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# Awareness of Biological Hazards and Radiation Protection Techniques of Dental Imaging Among Dental students in South Chennai-A Questionnaire Study

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**Abstract:** *Aim and objectives: To assess the attitude and awareness about Biological Hazards of dental X-rays and appropriate radiographic protection techniques of dental imaging among dental students in South Chennai. Materials and methods: The study participants comprised of 100 undergraduate dental students (pre-clinical & clinical) in South Chennai, whose curriculum includes X-ray physics. The information was collected via an online 15 structured multiple choices questionnaires. Statistical analysis was performed using Pearson correlation co-efficient test to know the validity of questionnaire and any  $P \leq 0.05$  was considered statistically significant. Results: Of all the 100 undergraduate dental students enrolled in this study, 80% of dental students were aware of harmful effects of dental X-rays. While majority of dental students (25%) were unaware about which speed film used to reduce radiation exposure. It was found less percentage of dental students (47%) were aware of the contraindication of radiography during first trimester of pregnancy. However, majority of dental students (68%) were aware of position-distance rule and remaining were unaware about this rule. Conclusion: This study highlights significant awareness among dental students in South Chennai regarding biological hazards and radiation protection techniques in dental imaging. The majority demonstrated a commendable understanding of crucial aspects, such as the harmful effects of dental x-rays, radiation protection recommendations, and the composition of the intensifying screen. However, variations in knowledge were observed, particularly concerning radiation dosage and contraindications during pregnancy. This underscores the importance of continuous education and training in radiation safety within the dental community.*

**Keywords:** Dental imaging, Ionizing radiation, biological hazards, Radiation protection techniques, Dental students, Awareness.

## I. INTRODUCTION

It is well known that ionizing radiation has biological damaging effects, either affecting the cell directly or indirectly via the production of free radicals. Both lead to DNA damage, including single or double-strand breaks and or DNA protein cross-links<sup>[1]</sup>. Radiation hazards evaluation is very important in justifying and ensuring protection. With such evaluation, safe limits of radiation can be evaluated. Radiation exposure limits were introduced by the International Commission on Radiological Protection (ICRP), which was founded in 1928. In India, Atomic Energy Regulatory Board (AERB) is the competent authority.

In dentistry, radiographs are mainly used for diagnostic purposes, and in a dental set-up, usually the practising dentist exposes, processes and interprets the radiograph. Even though such exposure is less, it is critical to reduce exposure to the dental personnel and patients to prevent the harmful effects of radiation<sup>[2]</sup>. Biological hazards are classified based on occurrence probability into: Non- stochastic and stochastic effect. Non stochastic or deterministic, in which there is determined dose above which the damaging insults start to appear. Stochastic effect, meaning that there is no deterministic dose that could lead to biological damage. High- dose ionizing radiation (X-ray) has both deterministic and stochastic effects. In contrary to lower doses, radiation hazards are primarily stochastic rather than deterministic<sup>[3-5]</sup>. Additionally, the amount of radiation exposure from dental radiographs depends on many variables starting from film speed, collimation going through exposure factors, selected technique, year dental students and protecting barriers used<sup>[6]</sup>. The aim of this study was to assess the awareness of biological hazards and radiation protection techniques of dental imaging among dental students.

## II. MATERIALS AND METHODS

A questionnaire study was carried out among 100 undergraduate dental students including preclinical & clinical in South Chennai. A structured questionnaire consisting of 15 questions was used to assess the awareness of biological hazards and radiation protection techniques of dental imaging. The questions were distributed through google forms and the response were received through e-mail. The students were informed about the anonymous processing of the questionnaires. The data thus obtained was transferred to excel sheet and statistical analysis was done using Pearson correlation coefficient test to know the validity of the questionnaire and any  $P \leq 0.05$  was considered statistically significant.

## III. RESULTS

Of all the undergraduate dental students enrolled in the study, 80% were aware of harmful effects of dental X-rays, 87% of dental students were aware of the radiation dose given by National Council on Radiation Protection (NCRP) & International Commission on Radiological Protection (ICRP), it was observed 84% of dental students were aware of Deterministic & Stochastic effects of radiation (Figure 1). It was observed majority of dental students (82%) were aware of intensifying screen material made up of lead (Figure 2). Majority of dental students (50%) were aware of rectangular collimator used to reduce radiation exposure, remaining are unaware about which collimator reduces radiation exposure (Figure 3). It was observed majority of dental students (70%) were aware of TLD badges is a personal monitoring device used to measure the radiation exposure (Figure 4). Majority of the dental students (25%) were unaware about which speed film used to reduce radiation exposure (Figure 5). Majority of dental students (68%) were aware of position-distance rule, remaining were unaware about the rule (Figure 6). Less percentage of dental students (40%) were aware of thyroid is the most important organ to protect during dental radiography, while others are unaware about the organs affected during dental radiography (Figure 7). Less percentage of dental students (47%) were aware of the contraindication of radiography during the first trimester of pregnancy, remaining others were unaware about which trimester is more contraindication of radiograph during pregnancy (Figure 8).

