International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Knowledge, Attitude and Perception about the Effects of Radiation and Its Safety Protocol among Dental Students

Dr. Gayathri P S[1], Dr. Priya Ramani[2], Deepika Lakshmi R[3], Brindha S[4], Jagadish L[5], Hari Prasad S[6]

[1]Reader, Department of Oral Medicine and Radiology, Thai Moogambigai Dental College and Hospital, Chennai
[2]Head of Department and Professor, Department of Oral Medicine and Radiology, Thai Moogambigai Dental College and Hospital, Chennai
[3,4,5,6]Junior Resident, Thai Moogambigai Dental College and Hospital, Chennai

ABSTRACT

Background: Dental radiography is indispensable for diagnosing and treating oral conditions, but it carries inherent radiation risks. Dental students must grasp radiation's effects and safety protocols to ensure patient and practitioner safety.

Methods: A cross-sectional study with 108 participants assessed dental students' awareness of radiation effects and safety measures using a structured questionnaire. Data were analyzed using PSPP 3.0 software.

Results: Most participants correctly identified sensitive tissues to X-rays is tooth buds and acinar cells and recognized Wilhelm Conrad Roentgen as the father of radiation. However only some participants identified amifostine as a radioprotective agent and mucositis as a primary post-radiotherapy complication. More than half participants knew the gray as the SI unit of absorbed dose and the maximum permissible dose for operators (5 rem/year) and correctly defined ALARA. Safety practices includes the understanding of the position-distance rule, acknowledging lead aprons for patient protection, and recognizing barium plaster and concrete walls for environmental radiation protection.

Conclusion: Dental students display varying levels of awareness regarding radiation safety. While knowledge in some areas is strong, improvements are needed in radioprotective measures and about its complications. Comprehensive radiation safety education is essential for future dental professionals.

Keywords: Dental students, radiation safety, awareness, radiography, ALARA principle.

INTRODUCTION

Radiation is an indispensable tool in modern dentistry, aiding in the accurate diagnosis and effective treatment of oral and maxillofacial conditions. However, the use of ionizing radiation in dental radiography also carries inherent risks, making it crucial for dental students to possess a deep

understanding of the effects of radiation exposure and the essential safety protocols that mitigate these risks[1]. This study delves into the realm of dental education, seeking to assess the awareness levels among dental students regarding radiation's effects and the adherence to safety measures. Dental radiography serves as a cornerstone for dental practitioners, facilitating the detection of dental caries, periodontal diseases, and various oral and maxillofacial pathologies. It plays a pivotal role in treatment planning, guiding surgical procedures, and monitoring patient progress. Despite its undeniable benefits, the ionizing radiation used in dental radiography has the potential to cause harm, both to patients and the dental healthcare professionals responsible for administering these radiographic procedures[2].The hazards associated with ionizing radiation encompass a range of effects, from deterministic, acute injuries such as radiation burns, to stochastic effects like carcinogenesis and genetic mutations, which may manifest long after exposure. Therefore, it is incumbent upon dental schools and educators to ensure that dental students are not only well-versed in the clinical applications of radiography but are also thoroughly educated on the associated risks and safety measures[3][4]. This study's primary objective is to evaluate the extent to which dental students are aware of the effects of radiation exposure and their familiarity with the safety protocols mandated to mitigate these risks. Through a cross-sectional design and a comprehensive questionnaire, we aim to shed light on potential gaps in knowledge and training, providing insights that can inform improvements in dental education. By doing so, we seek to contribute to the development of a new generation of dental professionals who can harness the power of radiation safely, ensuring the wellbeing of both patients and themselves.

