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A survey study on radiology and imaging students about radiation protective devices

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ABSTRACT

Aim: The aim of this study is to see how well radiography students understand radiation protection equipment, how to use it, and how to handle it. *Methods*: A prospective questionnaire-based research was done by the Department of Radiology and Imaging. A validated questionnaire was provided to undergraduate radiography students to complete the study. *Result*: In this study, 267 Radiology and imaging undergraduate and diploma students completed a questionnaire. To put their knowledge of radiation protective equipment, its use, and handling to the test, they participated in theoretical sessions and hospital placements. In the group, there were 82 (30.7%) girls and 185 (69.2%) males. *Conclusion*: According to the findings, radiology departments should provide appropriate theoretical classes for the transfer of knowledge on radiation protection systems, their use, and management. This questionnaire-based study discovered that current radiation protective equipment, its use, and handling skills among radiography students at Assam Down Town University's faculty of paramedical sciences were inadequate, and that this could be improved with well-designed training and theoretical sessions. As a result, we strongly advise all members of the medical community to attend seminars, guest lectures, training sessions, and other related events.

Keywords: Radiation protection, devices, lead equivalent, X-Ray, Radiology.

1. INTRODUCTION

Radiation is a type of energy that originates from a source and may move at the speed of light in a vacuum, i.e. without passing through any medium. Typically there are two types of radiation:

1. Ionizing Radiation: Gamma and X-rays are employed in ionising radiation.
2. Non-ionizing Radiation: Electromagnetic and radiofrequency waves are employed in non-ionizing radiation.

Since the discovery of x-rays on 8th Nov 1895 by Sir Wilhelm Conrad Rontgen, It's an important aspect of health-care diagnosis and treatment (Bhargava, 2011). In interventional fluoroscopy, CT, and other procedures, ionising radiation is used. Every year, more than 2.5 billion diagnostic radiological exams, 5.5 million radiation sessions, and 32 million nuclear

medicine sessions are done across the world. Low dosages of ionising radiation can have a deterministic effect (Kazempour et al, 2015).

Ionizing radiation is utilized in Radiology departments, which are the most significant instruments in medical imaging. Ionizing radiation, which is employed in radiology departments, is harmful to the human body. Radiation has caused a variety of untreatable injuries. Ionizing radiation can harm the central nervous system, the gastrointestinal system, the reproductive system, and possibly the entire organism. Although a somatic effect can occur shortly after an ionising genetic impact must not arise as a result of exposure (Jones et al., 2013; Iball et al., 2008; Kim et al., 2016). It appears in the following generation right away. When radiation is employed during any process, radiation worker protection is required. All diagnostic imaging departments are required to use radiation worker shields. Ionizing radiation is the most extensively used form of ionising radiation in medicine and industry, and it poses a significant health risk by causing microscopic damage to living tissue. In the radiology department, radiation protection devices are employed to safeguard patients from the harmful effects of radiation (Hubbert et al., 1993; Hu et al., 2017). Because ionising radiation is responsible for the majority of adverse consequences such as cataracts, skin erythema, organ atrophy, and cancer, among others. The following are examples of radiation protective devices: 1. A lead apron; 2. Thyroid protection; 3. The shield of Gonad; 4. Wearing lead gloves

When the radiography unit is in use, everyone working in the radiation room must wear personal protective equipment (Lakhwani et al., 2019). Radiation safety is a problem for physicians, patients, nursing staff in many departments, including radiology, surgery, and interventional cardiology etc. Radiation is released during fluoroscopic procedures, which is the source of the highest radiation dosage for medical personnel. Because fluoroscopy imaging, which employs X rays to acquire dynamic imaging, accounts for the majority of ionising radiation exposure in medical settings. During x-ray exposure, the whole radiography room team stands behind a moveable protective barrier or wears a lead apron that covers the exposed body portion (Kuppusamy, 2017; Kazempour et al., 2015). The total lead equivalent of the protective barrier applied is not less than 2 mm. Personnel protection equipment has a thickness of 0.5mm to 0.25mm while standing in the primary beam for dispersed radiation. Workers who were not standing on the primary beam required a lead equivalent shield of at least 0.25mm.

