

# The Knowledge of Radiation and the Attitude Towards Radio-Protection among Urology Residents in India

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## ABSTRACT

**Introduction:** Exposure to radiation is a hazard and precautions are necessary to limit it. This study was done to assess the knowledge of radiation and the attitude towards radio-protection among urology residents in India.

**Materials and Methods:** A questionnaire was administered to assess the knowledge and attitude of urology residents who came from all over the country to attend a clinical meeting at Apollo Gleneagles Hospital, Kolkata, India.

**Results:** All the respondents agreed to being exposed to radiation, with 78.2% using radiation in more than five cases a week. Only 65.2% always took some steps for radio-protection. Lead aprons and thyroid shields were the most common radiation

protection devices used. None of the residents ever used lead gloves or protective eye glasses or dosimeters. An 82.6% felt that they did not have adequate knowledge, 85.4% of residents did not receive any formal classes regarding the risk of radiation, 21.7% either rarely or never moved out of the operating room when the radiation was being used, 42.4% did not know that the SI unit of the equivalent absorbed dose of radiation & 52.1% did not know about the amount of radiation delivered to an adult during a contrast enhanced CT scan of the abdomen.

**Conclusion:** Results of the present study reveal that the urology residents of India lack knowledge about the risks of radiation exposure. Majority of them did not take necessary precautions to limit their exposure to radiation.

**Keywords:** Imaging, Ionizing radiation, X ray

## INTRODUCTION

Urology and radiation exposure go hand in hand. Endoscopic interventions are an integral part of urologic practice and they depend upon the use of radiation. As such, the number of endourological procedures being performed by a urologist are increasing by the day. This has led to increased use of radiation and the chances of radiation associated hazards. The urologists, if they have proper knowledge about radiation hazards, can decrease the amount of radiation exposure. A multitude of measures can be taken to this effect [1,2]. Unfortunately, it has been seen in various studies that the urologists do not attribute significant attention towards radiation safety [3,4]. The urology residents constitute a very important group in the ladder of urologic care. During the tenure of their training, they are constantly exposed to the radiation. As they are young, the cumulative dose of radiation received by them in their life time can be high and hence they are theoretically more prone to suffer the after-effects of radiation exposure. It is imperative that they have proper knowledge about the risk of radiation and take steps to curtail the amount of radiation exposure. Their behaviour, at this stage, tends to establish their attitude towards radiation hazard in the later stages of their career. This survey was conducted to assess the knowledge and attitude of the residents towards radiation safety. To the best of our knowledge this is the first such study in the Indian urology residents.

## MATERIALS AND METHODS

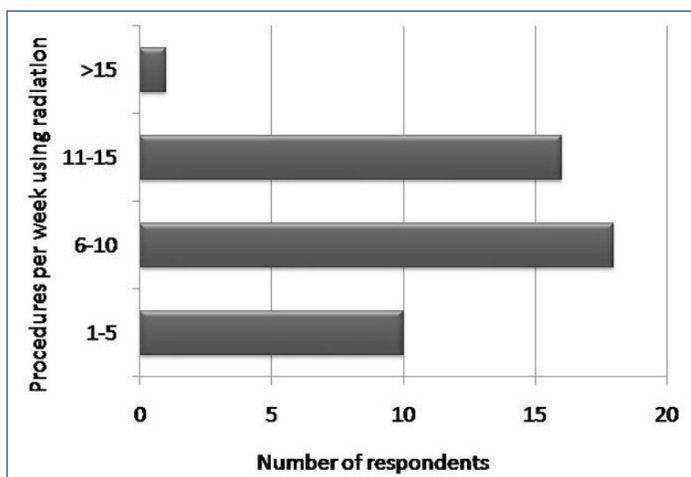
A questionnaire was constituted which could assess the knowledge, practice and attitude of the respondents towards radiation safety (Annexure 1). The clearance was taken for this study from the institutional protocol and ethics department. This questionnaire was given to a group of 51 final year urology residents who came to attend a clinical meeting. These residents were from all over the country. They were informed that their participation was completely at their discretion. They were also told that the results will be analysed and will be used as a part of scientific study. The questionnaire was anonymous and did not require their name or the institution's name to which they belonged.

## STATISTICAL ANALYSIS

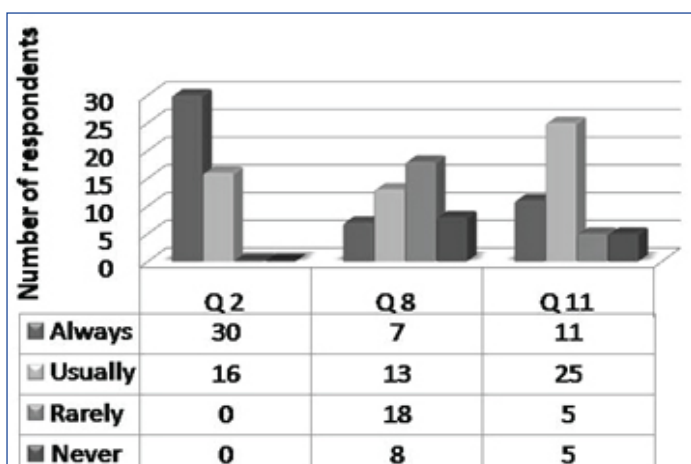
The responses were integrated and statistically analysed using the SPSS 13.0 software (SPSS Inc., Chicago, IL).