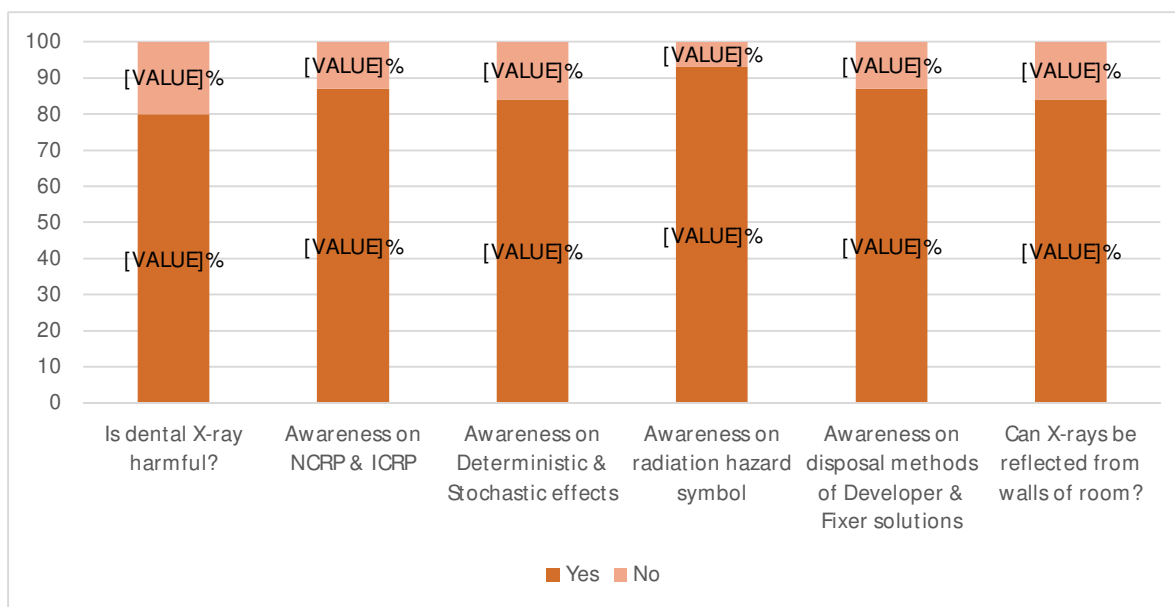


Figure 1

Material used in intensifying screen

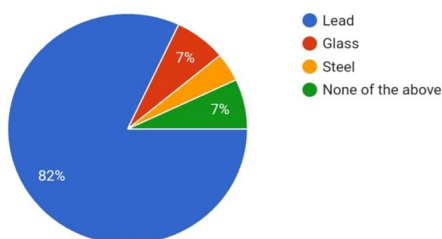


Figure 2

Collimator which reduces radiation exposure

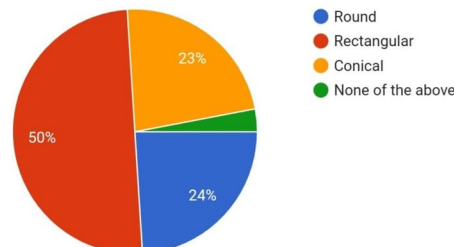


Figure 3

Measuring radiation exposure dosage

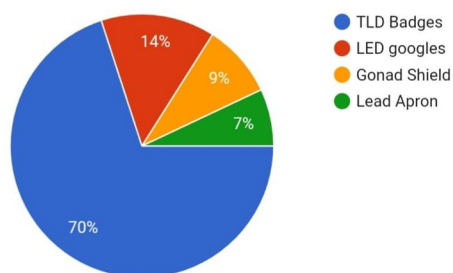


Figure 4

Speed films available for conventional radiographs

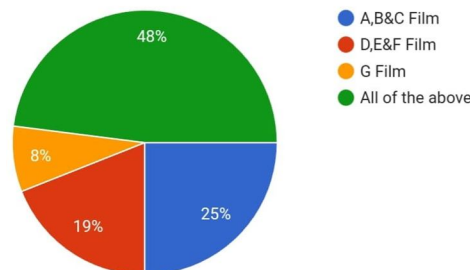


Figure 5

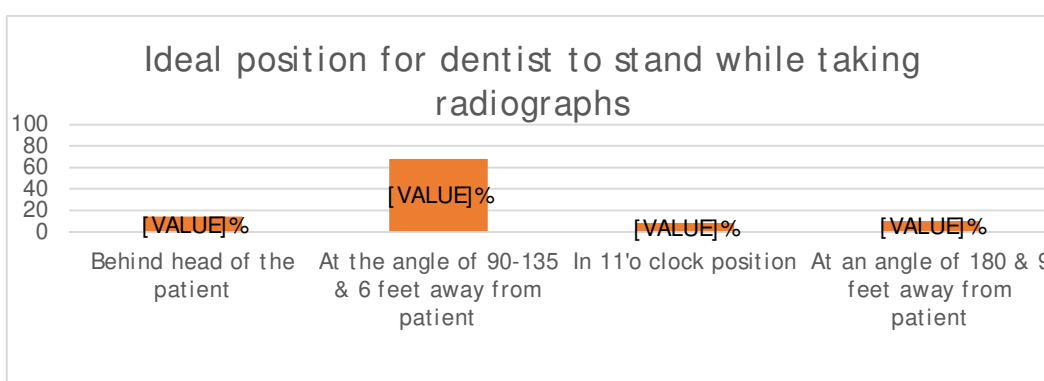


Figure 6

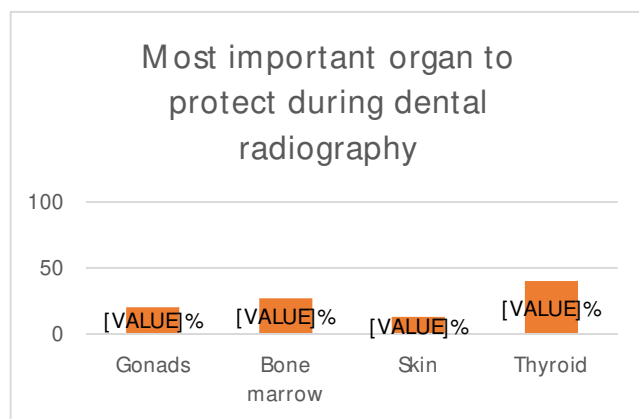


Figure 7

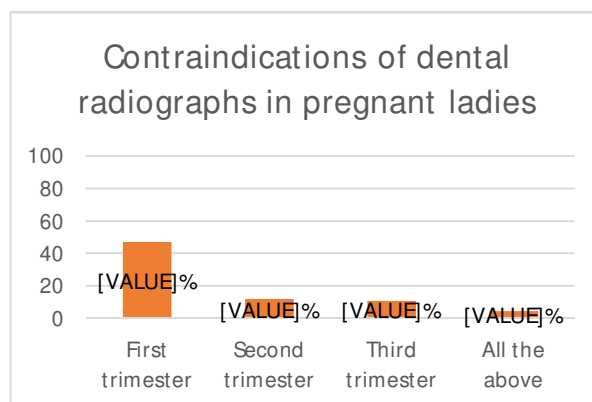


Figure 8

#### IV. DISCUSSION

The effect of ionizing radiation on living system is well known and documented. The biologic interaction between ionizing radiation and living organism leads to change in the electron level immediately within a fraction of seconds of exposure and persist for a varied period of time. Practitioners who administer ionizing radiation must be familiar with the magnitude of radiation exposure encountered in dentistry, the possible risk that such exposure entails, and the method used to reduce doses. This information provides the necessary background for explaining the concerned patients the benefits and possible hazards involved with the use of x rays [7].



Our present study revealed several significant findings related to the awareness of biological hazards and radiation protection techniques of dental imaging. Majority of dental students were aware of harmful effects of dental x rays and has significant awareness of deterministic and stochastic effects of radiation. Majority of dental students were aware of rectangular collimator used to reduce the radiation exposure, according to Priyanka Baswaraj Lasune et al <sup>[8]</sup>, 77.5% of dental