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Original Research Article

# An evaluation of knowledge and practice towards radiation protection among radiographers of Agra city

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**Abstract:** Radiation protection among radiographers has gained concern in recent times. The level of awareness concerning with radiation protection influences staff behavior. If they have not enough information related to mentioned issue, their action will not be safe and resulted to adverse effects. The objective is to evaluate the current status of knowledge and practices towards radiation protection among radiographers of Agra city. In this cross-sectional study, radiographers working in various hospitals of Agra city were identified and interviewed at their workplaces. List of health centers or hospitals providing radiology services in Agra city was obtained. These health centers or hospitals served as study places. Eligible study subjects were identified and interviewed. A semi-structured self-administered questionnaire served as study tool for this purpose. Data of 50 participants was included in the final analysis. 68% subjects had experience of upto 5 years for working in radiology. All the respondents agreed to being exposed to radiation with 40% of them using radiation in 6-10 cases in a week. All the study subjects were aware of use of special materials in doors and walls such as lead for more protection, periodical radiation dose check from TLD and usage of personal Protective devices. Lead gloves or protective eye glasses were never used by 70% and 76% of subjects respectively. The dosimeters were never/rarely used by 66% of the subjects. There exists 'knowledge-practice gap' about usage of personal Protective devices among radiographers. Concerned department should launch IEC campaigns in the form of workshops, training courses, distribution of sensitization materials about ionizing radiation in order to bridge the identified gap.
**Keywords:**Knowledge, Practice, Radiation Protection, and Radiographers

## INTRODUCTION

Use of radiation has become a necessary evil for the radiographers. Radiation protection is the science and art of protecting people and the environment from the harmful effects of ionizing radiation. It is also described as all activities directed towards minimizing radiation exposure of patients and personnel during x-ray exposure[1].The main aim of radiological protection is to provide with accurate standards to practice safely with ionizing radiation for public, workers and patients[2].

Ionizing radiation may effects gastrointestinal system, central nervous system, gonads or even whole body. These effects may appear as somatic effects or in next generation as a genetic effects[3].To ensure the safety of patients, providers, and staff members, it is important that the health care community become familiar with the terminology, common equipment, and standard practices used in radiation safety and monitoring[4].

Radiation protection among radiographers has gained concern in recent times. The level of awareness concerning with radiation protection influences staff behavior. If they have not enough information related to mentioned issue, their action will not be safe and resulted to adverse effects[5].Therefore the present study was planned to evaluate the current status of knowledge and practices towards radiation protection among radiographers of Agra city.

## MATERIALS AND METHODS

The present cross-sectionalstudy was planned and executed by the Department of Radiology of a tertiary care teaching institution of northern India. In this study, radiographers working in various hospitals of Agra city were identified and interviewed at their workplaces during year 2014-2015. Only those radiographers were included those actually involved with machines. Those only providing consultation services were excluded from this survey.

List of health centers or hospitals providing radiology services in Agra city was obtained. These health centers or hospitals served as study places. Eligible study subjects were identified and interviewed. A semi-structured self-administered questionnaire served as study tool for this purpose. Questionnaire had 22 questions divided in 3 sections. First section of questionnaire captured data about socio-demographic details of the study subjects. Second section of questionnaire contained questions about their working pattern in radiology and knowledge of participants regarding radiation protection. The last and third section of questionnaire had questions about their practices regarding radiation protection.

The study adhered to the tenets of the Declaration of Helsinki for research in humans. Permissions of Institutional ethics committee (IEC) and district authorities were sought before the commencement of the study. All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 20 (IBM, Chicago, USA). The results were expressed using appropriate statistical methods.

## RESULTS

Questionnaires were handed out to fifty-eight subjects. Fifty-three subjects returned the filled questionnaires giving a response rate of 91.4%. Three questionnaires were discarded and not included in the analysis, as they were incomplete. Data of 50 participants was included in the final analysis. Majority (72%) of study subjects belonged to age group of 16-35 years. Male participants outnumbered females. Most (70%) of study subjects were having any of the Diploma in Radiology like DMRD, DMRE or CPS. Sixty eight percent subjects had experience of upto 5 years for working in radiology. (Table 1).

