

Knowledge, attitude, and practice of dental practitioners toward radiation hazards and safety – A cross-sectional study

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ABSTRACT

Introduction: Although the radiation dose levels in dental practice are relatively low, one should consider the cumulative effect of repeated exposures. There should be a striving for the implementation of radiation protection measures and selection criteria for radiography in private dental offices. **Aim:** The study was to assess the knowledge, attitude, and practices of dental practitioners toward radiation hazards and safety. **Materials and Methods:** A self-formulated questionnaire composed of 12 questions was circulated among 100 dental practitioners which includes both general dental practitioners and specialist dental practitioners to evaluate their knowledge, attitude, and practices toward radiation safety standards. **Results:** The respondent's knowledge regarding as low as reasonably achievable principle was as high as 83.8%, but the application in their clinical practice such as usage of film holders by the professionals was only about 51% and only about 54% of the practitioners use personnel monitoring device. **Conclusion:** The knowledge, attitude, and practices of dental practitioners in regard to radiation protection and safety were noted to be higher with less application in their practice. This necessitates enforcement of appropriate measures to ensure maximum safety.

KEY WORDS: Film holders, Personnel monitoring device, Radiation protection measures

INTRODUCTION

From the time of its discovery, X-rays have played a pivotal role in the field of medical and dental science. Ranging from diagnostic to therapeutic applications, the use of X-rays is manifold. Probably, the most widespread application is in the field of dentistry from the simple diagnosis of incipient caries and miniscule fractures to aiding in more complex procedures such as precision implant planning.^[1] Dentists use radiographs more often than any other health professional. It is reported that around 45% of dental patients require radiographs for diagnosis. Therefore, it is necessary that the patient should be exposed to the lowest achievable dose of radiation exposure.^[2] For this reason, compliance to as low as reasonably achievable (ALARA) principles becomes important in their practice to reduce patient exposure to ionizing radiation. The ALARA principles in dental radiology

are aimed mainly at selection criteria, equipment, and quality assurance. Continuous advances in dental radiography equipment have resulted in dose reduction without quality impairment.^[3]

Although the data obtained from radiography is useful for diagnosis, radiographic examination exposes the patient to ionizing radiation. This ionizing radiation results in the modification of biologic molecules, including metabolism, growth and multiplication of cells, and genetic changes. Therefore, along with an increase in the diagnostic application of X-ray, radiation protection protocols should be considered.^[4] To combat radiation-induced hazards, dental practitioners must adhere to these radiation protection guidelines.

Principles of Radiation Protection

The current radiation protection standards are based on three general principles:

- Justification of a practice, i.e., no practice involving exposures to radiation should be adopted unless it provides sufficient benefit to offset the detrimental effects of radiation

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- b. Protection should be optimized in relation to the magnitude of doses to which a person is exposed
- c. Dose limitation, on the other hand, deals with the idea of establishing annual dose limits for occupational exposures, public exposures, and exposures to the embryo and fetus.^[5]

Although the radiation doses used by dentists might be low for individual examinations, patients are exposed to repeated examinations over time, and many people are exposed during the course of dental care. Hence, attention is usually given to minimize unnecessary exposure for members of the public and occupational workers.^[6,7] During the course of their training, all health-care personnel are trained regarding radiation hazards and requisite safety measures. However, the sincerity with which the matter is considered needs to be assessed from time to time.^[1] Therefore, the present study aimed at assessing dental practitioners' knowledge, attitudes, and practices with regard to radiation hazards and protection.

MATERIALS AND METHODS

A self-formulated questionnaire composed of 12 questions was circulated among 100 dental practitioners which include both general dental practitioners and specialist dental practitioners to evaluate their knowledge, attitude, and practices toward radiation safety standards, mainly the methods applied to control patients to unnecessary exposure during dental radiography. The studied indices were the use of prescription of dental radiographs, image receptor, position distance rule, use of film holders and badges, and lead partitions or leaded walls.

RESULTS

Radiation Safety Protocol

Among the 100 respondents, 74 dental practitioners which include both general and specialist dental practitioners followed radiation safety protocol while the remaining 26 dental practitioners did not follow the protocol. However, most of the dentists (83.8%) reported that they were aware of ALARA principle [Figure 1].

