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Evaluate the Output Radiation of Light Curing Sources in Dental Offices Across the Left Side of Nineveh Province

The research aims to evaluate the extent of the effect of optical processing sources and other factors on radiation outputs in dental clinics on the left side of Nineveh Governorate. Use a radiometer to measure the amount of radiation coming from polymerization devices. Radiation values were recorded at three locations in the clinics while the polymerase machines were operating. The mean radiation was determined after a short period of operation. The results showed that many dentists do not use curing lamps correctly and are not provided with sufficient information about the harm resulting from these devices and their impact on their health and the health of patients and the surrounding environment. Therefore, emphasis must be placed on appropriate education and training on the ideal light therapy technique. Improve photo curing performance at scale with detailed instructions on optimizing photo curing technology.

Keywords: Radiation; Light intensity; Light curing; Phototherapy units
Received: 04 April 2024; **Revised:** 25 April 2024; **Accepted:** 01 May 2024

1. Introduction

Radiation is a measure of the amount of radiation present in a given environment. The effective dose is the radiation dose to which tissues and the environment are exposed, taking into account the different biological effects resulting from different types of radiation. Blue light therapy has increased in popularity in the past few years. It is a painless, comfortable, non-invasive and highly effective biophysical treatment for many diseases [1,2]. There is no evidence that devices operating on mid-level blue light have harmful effects, but the potential effects of long-term cumulative exposure and dose-response effects are currently unknown[3].

A dental device used to polymerize composites based on photo curing, used to harden the composite material. There are four basic types of light sources for dental treatment: tungsten halogen, light-emitting diodes (LED), plasma arcs, and lasers. All these modules emit blue light in the wavelength range of 380-510 nm [4]. It emits appropriate light intensity. The consumption of light source and exposure to light radiation of materials can reduce the output intensity of the module. Therefore, it is recommended to evaluate the performance of optical processing units [5]. As the polymerization system ages, the light output diminishes due to prolonged use, resulting in decreased mechanical properties [6]. Blue light from therapy lights can cause eye damage; the risks depend on the radiation emitted, radiation geometry, exposure time, and degree of reflectance. The International Commission on Radiation Protection has stressed the application of special guidelines when exposed to blue light and its reflection from treatment lamps. Safety concerns are essential to avoid a work-related injury [3,7,8]. Regarding the principles of patient safety and radiation protection, the dentist must improve the treatment procedures. When exposed for a long time, the pulp and tissues of the tooth exposed to light are damaged [9]. On the contrary, applying low radiation or short treatment time leads to failure of the restoration. Although LED lamps are more commonly used compared to halogen lamps, the radiation of LED lamps decreases over time and causes technical failure. Therefore, curing lamps need constant maintenance and regular monitoring to control the beam coming from light sources [10].

This study aims to determine the amount of radiation resulting from light sources in dental clinics on the left side of the city of Nineveh and to determine the extent of its impact on the doctor, the patient, and the surrounding environment during and after treatment and to know the characteristics and correct usage of these devices.

2. Experimental Part

This study was conducted in the left side of Nineveh Governorate, and 45 private dental clinics were randomly selected, including 78 phototherapy devices that work to polymerize light-cured resin. The following information was collected: type of unit (LED and the QTH unit), age of the unit, and date of last maintenance. For the device, number of

uses during the day, light output (light intensity in mW), and radiation from the clinic and units, use a radiation measuring device (1 pc An hour (μSv/h) to 150 mSv/h to measure the amount of radiation emitted by the polymerization devices in these offices.

Radiation values were recorded in three different locations in the clinics while the polymerization devices were operating. The average radiation emitted by each device was measured at different times. This was repeated three times and we obtained three readings from each LED unit and the QTH of all parameters, after which the average irradiance was determined after a short period of operation and all results were recorded in tables for analysis.

3. Results and Discussion

Tables (1) and (2) show the average radiation changes with the (age, last maintenance date, number of times used during the day, intensity) of the unit versus the number of curing units. The results showed that the radiation rate was not influenced by the last maintenance date of the unit, but the three variables (age, number of times used during the day, intensity) did have an effect on the unit versus the number of curing units. To maintain the safety of the patient and dentist and reduce radioactive contamination of the environment surrounding clinics, appropriate treatment units with appropriate characteristics must be chosen. This study highlights the importance of repeatedly evaluating the radiation rate of different treatment units used in dental clinics in the left side of Nineveh province. efficiency Continuous improvement in treatment unit technology may contribute to increased adoption by dentists of these curing units in clinics as they have numerous benefits such as narrow emission spectrum, specific energy density, improved treatment efficiency, durability, compact device form, and energy [11,12] and thus lead to a reduction in Emitted radiation is harmful to humans and the environment. When the intensity is low, the light radiation from light sources does not produce efficiency in treatment even if the treatment time is increased. However, the ray with a high intensity and the shortest treatment time produces high-precision mechanical properties, and increasing the treatment time can be an alternative to low intensity in some treatments, the fracture strength efficiency and hardness of the composite material increase [13-15].

This study demonstrated how easily errors can occur during the phototherapy process, leading to increased risks during restoration operations. However, photo curing performance can be extensively enhanced using detailed instructions on improving the technology used in photo-polymerization and detecting the resulting damage and radiation emitted by photo polymerization devices used in dental clinics and hospitals. This is a result of the incorrect use of some relevant features and understanding the technical knowledge in these devices and providing the necessary advice and guidance to the owners of these clinics, according to the survey data collected. The results of this study showed that many dentists do not use curing lamps correctly and are not provided with sufficient information about the harms resulting from these devices and their impact on their health and the health of patients, as well as their impact on the surrounding environment. To their clinics. Therefore, emphasis should be placed on appropriate education and training on the ideal phototherapy technique in all dental schools and even the inclusion of all dentists in special and periodic courses to understand the problems related to phototherapy.

Table (1) Average radiation changes with: Age and last maintenance date (c) the no. of times was used during the day (d) the intensity of the unit versus no. of curing unit

average Radiation μSv/h	Age of the unit (years)	Number of QTH lights (n=26)	Number of LED lights (n=52)
0.12	<1	6	19
0.15	1-4	9	24
0.18	>4	11	9
Average Radiation (μSv/h)	**Last maintenance date of the unit (months)**	**Number of QTH lights (n=26)**	**Number of LED lights (n=52)**
0.22	no	9	22
0.17	<3	2	3
0.20	3-6	6	5
0.15	6-12	5	18
0.21	>12	4	4

Table (2) Average radiation changes with: the no. of times was used during the day and the intensity of the unit versus no. of curing unit

Average Radiation (μSv/h)	The number of times the unit was used during the day	Number of QTH lights (n=26)	Number of LED lights (n=52)
0.17	<5	13	19
0.21	5-10	7	12
0.24	>10	6	21
Average Radiation (μSv/h)	**Intensity (mW/cm²)**	**Type of QTH lights (n=26)**	**Type of LED lights (n=52)**
0.16	<250	15	17
0.18	250-1000	7	25
0.23	1000-1500	4	10

4. Conclusion

The typical treatment times with radioactive light were addressed, in addition to a typical number of daily treatments as well as maintenance, the danger of these devices to the surrounding people and the environment may exceed the limits, because dentists did not protect themselves and their patients adequately from these devices Requires the operator to know the characteristics and correct usage of these devices.

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