## RESULTS

Of the 51 residents, 48 residents filled and returned the questionnaire. Of these, two forms were incomplete hence could not be included in the analysis. The mean age of the respondents was 33.2 years (range 30-35 years). All the respondents agreed to being exposed to radiation with 78.2% (n=36) of them using radiation in more than five cases in a week [Table/Fig-1]. All the respondents tried to protect themselves from radiation exposure but only 65.2% (n=30) of them "always" took steps for radio-protection [Table/Fig-2]. Lead aprons and thyroid shields were the most common radiation protection devices used. A total of 45.6% (n=21) did not use a thyroid shield and used only lead aprons. None of the residents ever used lead gloves or protective eye glasses. The dosimeters were also not used by any of the residents. An 85.4% (n=41) of residents did not receive any formal classes or lectures regarding the risk of radiation and the methods to prevent the exposure. Although 84.7% (n=39) of the residents believed that they can reduce the amount of radiation used in their operation theatre, 82.6% (n=38) did not feel that they have adequate knowledge about radiation safety. The principle of ALARA (As Low as Reasonably Achievable) was not known by 28.2% (n=13) residents while only 45.6% (n=21) practised it. Only 15.2% (n=7) residents always informed the patients that they would be exposed to radiation during the surgical procedure. More than half of the residents did not or only rarely provide this information to the patients [Table/Fig-2]. Thirty five (76%) of the residents knew that the optimal thickness of the lead shield used for protecting should be 0.5 mm. It is advisable that the personnel who are not actively involved in the surgical procedure should leave the operating room when radiation is being used. Only 23.9% of our respondents always employed this while 21.7% either rarely or never moved out of the operating room when the radiation was being used [Table/Fig-2].



[Table/Fig-1]: Graph demonstrating the number of procedures performed per week by respondents which expose them to radiation



[Table/Fig-2]: Graph demonstrating the results for question number two, eight and eleven of the questionnaire

For the question number twelve that assessed the knowledge about the steps that can be taken to reduce radiation exposure, 71.4% (n=33) rightly recommended the use of protective gear, increasing the distance from the source of radiation and decreasing the time of the use of the fluoroscope. A 42.4% (n=20) did not know that the SI unit of the equivalent absorbed dose of radiation is "Sivert". A 52.1% (n=24) incorrectly answered the amount of radiation delivered to an adult during a contrast enhanced CT scan of the abdomen (normal value is 10-30 mSv).

## DISCUSSION

Use of radiation has become a necessary evil for the urologists. In a recent review it was shown that it is not just the surgeon who is exposed to the radiation but even the assistants, nurses, floor nurses etc, are also exposed to significant amount of radiation [5]. This can have acute as well as chronic effects on the health of the medical personnel. The present study shows that urology residents are regularly exposed to radiation with a majority of them (78.2%) involved in more than five procedures per week that use radiation. This necessitates that they should be well versed with the risks involved and take all the precautions to decrease the amount of radiation they are exposed to. Unfortunately, it was found that an overwhelming number of them did not receive any formal lecture or training during the course of their residency regarding the risks of radiation or radio-protection. More than 80% of the residents believed that the amount of radiation used in the operating room can be reduced by taking proactive measures but a majority of them were handicapped due to the lack of adequate knowledge regarding radio-protection. The lack of knowledge also reflects in the use of protective gear. While lead aprons were most commonly

used, fewer people used thyroid shields. None of the residents used lead gloves or protective eyeglasses.

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 [6]. Hence the use of dosimeters is essential to measure the amount of radiation received by the personnel. Our study reveals worrying results as none of the respondents used dosimeters. This may have very serious implications as one would never be aware of the amount of radiation received. Another important 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. It is also the duty of the surgical team to inform the patients that they would be exposed to radiation during the time of surgery [7]. It was found in our study that only 15.2% of the residents routinely informed the patients about this. The lack of knowledge was also revealed by the fact that more than half of the residents did not know the amount of radiation received by the patient during a contrast enhanced CT scan of the abdomen.

It is recommended by the ICRP to follow the principle of ALARA (As Low As Reasonably Achievable) [8]. It calls for steps to be taken to educate all the personnel involved during surgery in which a source of radiation is used so that they can decrease the amount of radiation used and also take steps to protect themselves. It is advised that lead aprons, thyroid shields, protective eye glasses should be used. They are made up of lead and decrease the amount of radiation received by the operator. Commonly a 0.5 mm lead shield is used [9]. Nearly one quarter of the residents in the survey did not know this. Medical personnel can prevent themselves from radiation by increasing the distance from the source of radiation or by leaving the operating room, if not actively involved in the procedure, when the radiation is being used [9]. We found that only about a quarter practiced this routinely.