MATERIALS AND METHODS

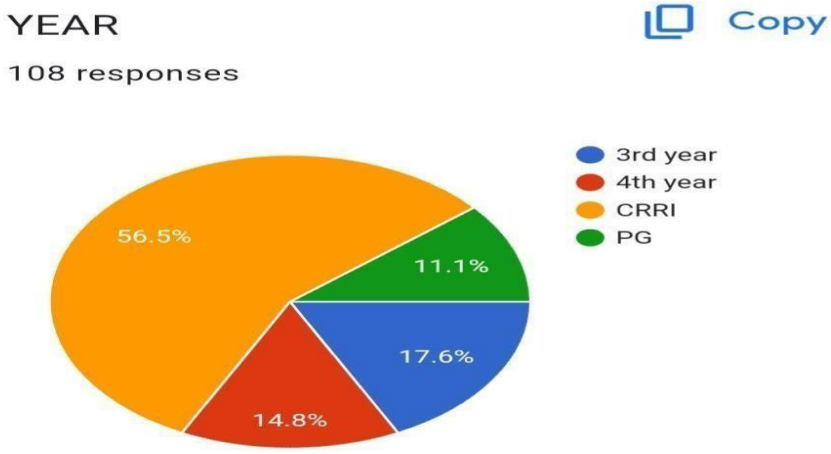
A questionnaire survey was carried out among undergraduate and postgraduate dental students at a privately-owned dental college located in Chennai. The study involved a total of 108 participants, all of whom provided their informed consent to participate. We utilized a well-structured questionnaire (see Table 1) comprising 15 questions related to the awareness levels concerning radiation effects and safety protocols. These questionnaires were distributed using Google Forms and disseminated through various social media platforms. Once the data was collected, it was then transferred to an Excel spreadsheet for subsequent analysis. Data analysis was performed using PSPP 3.0 software.

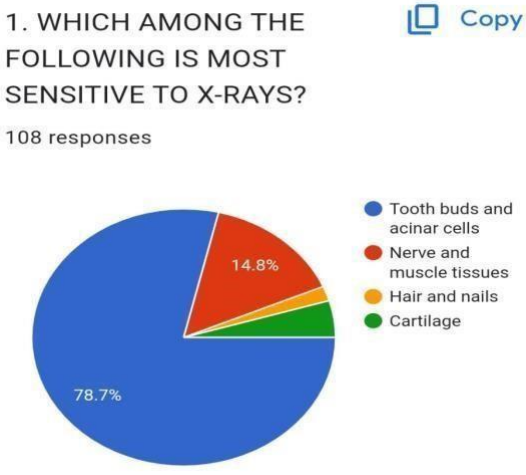
RESULTS

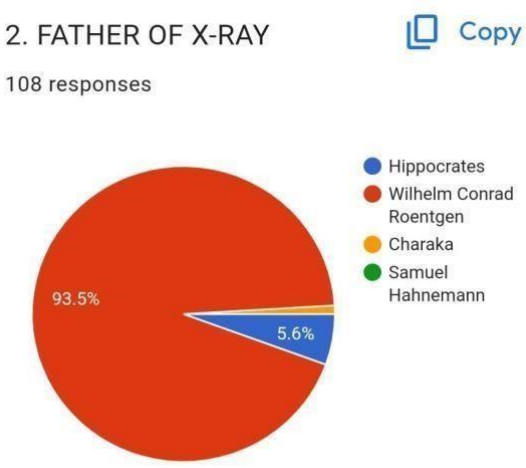
In our study, a total of 108 students participated. Among them, 56.5% were interns, 17.6% were thirdyear undergraduate (UG) students, 14.8% were final-year undergraduate (UG) students, and 11.1% were postgraduate (PG) students. Regarding X-ray sensitivity, approximately 78.7% of participants correctly identified tooth buds and acinar cells as the most sensitive cells to X-rays when compared to nerves, muscle tissues, nails, hair, and cartilage. In terms of historical knowledge, a significant majority of participants (93.5%)correctly recognized Wilhelm Conrad Roentgen as the father of radiation. Concerning radioprotective agents, about 31.5% of respondents accurately identified amifostine as the agent used to safeguard salivary glands during head and neck cancer radiotherapy. Regarding complications after radiotherapy, 33.3% of participants mentioned mucositis as the primary complication, and others mentioned xerostomia, candidiasis and alopecia. In the realm of units, a majority of participants(59.3%) correctly identified the gray as the SI unit of absorbed dose. For safety regulations, approximately 57.4% of participants correctly recognized that the

