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Original Research Article

Assessment of Practice of Radiation Protection Devices in Fluoroscopy in SKIMS SOURA Hospital Srinagar J&K

Mr. Zubair Nisar[1], Miss. Shahida Bano[2*]

[1]Department of Radiology, Rayat Bahra University Mohali, Chandigarh, India
[2]Department of Obstetrics and Gynaecology Nursing, Smt. Nagarathnamma College of Nursing, Bangalore, Karnataka, India

***Corresponding Author:** Miss. Shahida Bano
Department of Obstetrics and Gynaecology Nursing, Smt. Nagarathnamma College of Nursing, Bangalore, Karnataka, India

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Abstract: This study evaluated radiation protection practices in fluoroscopy at Sher-i-Kashmir Institute of Medical Sciences (SKIMS) in Soura, Jammu and Kashmir. A descriptive cross-sectional design involved observing 47 patients and medical professionals during radiological procedures in the gastroenterology and radiology departments. Data were collected using a chart table, focusing on the use of radiation protection apparel and devices. Results showed that 50% of patients were aged 26-35, with an equal gender ratio. Thyroid shields were used by 56.7% and gonad shields by 36.7% of patients. Among radiation technologists, 75% were aged 30-40 and all used lead aprons and thyroid shields. Radiologists were evenly split by age and gender, with all using lead gloves, thyroid shields, collimators, and filters. The findings indicate that SKIMS staff exhibit strong knowledge and adherence to radiation protection guidelines, providing adequate safety measures for patients and themselves.

Keywords: Radiation Protection, Fluoroscopy, Protective Device, Patient Safety, Occupational Exposure.

1. INTRODUCTION

Background

Radiation can be either ionizing or non-ionizing depending on its energy or its penetrating power. Non ionizing radiation is not harmful such as visible light. Ionizing radiation is harmful that carries enough energy to ionize atoms or molecules and ionizing bonds such as x-rays alpha, beta, gamma radiation etc. Radiation possesses both benefits and hazards. Both ionizing and non-ionizing radiation are commonly used in daily medical practices, it plays important role in both therapeutic and diagnostic modulation. However ionizing radiation has hazards effects on personal who are exposed to radiation in their work place various studies have demonstrated that exposure to medical radiation increases the risk of bone marrow suppression, cataract, infertility, birth deformities and several types of cancer, especially thyroid carcinoma. X-ray was used in medical after the discovery of x-ray by W.C ROENTGEN in 8- Nov-1895. After three years of discovery it was used in India. Radiation effect could be seen soon after the discovery of x-rays. The x-rays were used injudiciously in the early years and caused visible damage to several physicians and x-ray enthusiasts. Several cause of Euthermia and Alopecia were reported among x-rays operators and their patients within six months of their use. The first x-ray induced skin cancer was reported in 1902. Ironsides Bruce, at the age of 38 a radiologist in a London Hospital died of cancer. Similarly due to excessive X-ray exposures several lives were lost.

The main purpose of radiation safety is to protect the patients, staff and public from unnecessary exposure to ionizing radiation. Radiation safety, also known as Radiological Safety, is the science and practice of protecting peoples and environment from harmful effect of radiation.

Need of the Study

Minimizing Radiation Exposure: Fluoroscopy involves continuous radiation, which can lead to significant exposure for patients. Evaluating protection devices ensures that exposure levels are kept as low as reasonably achievable (ALARA), thereby enhancing patient safety.

Protecting Healthcare Workers: Radiology staff are at risk of cumulative radiation exposure. An assessment helps identify the effectiveness of protective measures, reducing the risk of long-term health effects for medical personnel.

Ensuring Compliance with Standards: Healthcare facilities must comply with national and international radiation safety regulations. This study can evaluate whether current practices align with guidelines from organizations like the IAEA and AERB, promoting regulatory adherence.

Improving Patient Care Quality. Identifying shortcomings in the use of radiation protection devices can lead to improvements in protocols and practices, ultimately enhancing the quality of patient care and outcomes.