Care and use of radiation protection devices

The lead integrity must be maintained by taking care of the radiation safety equipment. Dropping, stacking, regularly falling down, and incorrectly storing can fracture the inner layer of lead, affecting its protective and integrity abilities, therefore careful inspection and storage are essential for proper use. The shielding integrity of radiation protection equipment should be examined once a year (Livingstone et al., 2018).

Storage

To prevent defects and interior cracks, lead aprons, thyroid shields, gonad shields, side shields, gloves shields, and other safety devices would be placed on hanging or flat on well-designed racks. Internal fractures in the lead lining can form at the folds, shortening the device's usable life.

2. MATERIAL AND METHODS

Study type

The Department of Radiology and Imaging at Assam Down Town University conducted a prospective questionnaire-based research. This research was based on a survey of radiographic students' of Assam down Town University to make awareness on radiation protective devices, their use, and handling. To assess undergraduate and diploma radiographic students' understand of radiation protection devices, their use, and handling.

Study design

The study was design to assess the knowledge of Radiography undergraduate second and final year students, as well as Diploma final year students, at the Assam Down Town University in Guwahati, Assam, India.

Study area

Radiology and Imaging Students of Assam Down Town University, Guwahati, Assam, India

Study duration

This six-month prospective questionnaire-based study was done at Assam Down Town University in Guwahati, Assam, India, from April 2021 to October 2021.

3. RESULT

In this study, a total of 267 participants of undergraduate and diploma students in Radiology and Imaging filled out questionnaires. To test their understanding of radiation protection equipment, their usage, and handling acquired throughout theoretical sessions and hospital placements. There were 82 (30.7%) females and 185 (69.2%) males (Fig 1) in the group. 202 (75.6%) of the 267 respondents were undergraduate students, 66 (24.7%) were diploma students (Fig 2). In this study, students from undergrad to diploma level in radiology and imaging were assessed for their expertise. Radiation protection equipment knowledge, usage, and management in the radiology department are a critical issue that must be handled quickly and thoroughly. The mean value of correct-answer responders was calculated. The following conclusion was reached after analyzing the collected data. Knowledge and awareness on radiation protective devices, their use and handling in Undergraduate 3rd semester students had insufficient knowledge 7.30%, Undergraduate 5th semester students had average knowledge 86.10 %, and Diploma students had insufficient knowledge 6.60%.

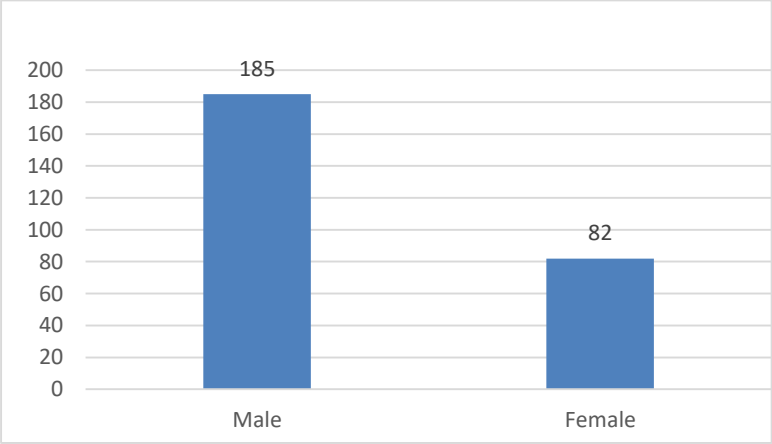

Figure 1 shows the ratio of male and female students

In fig 1, there were 185 no. of male students and 82 no. of female students. A total no. of 267 students has responded the questionnaire survey. Out of 267 students, 93 students from Undergraduate 3rd semester,109 students from Undergraduate 5th semester, 55 students from Diploma 3rd semester and 10 students from Diploma 5th semester. Fig 2 shows that out of 267 students, 93 students from Undergraduate 3rd semester, 109 students from Undergraduate 5th semester, 55 students from Diploma 3rd semester and 10 students from Diploma 5th semester answered the questionnaire. The Study shows (Fig 3) that only 86.10% students have the knowledge about Radiation hazards and rest 13.90% students have no idea about Radiation hazards.