maximum permissible dose of radiation for an operator in an X-ray machine is 5 rem per year. In terms of safety tests, 72.2% of participants correctly understood that the penny test is used to detect unsafe illumination. Regarding protective materials, an overwhelming majority of participants (87%) correctly identified lead as the most commonly used metal for protection against X-ray radiation. In terms of safety practices, approximately 82.4% of participants correctly understood the position-distance rule, which dictates that the operator should maintain an angle of 90 - 135 degrees and a distance of 6 feet away from the patient. For protective gear, about 66.7% of participants accurately stated that the thickness of lead in a thyroid collar is 0.5mm. Regarding radiographic film, 62% of participants correctly identified the standard size of periapical film used in adults as 31x41mm. In terms of radiation safety principles, an overwhelming majority of participants (90.7%) correctly defined ALARA as an acronym for "as low as reasonably achievable." For operator protection, a substantial majority of participants (82.4%) identified the position-distance rule as the best method. Concerning patient protection, approximately 79.6% of respondents indicated that lead aprons are the most effective method. In the context of environmental protection, a significant majority of responded 76.9% stated that using barium plaster and walls made of 3-inch concrete is the most effective method for radiation protection.

STATISTICAL ANALYSIS



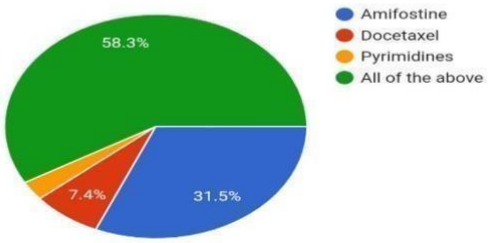




3. RADIO PROTECTIVE AGENT USED TO PROTECT SALIVARY GLANDS DURING RADIOTHERAPY OF HEAD AND NECK CANCER

Copy

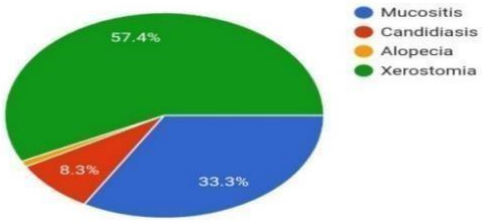
108 responses



4. WHICH AMONG THE FOLLOWING IS THE FIRST COMPLICATION AFTER RADIOTHERAPY?

Copy

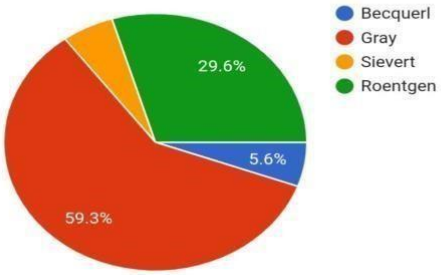
108 responses



5. S.I UNIT OF ABSORBED DOSE

Copy

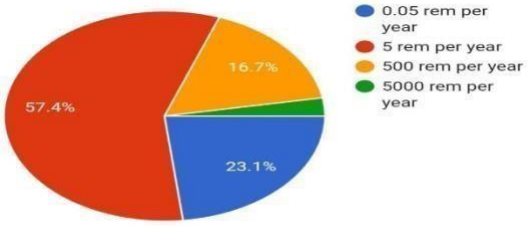
108 responses



6. THE MAXIMUM PERMISSABLE DOSE OF RADIATION TO THE OPERATOR IN AN X-RAY MACHINE IS

Copy

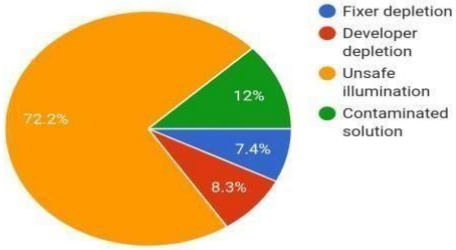
108 responses



7. PENNY TEST IS USED TO DETECT

Copy

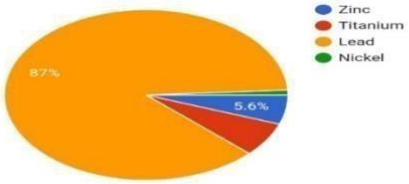
108 responses



8. WHICH OF THE FOLLOWING METAL IS MOST COMMONLY USED FOR THE PROTECTION AGAINST X-RAY RADIATION?

Copy

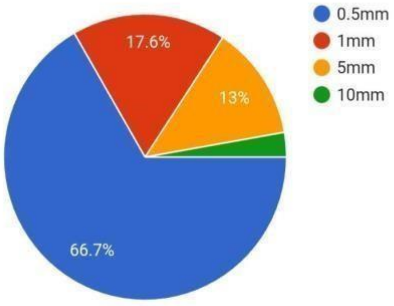