Raising Awareness and Education: The assessment can highlight the importance of radiation safety, leading to better training and awareness among healthcare professionals about the correct use of protective devices.

Resource Optimization: Understanding the current state of radiation protection practices can guide hospital management in allocating resources effectively, ensuring that adequate safety measures are in place.

Local Relevance: Considering regional healthcare challenges and practices, the study can provide insights specific to the local context, facilitating the development of targeted safety strategies.

Review of Literature

Many studies were performed for radiation protection in fluoroscopy. Many researchers performed multiple studies around the world to check the knowledge of radiation technologists, radiologists, physicians, nurses and students about radiation protection and dose limits those working in the radiation field. This study was carried out this study at Cellular and Molecular Research Centre, Yasuj University of Medical Sciences, Department of Radiation Sciences, School of Paramedical Sciences, Yasuj University of Medical Sciences, Department of Chemistry, Yasouj University, Yasouj, Department of Radiology, School of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Department of Radiology, Facultyof Paramedical, Kurdistan University of Medical Sciences, Sanandaj, Iran on 06 August 2019 [10]. The purpose of this study was to estimate the education and practice of medical professionals on radiation protection in interventional radiology. An explanatory questionnaire based study was carried out among 215 medical professionals and the practice of 31 medical professionals was studied using charts based on ICRP guidelines and ALARA principles. The questionnaire was divided into two parts. First part of questionnaire related to the demographic information like participant′s age, sex, and work experience. Second part of the questionnaire related to the radiation protection questions. Each participant′s filled an informed consent form during the questionnaire and the study was reviewed and approved by the ethical committee A total of 45.1% and 43.3% medical professionals answered correctly for practice and knowledge. This study reflects the lack of education and practice of radiation protection among medical professionals. All medical professionals need to know about radiation protection.

This study was carried out this study at Department of Diagnostic and Interventional Radiology, University of Pisa, Via Roma 67, 56100, Pisa, Italy Institute of Clinical Physiology, Via Moruzzi, 56124, Pisa, Italy Unit of Biostatistics and Clinical Epidemiology, Department of Public Health, Experimental and Forensic Medicine, University of Pavia, Via Forlanini, 27100, Pavia, Italy on 07 June 2016 [11]. The purpose of this study was to check the knowledge of radiation protection and dose levels of imaging producers between radiology residents, radiography students, and medical students at an academic hospital. A total of 159 students and doctors (including 43 radiography students, 56 medical students and 60 radiology residents) were pursued to fill a questionnaire containing 16 multiple choice questions that is divided into three separate sections. The data was collected from 1 January - 31 December. The study shows that the education of radiation protection is good in medical students rather than radiography students and radiology residents (94.4%, 55% and 35.7%). The conclusion of this study was the knowledge of radiation protection in radiology residents, radiography students and medical students is very less. All students need a radiology safety course for knowledge about radiation protection.

This study was carried out this study at Department of Radiology, Medical University of Gdansk, Gdansk, Poland, Polish-Japanese Institute of Information Technology in Gdansk, Gdansk, Poland, Chair & Clinic of Neurosurgery, Medical University of Gdansk, Gdansk, Poland on 14 October 2014 [13]. The purpose of the study was to raise awareness of radiation protection among medical staff. The awareness of radiation protection is necessary for medical staff working in a radiation environment. A questionnaire-based study was performed among 150 health professionals including nurses, doctors, medical technicians, and supporting staff. This questionnaire consisted of seven questions related to exposure risk to ionizing radiation, medical staff profession and their work experience. This study was carried out between July and October 2013 at University Clinical Hospital in Gdansk, Specialist Hospital in Gdansk-Zaspa and Pomeranian Trauma Centre in Gdansk. The radiation staff and emergency department with work experience of 1-5 years gave the highest rate of correct answers to questions related to the issue of radiation protection. Staff working in surgical wards with professional experience of 11-15 years gave the most satisfactory answers. The conclusion of this study was the radiation protection should be a subject of periodic training of medical staff for awareness of radiation protection.