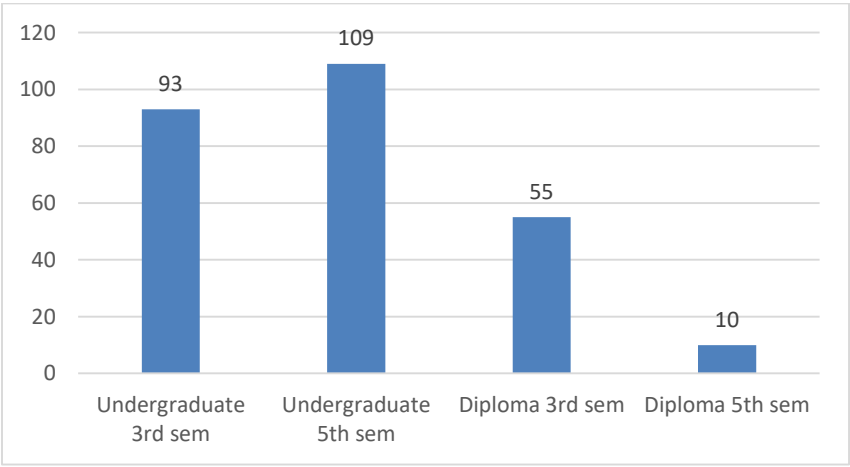

Figure 2 Shows the ratio of Undergraduate and Diploma Students

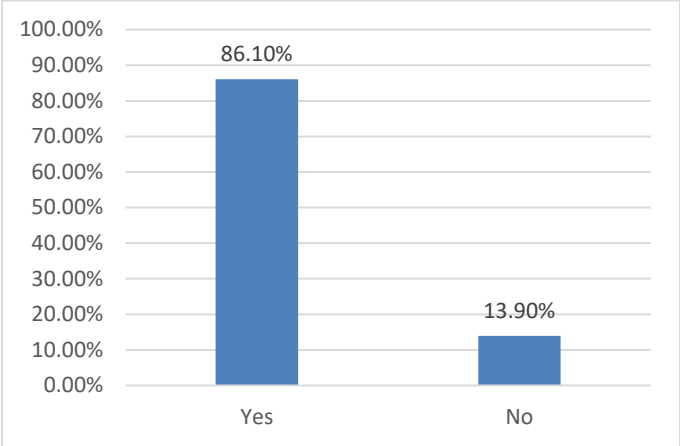

Figure 3 Shows the total percentage of students having knowledge in radiation hazards

4. DISCUSSION

The reason behind this study was to examine the knowledge of students from undergraduate to diploma level in Radiology and Imaging. Radiation protection equipment knowledge, usage, and management in the radiology department are a critical issue that must be handled quickly and thoroughly (Kazempour et al., 2015; Livingstone et al., 2018). The mean value of correct-answer responders was calculated. The following conclusion was reached after analyzing the collected data. The knowledge and awareness on radiation protective devices, their use and handling in undergraduate 3rd semester students had insufficient knowledge 7.30%, undergraduate 5th semester students had average knowledge 86.10 % (Fig 3), and diploma students had insufficient knowledge 6.60% (Omojola et al., 2019).

5. CONCLUSION

According to the findings, suitable theoretical classes should be provided in radiology departments for the transmission of information regarding radiation protection devices, their usage, and management. Not only the amount of hours necessary to acquire the information, but also the equipment is required to run the classes in the simulation-based learning environment. It should be considered during training sessions and teaching standards. This questionnaire-based study found that current radiation protection equipment, their use, and handling skills among radiography students at Assam Down Town University were insufficient, and that might be improved by well-designed training and theoretical sessions. Based on the findings of this study we recommend that all the health-care community must attend seminars, guest lectures, and training sessions regarding radiation protection equipment, their usage, and handling

Author contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Ethical considerations

This study was obtained from the Assam Down Town University (Approval number: AdtU/Ethics/research-lett/2021/048). Data were kept anonymous and confidential during all stages of the study.

Funding

The study did not receive any external funding.

Conflict of interests

The authors declare that there are no conflicts of interests.

Data and materials availability
All data associated with this study are present in the paper.

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