students were aware of the type of collimator which reduce the radiation exposure but which is inconsistent with our study were only 50% were aware of it. The radiation exposure dosage given by NCRP and ICRP among our dental students were nearly 87%, which was inconsistent with other studies conducted by Harshinee et al <sup>[9]</sup>. Personal monitoring device were used to measure the exposure of operator or associated personal as a protective measure, 70% of dental students were aware of personal monitoring device which is consistent with other study done by Math SY et al <sup>[10]</sup>. A strict adherence to what has been turned the position and distance rule is required to reduce the x ray exposure to the dental students, according to which the operator should stand 6 feet from the patient at an angle of 90 to 135° degree to the central x ray of the x ray beam, 68% of dental students were aware of the position and distance rule in our study, which is not in accordance with the study done by Asha et al <sup>[11]</sup> showed 34.4% of dental students following this rule.

## V. CONCLUSION

This study highlights significant awareness among dental students in South Chennai regarding biological hazards and radiation protection techniques in dental imaging. The majority demonstrated a commendable understanding of crucial aspects, such as the harmful effects of dental x-rays, radiation protection recommendations, and the composition of the intensifying screen. However, variations in knowledge were observed, particularly concerning radiation dosage and contraindications during pregnancy. This underscores the importance of continuous education and training in radiation safety within the dental community.

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