Radiographic Techniques

Several combinations of radiographic views were considered for the initial visit of the patient, and nearly 66% of the dentist's preferred panoramic radiograph to reduce the radiation exposure to the patient while the remaining 35% of the dentists prefer full mouth series. Nearly 56% of the practitioners preferred the conventional intraoral films in their practice while only 44% dentists replied that they use digital films for intraoral imaging.

Film Holder

On an average, every dental practitioner exposed 20–40 intraoral radiographs every month. The majority of the dental practitioners (51%) reported using film holders, where, most of the time, the dental practitioners asked their patients to hold the films inside the mouth with their fingers for almost every exposure. A surprising finding was that 49% of the dentists held the film themselves while the radiograph was being taken of the patient [Figure 2].

Relative Position from Patient and Radiation Tube

About 72.3% of dentists stood behind a protective wall during radiation exposure and hence followed the

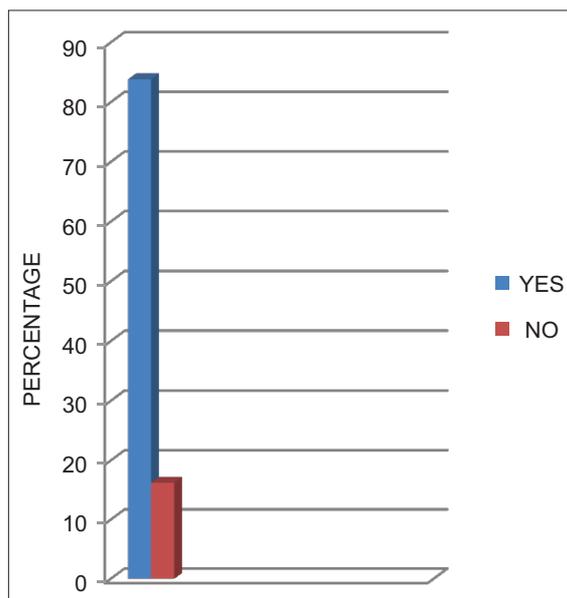


Figure 1: Dentists aware of “Alara” principle

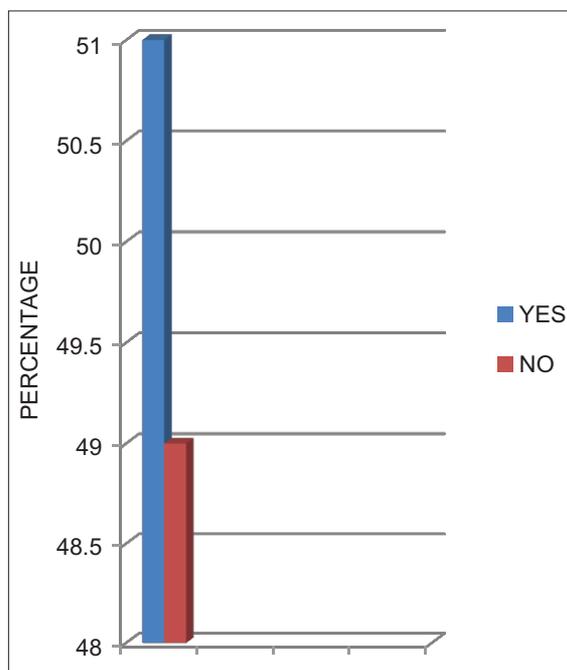


Figure 2: Usage of film holders

position and distance rule while 27.7% of the dentists did not follow the position and distance rule and thus are at a risk of unnecessary risk of radiation exposure.

Personnel Monitoring Device

About 54% of the practitioners were using personnel monitoring device among which 28% dentists used film badges, 23% dentists used top-level domains, and the remaining 3% of the dentists used ionization chambers as radiation protection device, whereas the remaining 46% of the dental practitioners did not use any radiation monitoring device.

Radiation Protection

About 65% of the dentists used lead aprons in their practice, and 35% have used a combination of safety techniques such as lead apron and lead barrier to reduce radiation exposure to the patient [Figure 3].