108 responses



10. THICKNESS OF LEAD IN THYROID COLLAR

Copy

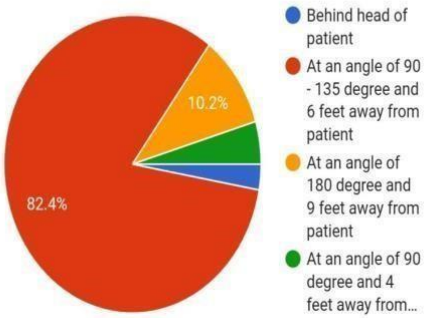
108 responses



9. WHAT IS POSITION-DISTANCE RULE?

Copy

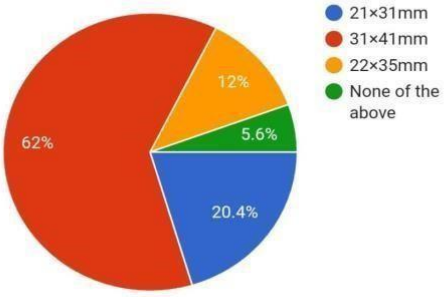
108 responses



11. STANDARD SIZE OF PERIAPICAL FILM USED IN ADULTS

Copy

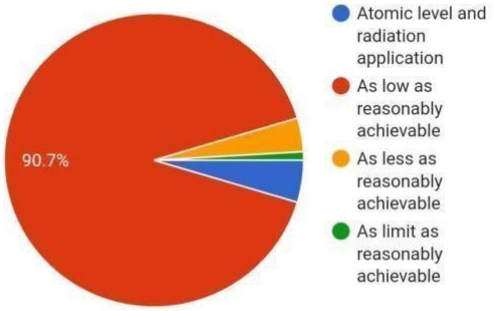
108 responses



12. ALARA-

Copy

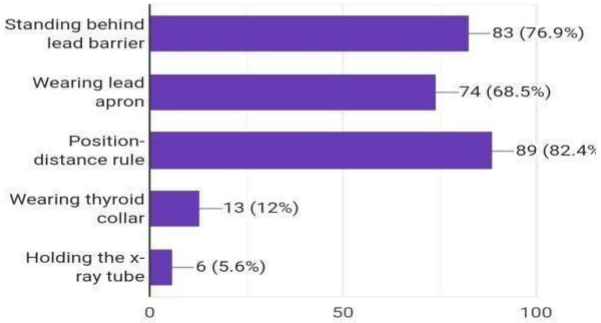
108 responses



13. BEST METHOD FOR RADIATION PROTECTION OF OPERATOR

Copy

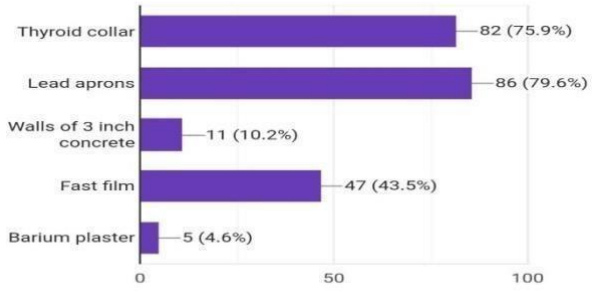
108 responses

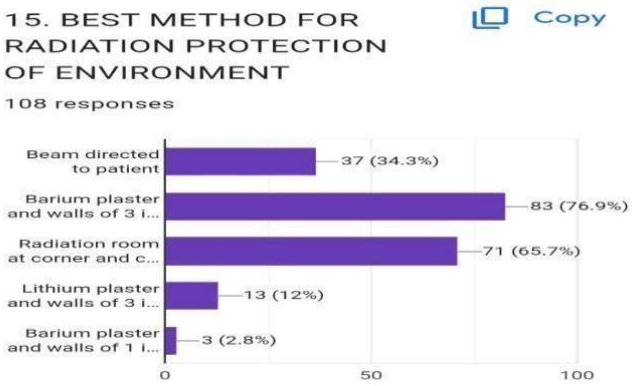


14. BEST METHOD FOR RADIATION PROTECTION OF PATIENT

Copy

108 responses





DISCUSSION

Most of the participants correctly identified tooth buds and acinar cells as the most sensitive to Xrays. This knowledge is critical for dental practitioners as it influences their approach to radiographic procedures and patient care. A significant majority recognized Wilhelm Conrad Roentgen as the father of radiation. Understanding the historical context is fundamental in appreciating the significance of radiation safety measures. Only less than half of respondents correctly identified amifostine as the radioprotective agent used to safeguard salivary glands during radiotherapy for head and neck cancer. This suggests the need for increased education on radioprotective measures. In our study approximately 77% of participants had "good" knowledge about radiation safety, protection, and hazards which is similar to the study conducted by Deepanshu Garg et al [5] .Our study highlighted that a considerable portion of participants recognized mucositis as the primary complication after radiotherapy .However, a significant percentage also mentioned xerostomia as first complication after radiotherapy. In our study approximately most of the participants correctly identified the maximum permissible dose of radiation for an operator in an X-ray machine as 5 rem per year. In our study 79.6% of respondents are aware about the use of lead apron as a radiation protection while comparing with the Priyanka BaswarajLasune's study reported that 79.5% of students used lead aprons regularly[6]. In addition a similar study by Rela R in 2019, almost 97% of dental students were using lead aprons which is similar to our study [7].This is crucial information for ensuring the safety of dental professionals working with X-ray equipment. Our