Problem Statement: Assessment of practice of Radiation Protection devices in Fluoroscopy in SKIMS SOURA Hospital Srinagar J & K".

Objectives of the Study

- To assess the available radiation protection devices in the Radio-diagnosis and Imaging department.
- To assess the utilization of radiation protection devices for Fluoroscopy.
- To assess the utilization of radiation protection devices for patients.
- To assess the utilization of radiation protection devices for Radiation professionals.
- To assess the utilization of radiation protection devices for Students and Radiologists.
- The use of Ionizing radiation has been more frequent in various medical procedures; the motive of this study was to inform radiation technologist, radiologists, physicians, students about radiation protection.
- To assess the knowledge of radiology staff, physicians, patients and students about radiation protection.

Assumptions

In assessing radiation protection devices in fluoroscopy at SKIMS Soura Hospital, key assumptions include: compliance with national and international guidelines (AERB, IAEA); availability of necessary protective equipment (lead aprons, shields); adequate staff training in safety protocols; patient awareness of risks; regular maintenance of equipment; established monitoring protocols for radiation exposure; availability of accurate data on procedures and doses; awareness of potential adverse effects; adherence to ethical guidelines ensuring confidentiality and informed consent; and a focus on practical application of protective measures. These assumptions will guide the study's framework and data analysis.

Proposed Approach: This study aims to assess radiation protection practices in fluoroscopy at SKIMS Soura Hospital, Srinagar, J&K. Through a cross-sectional design, it will gather data via questionnaires, observations, and interviews, analyse findings statistically, and provide recommendations to enhance safety for patients and staff, ensuring ethical compliance throughout.

Value of Research: This study enhances safety by assessing radiation protection in fluoroscopy, providing evidence-based insights for informed decision-making. It identifies gaps in current practices, influences policies, and contributes to the literature on radiation safety. Additionally, it raises public awareness, encouraging patient advocacy and informed consent regarding radiation exposure.

Hypotheses

- **H1**: There is a significant correlation between the use of radiation protection devices and the reduction of radiation exposure among patients during fluoroscopic procedures.
- **H2**: Staff training in radiation safety protocols positively impacts the proper use of radiation protection devices in the fluoroscopy department.

Aim of the Study: This study is conducted with the aim of evaluating the practice of radiation protection in fluoroscopy as described by the regulatory authority and international radiation safety guidance in India.

2. METHODS AND MATERIALS

Design: Retrospective cross-sectional design was used.
Setting: This study was conducted in the gastroenterology department and radiology department of Sher i Kashmir Institute of Medical Science skims soura Srinagar Jammu and Kashmir.
Sampling Method: The data was collected by observing radiological procedures of patients and before examination an informed consent form was filled from the patient for research purposes. • Many radiation protection tools were used for data collection. • Radiation protection devices were provided to patients for radiation protection purposes. • After every examination every patient was asked whether he/she was comfortable or not.
Type of Study: A descriptive, cross-sectional study was done for research purposes. Study was conducted from February 2022 to July 2022.
Participants: The participants for the present study were patients, Radiation technologists, Radiologists, Physicians, Students and who fulfilled the inclusion criteria such as available at the time of data collection period, can understand Kashmiri or English language, willing to participate in the study.
Sample Size and Estimation: The study population of 47 patients and medical professionals are taking this study.
Sampling Technique: In this study, non-probability, "Purposive" sampling techniques is used for the selection of the samples.

Sampling Criteria:
Inclusion Criteria: In this study following category patients were included: • OPD (out patients department) patients • Patients of different age groups. • Adult patients, those able to wear protective devices.
Exclusion Criteria: In this study following category patients were excluded: • Pregnant patients • Patients with psychological illness • IPD (In patients department) patients • Pediatric patients • Medico-legal cases • Recent trauma patients • Uncooperative patient.