About 82.7% of the practitioners were aware of special situation such as pregnant women and children who are more susceptible to the hazardous effect of radiation. Majority of the dentists were interested in updating their knowledge about radiation hazard and safety using various modes, 32.7% by continuing medical education programs, 7.3% by articles and journals, 25.4% by workshops, and the remaining 13.9% by internet update [Figure 4].

DISCUSSION

Technical advances in X-ray equipment and imaging systems have allowed significant reduction in radiation doses to patients during intra and extraoral radiography.^[8] To be certain of the radiation safety of the patient and the operator, several protocols, principles, and guidelines have been given to achieve radiation

exposure dose as low as reasonably achievable for the patient.^[9] To adhere to ALARA principles, it is very important to avoid ordering unnecessary radiographs. In our study, most of the dentists (83.8%) reported that they were aware of ALARA principle.

Radiation dose reduction measures are necessary for both patient and the dental practitioner as well. The position distance rule also helps in radiation dose reduction when implemented properly.^[10,11] The position of the patient to the radiation tube in most cases is determined by physical constraints of the design of the dental office. In our study, about 72.3% of dentists changed their position according to the direction of radiation tube, which shows their knowledge regarding radiation protection. The respondents in this survey when questioned about amount of radiation for a full mouth series versus panoramic radiograph, the results obtained (66%) were similar to those obtained by a study conducted in Noida.^[12] The best way to ensure that personnel are following recommended safety protection measures is with the use of personal monitoring devices.^[13] Several types of devices such as film badges, the thermoluminescence dosimeter, and ionization chambers could be used to measure the exposure.^[14] The results of the present study (54%) on the use of personal monitoring devices concur with the results of study carried out by Kaviani *et al.*^[4]

The fact that film holders are being used by 51% of dentists deserves some attention. This number is comparable with the results of surveys conducted among Belgian dentists^[15] and Syrian dentists^[16] where about 60 and 43% of responders, respectively, used film holders. Even more important was the relatively large percentage (49%) of dentists who held the film inside the patient’s mouth while exposing. This points to a general underestimation of the potential risks of radiation exposure.^[11] And also, most of the participants about 82.7% were apprehensive about taking radiographs for pregnant women which correlate to results of studies conducted in Ukraine, Noida, and to recommendations given by Praveen *et al.*^[10] To effectively control and prevent radiation-induced hazards, it is essential to understand the effects of ionizing radiation on the health of an individual. These questions represent the knowledge domain of radiation protection, and studies which address the same have been reported in this literature.

CONCLUSION

Evaluation of the results of the current study showed that all the participants were aware of the fact that X-rays used in diagnostic dental radiology are harmful, and certain levels of precautions should be taken while in use. Although the levels of awareness were speckled, it is still arguable that more they get exposed

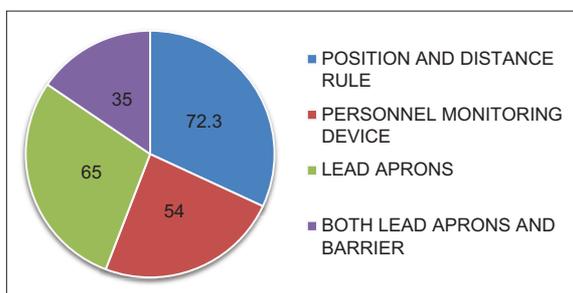


Figure 3: Radiation protective measures

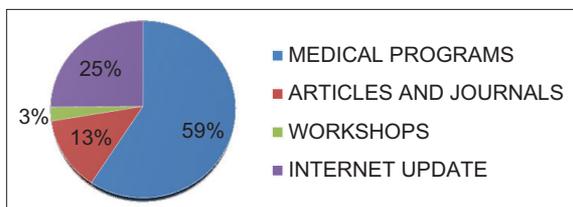


Figure 4: Which do you think will increase awareness of dentists towards radiation protection?

to unwanted radiation. This indicates that attempts should be made to improve dentists' knowledge about radiation dose reduction techniques. Reassurance program such as medical education programs, articles and journals, and workshops should be conducted at regular intervals to update their knowledge about radiation hazard and safety.

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