the restoration or avert them when the light is on, if they know if the light output matches the resin used, and questions about their familiarity with terms that included depth of cure, beam collimation, beam profile, irradiance, spectral emission, hardness mapping, and where they would like to get more information on LCUs (printed journals, continuing education (CE) lectures, online journals, colleagues, dental magazines, manufacturers, or online blogs).

Statistics: Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) software version 23.0 (SPSS Inc., Armonk, New York, USA). Results are expressed in numbers and percentages for categorical variables, and mean, standard deviation (SD), and range for continuous variables. Correlation between two variables was analyzed using the Pearson correlation. Chi-square test (×2) was done to determine the significant difference between categorical variables. A p value of < 0.05 was considered statistically significant.

Results:

Demographics: A total of 407 dentists responded. Respondents who left the survey empty (n = 53) were excluded from the statistical analyses, leaving a total of 354 responses. The age of the respondents ranged from 21 to 77 years (mean 30.52, SD 8.6); 37.35% were females and 62.7% were males; 87.9% of respondents were Saudis and 12.1% were non-Saudis. Most of the respondents (301; 85.0%) graduated from Saudi Dental College and 53 (15.0%) graduated from a non-Saudi dental college. General practitioners and interns had the highest rate of responses (256; 72.3%), followed by specialists (58; 16.4%) and consultants (40; 1.3%). Almost half of the respondents (49.2%) are currently working in the central region of Saudi Arabia. 44.9% of the respondents are working in governmental sector, 32.8% are working in the private sector, 12.1% are in academics, and 10.2% are working in more than one sector.

Knowledge of LCU use and safety: Most of the respondents (76.8%) are using LED type LCUs. The majority of the respondents (314; 88.7%) were unaware of the intensity value of the output of their LCU. A total of 73.7% stated that they do not do routine maintenance of their LCU. 70.3% averts their eyes while using the LCUs. More than half of the dentists (59.0%) knew that the type of light output matched the resin they were using either in a restoration or resin cements with while more than two thirds (70.3%) of the respondents say they follow the manufacturing instructions to determine the exposure time. There was no significant difference in responses related to the dentists' positions or education (p = 0.866).

Familiarity of terminology: The most familiar term for the respondents was the depth of cure (87%); those familiar with this term are also able to explain it to others. For the remaining familiarity level of various terms, see Table 1.

	New term	Familiar	Could explain to others
Depth of cure	12.4%	54.2%	33.3%
beam collimation	46.0%	38.7%	15.3%
Irradiance	52.8%	39.3%	7.9%
Spectral emmision	68.1	22.6%	9.3%
Hardeness mapping	64.1	28.0%	7.9%

Table 1: Dentists' Familiarity of Terminology

Sources for further information: Most dentists agreed that the best sources for gaining more information about LCUs was from the manufacturers with (96.3%) of the responses, online journals, and CE lectures with(94.9%) and printed journals with (94.4%), while (75.8%) of dentists considered digital magazines acceptable, and (44.6%) were neutral about obtaining more information from colleagues.

Discussion:

The study identified, through the use of a questionnaire, the levels of knowledge about various aspects of LCUs among dentists practicing in Saudi Arabia. The study revealed that more than two-thirds of dentists are averting their eyes while using LCUs instead of using proper eye protection. Studies have reported that averting the eyes during the process of light curing results in a high chance of moving the light-curing tip of the LCU. The use of filtered eyewear goggles, visors, or hand-held shields was recommended to achieve stability of the LCU in the correct position while providing appropriate eye protection22–24.

Knowledge and understanding of the LCU output intensity is important to ensure sufficient curing of the resin and to prevent any damage or harm. Most of the respondents did not know the output intensity of the LCU they were using, which increases their chances of having insufficient curing and polymerization by the LCU. Familiarity

with the terms used in LCU processes is very important to ensure the correct usage of the LCU with each type of resin. For the LCU to work most efficiently, all parts of it, including the battery, filters, other parts of the whole unit, and the quality of the tip through which the light is transmitted, must be maintained properly. This will allow the LCU output to have the proper intensity to avoid failure of the resin. Dentists need to confirm that they have the proper information on how to use LCUs for the best results. Information should be obtained from the manufacturer because asking a colleague runs the risk of getting incorrect information.

Conclusion:

This study revealed considerable variations among dentists working in Saudi Arabia with respect to their understanding and use of LCUs. Dental practitioners should continually seek out basic information regarding the use and maintenance of LCUs to maintain the quality of their work, as LCUs play an important part in dentists' daily practice.

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