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Evaluation of Knowledge of Dentists Working in Dental Clinics in Tobruk City Regarding Radiation Protection

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Abstract
About 20% of radio diagnostics in dental radiology represents human radiation exposure. Although the radıatıon dose of intraoral dentistry is low, however cannot be ignored due to the procedures performed. This study was carried out to evaluate the knowledge of dentists towards radiation hazards and protection. The data collected through questionnaires of 10 questions and analyzed by using Microsoft Excel software. The knowledge was limited among dentists. 70 % of dentists used a rectangular collimator, and 30% used a circular collimator. The type of films used by 90% of dentists were E-speed films, and 10% dentists used D-speed film. 80 % of dentists were not using film holders and asked their patients to hold the films inside the mouth with their fingers for almost every exposure. Lead aprons were worn by 30% of dentists during exposure, and 70% did not use any type of lead apron. 20 % of dentists use monitoring, and 80 % of dentists do not use any type of radiation monitoring devices. The study showed that dentists' awareness and knowledge are poor about radiation protection; as a result, all dentists need training programs in radiation protection.
Keywords: Radiation Protection, Training Programs, Dentists.

Introduction

Radiographic methods that rely on ionizing radiation are widely used in the diagnosis and treatment planning of oral and facial diseases (1-2). Multiple studies have confirmed that exposure to radiation during dental imaging may pose potential health risks to tissues such as the salivary glands and the thyroid gland. Recent advancements in dental radiology technology have shown that it's indeed possible to lower radiation doses without sacrificing the quality of the images we rely on for effective diagnosis and treatment. It's a delicate balance, but one that is crucial for both patient safety and care excellence (3-4).
Therefore, all precautions must be known and taken appropriately to ensure protection from radiation and radiation safety during dental imaging (5-6). The fundamental measures for radiation protection in diagnostic imaging are based on the principle of justification, which requires that the benefits of the procedure outweigh the risks associated with radiation exposure (7-8). Once the procedure is justified, the exposure parameters and imaging media (such as film/cassette selection, edge definition, tube voltage, tube current, and others) should be optimized according to the ALARA principle, which aims to maintain optimal image quality while minimizing radiation exposure to the lowest possible level (9-10).
Currently, radiographic examination is crucial for diagnosis and therapy. Given that the radiation was shown to be potentially hazardous. Radiation protection instruction is vital for medical sciences students. Health care providers have a role to diminish the social effective dose via sensible practice and logical prescription. The dentists found in India have weak performance in reducing doses. Shahab et al. (13), assessing knowledge of radiation protection among 1,000 dentists in Iran regarding patient dose protection, in the study group, concluded that most dentists didn't choose the correct method, equipment, and material to minimize unneeded radiation exposure for patients in dental radiography (11-12). The purpose of this research was to assess the knowledge and attitudes of dentists concerning radiation protection and radiation risks.

Methods

Study Design and Setting

A cross-sectional study was conducted across 10 dental clinics (9 private and 1 general) in Tobruk city. The study focused on assessing dentists' understanding of radiation safety measures through a structured questionnaire.

Participants

A total of 10 dentists (one from each clinic) participated in the study. Since the number of dental practitioners in Tobruk is limited, a convenience sampling method was used. All participants had experience in performing or prescribing dental X-rays.

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Data Collection
A self-administered questionnaire was distributed among the dentists. The questionnaire consisted of demographic and professional background (years of experience, type of practice). Knowledge assessment (10 multiple-choice questions covering key topics such as radiation shielding, optimal exposure settings, and safety protocols).

Data analysis
The responses were analyzed using Microsoft Excel to calculate frequencies and percentages. The results were presented in tables and charts for better visualization.

Ethical considerations
Verbal consent was obtained from all participants. Responses were kept anonymous to ensure confidentiality.

Results and Discussion
The results showed that the dentists surveyed included 5 males and 5 females. Demographic data revealed that 90% of the dentists were below 40 years of age, while 10% were above 40. Additionally, 80% of the dentists had been using radiographic X-ray machines for more than 5 years. In terms of monthly usage, 60% performed between 20–30 radiographic exposures, and 40% performed more than 30 exposures, as shown in the table.

Table 1. Classification of dentists based on age, gender, how long using the radiographic machine, and the number of exposures per month.

Questions	Criteria	%
Gender	Male	50%
	Female	50%
Age	Below 40 years	90%
	Above 40 years	10%
How long using a radiographic machine	Less than 5 years	20 %
	More than 5 years	80%
Number of exposures per month	20 – 30	60%
	More than 30	40%

The assessment of dentists' knowledge regarding radiographic exposure parameters revealed notable variations in practice. As illustrated in Table 2, kilovoltage (kV) settings differed among practitioners: 30% (n=3) operated their dental X-ray machines within the 60–70 kV range, while the majority (70%; n=7) used settings exceeding 90 kV. Exposure times also varied, with 70% of dentists (n=7) adhering to a 0.2–0.5 second range, whereas the remaining 30% (n=3) were unaware of their machine's exposure time.
Collimator usage further highlighted gaps in awareness. Only 30% of dentists (n=3) employed circular collimators, while 70% (n=7) were unfamiliar with the type of collimator in use. Film selection trends leaned heavily toward E-speed films (90%; n=9), with a small minority (10%; n=1) still using D-speed films. Alarmingly, none of the practitioners utilized film holders; instead, all relied on patients to stabilize films intraorally with their fingers.
Radiation safety practices were similarly concerning. While 30% of dentists (n=3) used lead aprons during exposures, 70% (n=7) did not. Thyroid collars were universally neglected, and only 20% of practitioners (n=2) maintained a safe distance by leaving the room during exposures—the majority (n=9) remained beside the patient. Additionally, no dentist employed radiation monitoring devices, indicating a critical need for improved safety protocols.

Table 2: Questionnaires asked to the dentists

Questions	Responses	%
Type of collimator	Cercular	30%
	Rectangular	70%
Speed of film	E- speed	90%
	D- speed	10%
Tube voltage for intraoral radiographic mashine	60 - 70 kvp	30 %
	More than 90 kvp	70%
	02 – 05	70%

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Exposure time for intraoral radiographic machine	Unaware	30%
Did you wear a lead apron during exposure	Yes	30%
	No	70%
Dentists stay outside the room when taking radiographic	Yes	20%
	No	80%
Did you use radiation monitoring devices?	Yes	00%
	No	100%

Exposure parameters analyser for intraoral radiographic equipment was found that 30% used 60 – 70 kvp, and 70% More than 90 kvp. The collimator shape of the ray beam is reported as two of the important factors in determining patient dose in dental radiology (13). The rectangular collimator reduces the dose by about 5 times that of the circular cone; however, in this study rectangular collimator is used 70% and 30% uses circular collimator. 10 % of dentists use intraoral D-speed film, and 90% of dentists use intraoral film E-speed, which reduces the dose by 40 – 50 % compared with D-speed film. The study shows that 30% of dentists wore lead aprons during exposure and 70% did not wear lead aprons during. Using monitoring devices such as, film badge is very important. Unfortunately, in this study, dentists did not use personal monitoring devices.

Conclusion

The study and results revealed that the awareness and knowledge regarding radiation protection are low in dental radiography. The poor knowledge about radiation protection may expose the patients to extra radiation doses that are not needed. The researchers recommended that the dentists should take courses about radiation protection to ımprove thier knowledge.

Conflict of interest. Nil

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