Data Collection Process: A descriptive, cross-sectional study was done for research purposes. A chart table was used for data collection. The study population of 47 patients and medical professionals took part in this study. The data was collected by observing patients, patients attendants, radiation technologists, radiologists, physicians and students that were using radiation protection apparels during radiological procedures at gastroenterology and radio-diagnosis department. Data was analysed using descriptive statistical tools, frequency mean and percentage. All radiation technologists, patients' attendants, radiologists and students used lead aprons and thyroid shields. About 56.7% patients used thyroid shields and 43.3% patients not used thyroid shields. About 36.7% of patients used gonad shields and 63.3% of patients did not use gonad shields. Collimator was used in about 96.6% of patients. Filters were used in 100% investigations. Lead aprons were not used in any investigation because lead aprons cover the area of interest during investigations. Lead gloves were used by 50% patients' attendants and not used by 50% patients' attendants. Tube curtain and collimator was used by 75% radiation technologists and not used by 25% radiation technologists. Lead gloves used by 50% radiation technologists and were not used by 50% of radiation technologists. Collimator and filters were used by all radiologists. Lead aprons were used by all physicians. Thyroid shields were used by 50% of physicians and not used by 50% of physicians. Tube curtains and collimators were used by 75% of physicians and not used by 25% of physicians. About 71.4% of students used tube curtains during investigations and 28.6% of students did not use tube curtains during investigations. About 85.7% of students used collimator during investigations and 14.3% of students did not use collimator during investigations. Lead gloves were not used by radiologists, physicians and students. Lead goggles were not used by any of medical professionals. According to guidelines it was not mandatory to use lead goggles and lead gloves during investigations. All radiation technologists, radiologists, physicians and students had good work practice, good knowledge about radiation protection and radiation protection apparels and they provide adequate radiation protection devices to patients and patients' attendants.

Instrument: Data collection instrument used for this study, are;
Allengers Medical System Limited fixed high frequency fluoroscopic X-ray machines were used for data collection.

- MARS-50 (G-XR-20843)
- MARS-80 (G-XR-23274)

These two fluoroscopic machines models are used for data collection. These machines come with various combinations of examination table and tube stand and application needs for radiation technologists.

Analysis Strategies:
Descriptive Statistics:

- Demographic Analysis: Summarize age, sex, marital status, and other demographic variables using means, medians, frequencies, and percentages.
- Device Utilization: Calculate the frequency and percentage of each radiation protection device used among patients, technologists, radiologists, and students.

Comparative Analysis:

- Group Comparisons: Use chi-square tests to compare the use of radiation protection devices among different groups (patients, technologists, radiologists, and students) based on demographic factors.
- Knowledge Assessment: Analyse knowledge levels about radiation protection among participants using t-tests or ANOVA for comparisons between groups.

Correlation Analysis:

- Device Usage and Knowledge: Employ Pearson or Spearman correlation coefficients to assess the relationship between knowledge of radiation protection and the actual use of protective devices.

Qualitative Analysis:

- Open-Ended Responses: Analyse qualitative feedback from participants regarding their perceptions and understanding of radiation protection through thematic analysis.

Data Visualization:

- Charts and Graphs: Create bar charts and pie charts to visually represent demographic distributions and device usage statistics, aiding in the interpretation of results.

Statistical Software:

- Utilize software such as SPSS, R, or Excel for data analysis to ensure accuracy and efficiency in calculations.

Interpretation of Results:

- Discuss findings in relation to existing literature on radiation protection practices, highlighting areas of strength and identifying gaps for improvement.