study indicated a strong awareness of safety measures among participants. For instance, 82.4% understood the position-distance rule, which dictates safe distances and angles for the operator during radiographic procedures. This knowledge is fundamental in reducing radiation exposure. However other studies made by Srivastava et al., 40.2% and Sultan et al., 64.5% were less than our results. About more than half participants correctly identified the thickness of lead in a thyroid collar as 0.5mm. Understanding the protective gear specifications is essential to ensure their proper use and effectiveness[8]. In our study majority of participants (90.7%) correctly defined ALARA as "as low as reasonably achievable." This principle underscores the importance of minimizing radiation exposure while maintaining diagnostic image quality while Priyanka BaswarajLasune's study found that 79.5% of students were aware of the ALARA (As Low As Reasonably Achievable) principle. In contrast, Arnout EA and Jafar A's study reported that only 40% of total students were aware of the ALARA principle. Additionally, Asha et al.'s study showed that 34% of dentists followed the ALARA principle during their practice. In Javali R and Dantu R's study, 74% of dental students followed a similar rule. Enabulele's Study showed that a considerably lower awareness level was reported, with

only 17.9% of the participants knowing what ALARA means. In Motwani Mukta B's Study only 51% of dental students in this study were aware of the ALARA principle[9][10][11][12][13][14][15].Our study revealed strong agreement on best practices for radiation protection. For operators, 82.4% identified the position-distance rule, while 79.6% recognized lead aprons as the best method for patient protection. Additionally, 76.9% acknowledged the importance of using barium plaster and concrete walls for environmental radiation protection.Our study shows only less than half of the respondents correctly identified amifostine as a radioprotective agent and mucositis as the first complication after radiotherapy, This suggests the need for increased education on radioprotective measures. The dental students should have proper knowledge of this concept so that they can provide the maximum benefit to the patient along with taking care of the health of their staff and other individuals sitting in their dental set up.