All the respondents agreed to being exposed to radiation with 40% (n=20) of them using radiation in 6-10 cases in a week. (Figure 1)

All the study subjects (100%) were aware of use of special materials in doors and walls such as lead for more protection, periodical radiation dose check from TLD and usage of personal Protective devices. 54% had correct knowledge of annual limitation dose for individuals whereas 66% could tell correctly about Dosimeter. Regarding practices, less than 60% of subjects used wall shield during working hours. (Table 2)

Lead aprons and thyroid shields were the most common radiation protection devices used. Lead gloves or protective eye glasses were never used by 70% and 76% of subjects respectively. The dosimeters were never/rarely used by 66% of the subjects. (Table 3)

**Table 1: Demographic characteristics of study subjects**

| Variable | N | %age |
|---|---|---|
| **Age group** | | |
| 18-25 years | 10 | 20 |
| 16-35 years | 36 | 72 |
| 36-45 years | 3 | 6 |
| >45 years | 1 | 2 |
| **Gender** | | |
| Male | 33 | 66 |
| Female | 17 | 34 |
| **Qualification** | | |
| Bachelor degree | 15 | 30 |
| Diploma in Radiology | 35 | 70 |
| **Work experience (years)** | | |
| Upto 5 years | 34 | 68 |
| 5-10 years | 13 | 26 |
| >10 years | 3 | 6 |

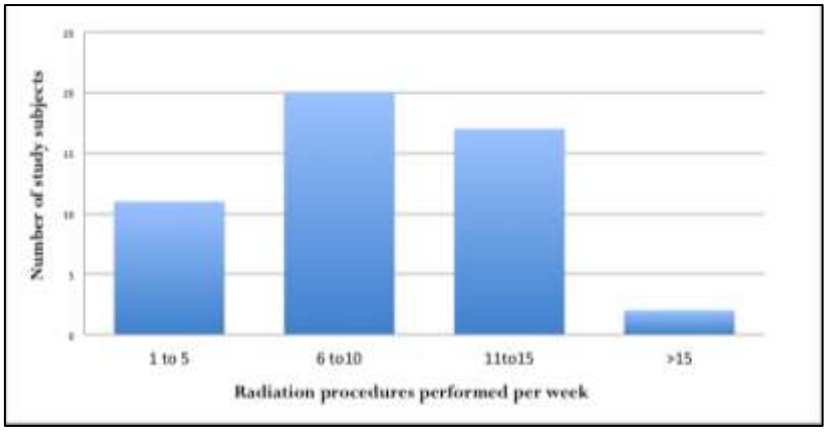


**Fig-1: Radiation Procedures performed per week by study subjects**

**Table 2: Knowledge and practices of study subjects regarding radiation protection (other than usage of personal protective devices)**

| Variable | N | %age |
|---|---|---|
| **Correct knowledge of participants regarding radiation protection** | | |
| Special materials to be used in doors and walls such as lead for more protection | 50 | 100 |
| Periodical radiation dose check from TLD. | 50 | 100 |
| Knowledge regarding use of personal Protective devices | 50 | 100 |
| Knowledge regarding annual limitation dose for individuals | 27 | 54 |
| Knowledge about Dosimeter | 33 | 66 |
| **Practices of participants regarding radiation protection (other than usage of personal protective devices)** | | |
| Using light beam diaphragm, cone and grid | 36 | 72 |
| Using wall shield during working hours | 29 | 58 |
| Using Radiation signs during working hours | 23 | 46 |