1.1 Tables

Table 1: Use of thyroid shield by patients

Age (Radiologist)	SEX	Thyroid Shield	Percentage
28 Y	M	1	50%
32 Y	F	1	50%
Total		**2**	**100%**

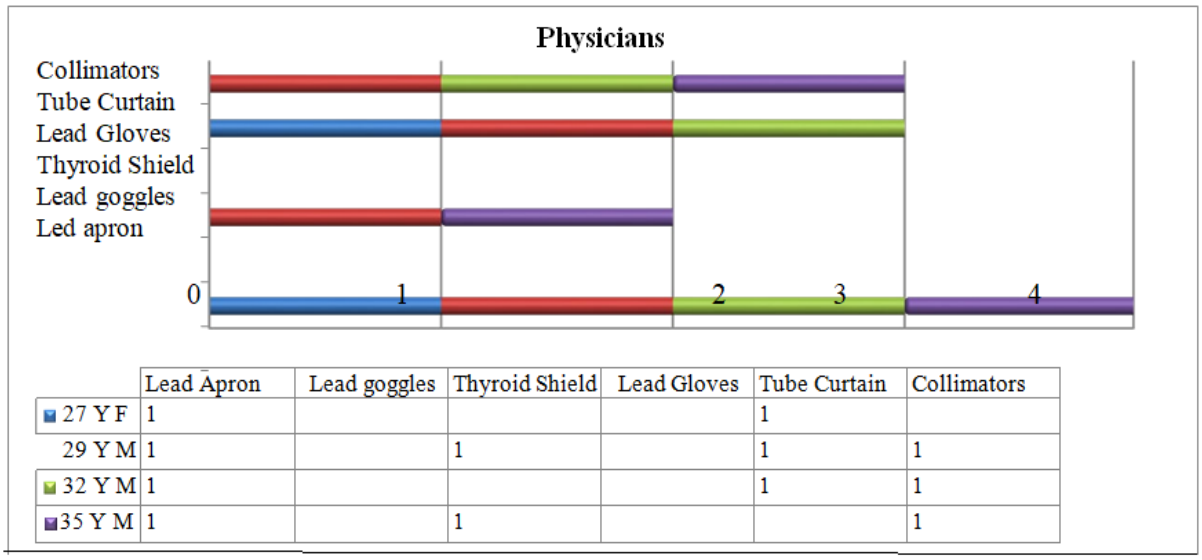
Table 2: Use of lead gloves by patient attendants

Age (Radiologist)	SEX	Lead Gloves	Percentage
28 Y	M	0	0%
32 Y	F	0	0%
Total		**0**	**0%**

Table 3: Use of lead apron by patient attendants

Age (Physicians)	SEX	Lead Apron	Percentage
27	M	1	25%
29	F	1	25%
32	M	1	25%
35	M	1	25%
Total		**4**	**100%**

1.2 Figure and Graphics



Graph 1: Graphical representation of use of radiation protection devices by physicians

4. RESULTS AND DISCUSSION

Out of this study the maximum number of patients (50%) belonged to the 26-35 years age group. In this study the patient's gender ratio was equal. The maximum number of patients (80%) was married, the minimum numbers of patients (3%) were separate and 17% patients were unmarried. About 56.7% patients used thyroid shields and 43.3% patients not used thyroid shields. About 36.7% of patients used gonad shields and 63.3% of patients did not use gonad shields. Collimator was used in about 96.6% of patients. Filters were used in 100% investigations. Lead aprons were not used in any investigation because lead aprons cover the area of interest during investigations. About 50% patients' attendants belonged to the 20-30 years age group and 50% patients' attendants belonged to the 30-40 years age group. The maximum

numbers of patients' attendants (75%) were males and the minimum numbers of patients' attendants (25%) were females. The maximum number of patients' attendants (75%) was married and the minimum number of patients' attendants (25%) was unmarried. Lead aprons and thyroid shields were used by all patients' attendants. Lead gloves were used by 50% patients' attendants and not used by 50% patients' attendants. The maximum numbers of radiation technologists (75%) belonged to the 30-40 years age group and the minimum numbers of radiation technologists (25%) belonged to the 20-30 years age group. The maximum numbers of radiation technologists (75%) were males and the minimum numbers of radiation technologists (25%) were females. All radiation technologists (100%) were married. Lead aprons and thyroid shields were used by all radiation technologists. Tube curtain and collimator was used by 75% radiation technologists and not used by 25% radiation technologists. Lead gloves used by 50% radiation technologists and were not used by 50% of radiation technologists. Lead goggles were not used by any radiation technologists. About 50% radiologists belonged to the 20-30 years age group and 50% radiologists belonged to the 30-40 years age group. 50% radiologists were males and 50% radiologists were females. All radiologists (100%) were married. Lead gloves, thyroid shields, collimator and filters were used by all radiologists.