The knowledge related to radiation exposure/protection is imparted in undergraduate courses. To find what is actually done, how much is gained by students and how much they apply is really a concern. Few studies conducted in various countries have used similar questionnaires to find out the knowledge and attitudes of medical personnel and have revealed disappointing results [10-13]. The studies call for urgent measures to impart education about radiation safety and implementation of adequate measures to decrease radiation exposure [14,15]. [Table/Fig-3] depicting the results of similar studies across the world. A few studies have been conducted in our country which also reveal dismal results [16,17]. Our study also supports the findings.

Authors: year	Country of study	Results	Conclusions
Söylemez et al., (2013) [4]	Various European Countries	72.5% of the respondents were exposed to radiation more than three times a week. 75% respondents used lead aprons but use of other modalities was negligible. Only 55% of the respondents had attended an education program in Europe about radiation safety	The level of knowledge about ionizing radiation was low among urology residents, and approximately half of responders had no idea that commonly used imaging modalities have a fatal cancer risk.
Söylemez et al., (2012) [3]	Turkey	84.58% of the urologists were routinely exposed to radiation but only 75.24% used lead aprons. More than 70% did not use dosimeters, eyeglasses etc.	The urologists of Turkey do not uniformly use the radiation protection devices

Friedman et al., (2012) [15]	Canada	Compliance with body and thyroid shields was high as 99% of the respondents used lead aprons while 73% used thyroid shields. 70% of respondents never used dosimeters while none of them used protective gloves.	The use of protective equipment usage and occupational radiation monitoring for the training urologist were insufficient
Zewdneh et al., (2012) [12]	Ethiopia	A mean score of 7.1 out of 19 was achieved.	The respondents lacked proper knowledge regarding radiation exposure and safety.
Present study	India	78.2% of the respondents were exposed to radiation in more than five cases in a week. 65.2% of them always took steps for radio-protection. 45.6% (n=21) did not use a thyroid shield and used only lead aprons. None of the residents ever used lead gloves or protective eye glasses or dosimeters.	There is a clear lack of knowledge in the Indian Urology residents regarding radiation safety.

**[Table/Fig-3]:** Table depicting the results of similar studies across the world

## LIMITATION

We acknowledge that our study does have some lacunae. Firstly, the questionnaire used by us was not a validated one. We did not stratify our results on regional basis and it is possible that some regions may fare better than the others. Despite these issues, present study does show an alarming situation.

## CONCLUSION

Present study shows that the knowledge about radiation safety is clearly lacking amongst urology residents. This reflects in their attitude and practices too. The radiation protection gear is under-utilized. We recommend that radiation safety lectures should be made essential for all residents. The principle of ALARA should be given its due importance and must be implemented.

## ANNEXURE 1

### The questionnaire used for the assessment of the knowledge, attitudes and practice attitude of the respondents towards radiation safety

Age:

- How many procedures you perform/assist in a week during which you are exposed to radiation?
  - 1-5
  - 6-10
  - 11-15
  - >15
- Do you take steps to protect yourself from risk of radiation?
  - Always
  - Usually
  - Rarely
  - Never
- What do you use to protect yourself (you can select multiple options)?
  - Lead aprons
  - Thyroid shield
  - Lead gloves
  - Protective eye glasses
  - Dosimeters

- Did you receive any formal class/lecture/training during your residency regarding the risk of radiation exposure and the methods to prevent it?
  - Yes
  - No
- Do you think that by taking proactive steps, you can reduce the amount of radiation used in your operation theatre?
  - Yes
  - No
- Do you think that you have adequate knowledge about risk of radiation and radiation safety?
  - Yes
  - No
- Do you follow the principle of ALARA in your urologic practice?
  - Yes
  - No
  - No idea
- Do you inform your patients that they would be exposed to radiation during their surgery?
  - Always
  - Usually
  - Rarely
  - Never
- What should be the optimal thickness of the lead shield used for protection against radiation?
  - 0.1 mm
  - 0.5 mm
  - 0.9 mm
  - 1.2 mm
- If fluoroscopy is on and you are not operating or assisting in the procedure, do you step out of the room?
  - Always
  - Usually
  - Rarely
  - Never
- According to you, what measures can be taken to decrease the risk of radiation exposure (you can select multiple options)?
  - Use of protective gear
  - Increasing distance from the source of radiation
  - Decreasing the time of fluoroscopy
  - Increasing the current of the fluoroscopy machine
- What is the SI unit for measurement of the equivalent absorbed radiation dose?
  - Rad
  - Rem
  - Sivert
  - Gray
- What is the average dose of radiation delivered to an adult during a CECT of abdomen?
  - 5-10 mSv
  - 10-30 mSv
  - >30 mSv

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**FINANCIAL OR OTHER COMPETING INTERESTS:** None.

Date of Submission: **Mar 15, 2015**

Date of Peer Review: **Jun 11, 2015**

Date of Acceptance: **Sep 03, 2015**

Date of Publishing: **Dec 01, 2015**