**Table 3: Usage of personal Protective devices by the study participants**

| Protective devices worn | Never | Rarely | Most of the times | Always |
|---|---|---|---|---|
| Lead aprons | 2 (4) | 5 (10) | 13 (26) | 30 (60) |
| Thyroid shield | 1 (2) | 11 (22) | 12 (24) | 26 (52) |
| Lead gloves | 35 (70) | 10 (20) | 4 (8) | 1 (2) |
| Protective eye glasses | 38 (76) | 10 (20) | 5 (10) | 0 (0) |
| Dosimeter | 20 (40) | 13 (26) | 11 (22) | 6 (12) |

## DISCUSSION

It was observed in this study that all the study subjects (100%) were aware of use of special materials in doors and walls such as lead for more protection, periodical radiation dose check from TLD and usage of personal Protective devices. The result of this study is in agreement with previous study from Saudi Arabia[6]. On the other hand, another study from United Kingdom reported poor knowledge of radiation protection issues among radiographers[7]. Our study contradicts findings of that study on this aspect.

Regarding periodical radiation dose check from TLD, authors from Nigeria[8] reported that 98.7% of the staff had periodical radiation dose check from their TLDs (wearing TLDs during their work hours). They also reported a better attitude to wearing radiation dosimeters among a sample of industrial radiographers in Nigeria.It has been recommended by International Commission on Radiation Protection (ICRP) that the annual occupational exposure to radiation should be limited to 20mSv over a period of five years[9].Therefore the use of dosimeters is indispensable to measure the amount of radiation received by the workers. Our study exposes distressing results as a big chunk of study subjects never or rarely used dosimeters. This may have very serious consequences, as one would never be conscious of the amount of radiation received. Another critical issue during the use of radiation is patient safety. It is the patient who is exposed to the maximum amount of radiation, both for the diagnostic and therapeutic purpose. It is imperative that steps are taken to reduce the exposure of the patients[10].

We observed in this study that regarding practices, less than 60% of subjects used wall shield during working hours. Another study by Ahmed RM *et*

*al* is also in concordance with our observations[6]. He observed that using light beam diaphragm and other protective devices (cone & grid) have percentage of (78.7%), while (61.3%) were using wall shield during exposure. Only 22.7% use lead gloves and this behavior will protect the radiographers themselves. Our findings also confirm the results of another study from Port Harcourt[11]. That survey reported that the size of the radiation field must be selected no larger than the size of the organ being photographed.Fatahi- Asl J.*et al*conducted another study in the hospitals of Ahvaz County, and observed that using of radiation field limitation was observed in only 43.7% of the cases[12].

It is mandatory, according to International Commission on Radiation Protection (ICRP) radiation safety standards for gonads shields to be used for the protection of the gonads when the pelvis is not part of the anatomical area being examined[6]. Thyroid protective shield used always by 52% in our study, while multiple authorities have investigated and clearly demonstrated the efficacy of protection equipment and the importance of shielding radiation-sensitive organs in reducing the absorbed dose[13].

As far as knowledge-practice gap is concerned, in spite of excellent knowledge (100%)about usage of personal Protective devices found among radiographers in this study, lead gloves or protective eye glasses were never used by 70% and 76% of subjects respectively. The dosimeters were never/rarely used by 66% of the subjects.

Regarding strengths of this study, to our knowledge, assessment of current status of knowledge and practices towards radiation protection among radiographers of has not been much investigated in Agra city till date. No similar studyis available in the literature to best of my knowledge, that's evident strength of this study. The study has some limitations as well. First, survey of radiation level in and outside the rooms where radiation equipment are placed was not carried out. Second, sample size was less. Third, similar study should have been rolled out among residents and nursing staff too.

## CONCLUSIONS

On the basis of empirical evidences observed in this study it could be concluded that there exists 'knowledge-practice gap' about usage of personal Protective devices among radiographers. They are not able to put their knowledge into practice. This gap needs to be bridged. Concerned department should launch IEC campaigns in the form of workshops, training courses, distribution of sensitization materials about ionizing radiation in order to bridge the identified gap.

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