Discussion

This research evaluates the practice of radiation protection devices among patients, attendants, radiation technologists, radiologists, physicians, and students. The participant demographic showed 44.7% were females and 55.3% were males. Among patients, 56.7% utilized thyroid shields, while 43.3% did not. Gonad shields were used by 36.7% of patients, leaving 63.3% without. Notably, collimators were employed in 96.6% of cases, and filters were used in 100% of investigations. However, lead aprons were not used due to their interference with the area of interest during procedures.

Patients' attendants universally used lead aprons and thyroid shields, with lead gloves used by 50%. Among radiation technologists, lead aprons and thyroid shields were also consistently utilized, but 25% did not use tube curtains and collimators. Lead gloves were used by 50%, while lead goggles were not used at all. Radiologists consistently used lead gloves, thyroid shields, collimators, and filters, but none used lead goggles. Physicians used lead aprons and tube curtains (75%), but only 50% utilized thyroid shields. In contrast, students showed a commendable level of protection practices, with 100% using lead aprons and thyroid shields, and 71.4% using tube curtains. The findings suggest a contrast with studies by Mohsen Shafiee et al. and Lorenzo Faggioni et al., which indicated deficiencies in education and practice among medical professionals. In contrast, this study reveals a strong knowledge and practice of radiation protection among medical professionals and students at SKIMS Soura Hospital.

CONCLUSION

The study conducted at SKIMS Medical College, Soura, Srinagar, evaluated radiation exposure among patients, attendants, radiation technologists, radiologists, physicians, and students. It found that all patients were provided with appropriate radiation protection devices, including collimators and filters, with 56.7% using thyroid shields and 36.7% using gonad shields, though some did not use them due to coverage of the area of interest. All radiation technologists consistently used lead aprons and thyroid shields, while some investigations limited the use of lead gloves and tube curtains. Radiologists and physicians also followed safety guidelines, using lead aprons and collimators, but had mixed compliance with thyroid shields and tube curtains based on the nature of the examinations. Students demonstrated good practices, with 71.4% using tube curtains and collimators. Overall, the study concluded that SKIMS staff exhibited strong knowledge and adherence to radiation safety practices, ensuring adequate protection for all involved.

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Declaration: I hereby declare that the project titled "Assessment of practice of Radiation Protection devices in Fluoroscopy in SKIMS SOURA Hospital Srinagar J&K " is my original work. This study has been conducted under the supervision of Guide and adheres to ethical guidelines and standards set by hospital. I affirm that all sources of information and assistance have been properly acknowledged and cited. The findings and interpretations presented in this project are based on thorough research and analysis conducted with integrity and adherence to ethical standards. I acknowledge the contributions of all individuals and institutions that supported me during this study.

Author Contribution

Author [1] Conceptualization of the study, formulation of report, and information.
Author [2] Data collection, and administration of the knowledge regarding assessment & care.
Author [1] Writing of the manuscript draft, literature review, and manuscript editing.
Author [2] Final review of the manuscript, approval of the final version for submission, and supervision of the overall project.

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Competing Interest: I declare that there are no competing interests related to the research project titled *"Assessment of the Practice of Radiation Protection Devices in Fluoroscopy in SKIMS Soura Hospital, Srinagar, J&K."* I have no financial, personal, or professional relationships that could influence the conduct or reporting of this research.

Ethical Clearance: Every procedure in this study complied with equivalent ethical standards. Permission was taken from the hospital before starting the research there. "The ethical aspect of the study has been institutionally reviewed" Informed consent has been procured by all respondents in this study

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