CONCLUSION

In conclusion, this study underscores the importance of comprehensive education on radiation safety for dental students. While there are areas of strong awareness, such as historical knowledge and safety measures, there are also areas where improvement is needed, particularly in radioprotective measures and about the complications awareness. To avoid the harmful effects of radiation during clinical practice, dental students must have a thorough understanding of the various radiation protective techniques.This study's findings can serve as a foundation for enhancing radiation safety education within dental curriculum.

ACKNOWLEDGEMENTS

We thank the 108 undergraduate and postgraduate dental students of various universities within Chennai city, Tamil Nadu, for participating in this survey and for spending their valuable time in this survey.

AUTHORS CONTRIBUTIONS

All authors participated in the design of the study and drafted the manuscript and read and approved the final manuscript.

CONFLICTS OF INTEREST

None of the authors have conflicts of interest to report.

FUNDING/SUPPORT

None.

REFERENCES

1. White, Pharoah. Oral radiology principles and interpretation, (4th ed) Mosby 2000:42-61.
2. Vassileva J, Mihaylova H. Radiation Protection Training for Dental Students – Experience in Bulgaria. Journal of Medical and Dental Practice. 2014;1(2):76–79
3. Swapna LA, Koppolu P, Takarji B, Al-Maweri SA, Velpula N, Chappidi V, et al. Knowledge on radiation protection & practice among dental students. BJMMR. 2017;19(7):01-07
4. Joen M Iannucci, Laura Jansen Howerton. Dental Radiography Principles and Techniques. 5th Ed. St. Louis: Elsevier Saunders, 2017, 41-52.

5. Garg D, Kapoor D. Awareness Level of Radiation Protection among Dental Students. JNMA J Nepal Med Assoc. 2018 Jul-Aug;56(212):800-803. Doi: 10.31729/jnma.3651. PMID: 30387473; PMCID: PMC8827536.
6. Priyanka BaswarajLasune et al., Knowledge and Attitude towards Radiation Hazards and Protection www.jcdr.net
7. Rela R. Knowledge, attitude and practice of radiation protection protocols among students of a dental college. Dentistry. 2019;09:530
8.] Arnout EA, Jafar A. Awareness of biological hazards and radiation protection techniques of dental imaging- A questionnaire based cross-sectional study among saudi dental students. J Dent Health Oral Disorder & Therapy. 2014;1(2):01-07.
9. Asha, Veena SN, Krupashankar R, Kavitha AP, Shobha R, Jijin MJ, et al. Awareness towards radiation protection measures among dental practitioners in Coorg district: A questionnaire study. Int J Dent Health Sci. 2015;2:1460-65.
10. Javali R, Dantu R. Attitude and awareness about radiation protection among dental surgeons in North Karnataka: A questionnaire study. J Indian Acad Oral Med Radiol. 2018;30:116-20.
11. Mahabob MN, Alabdulsalam M, Alabduladhem A, Alfayz S, Alzuriq A, Almomin AM. Knowledge, Attitude and Practice about radiation safety among the undergraduates inEastern province dental college. J Pharm Bioallied Sci. 2021 Nov;13(Suppl 2):S1442-S1447.Doi: 10.4103/jpbs.jpbs_248_21. Epub 2021 Nov 10. PMID: 35018006; PMCID: PMC8686986.
12. Srivastava R, Jyoti B, Jha P, Shukla A. Knowledge, attitude, perception toward radiation hazards and protection among dental undergraduate students: A study. J Int Oral Health. 2017;9:81–6.
13. Almohaimede AA, Bendahmash MW, Dhafr FM, Awwad AF, Al-Madi EM. Knowledge, attitude, and practice (KAP) of radiographic protection by dental undergraduate and endodontic postgraduate students, general practitioners, and endodontists. Int J Dent. 2020;2020:2728949.
14. Bahija B, Khalid A, Sulaiman A, Bassam A, Mashari A, Hussain A, et al. Knowledge, attitudes and perception toward radiation hazards and protection among dental professionals in Riyadh, Kingdom of Saudi Arabia. Int J Med Res Health Sci. 2019;8:75–81.
15. Sultan R, Parvez K, Qureshi H. Awareness about dental radiography among dental students. JPDA. 2018;27:147–51.