

# Attitudes and knowledge of anesthesiology trainees to radiation exposure in a Tertiary care hospital

## ABSTRACT

**Background and Aims:** Ionizing radiation procedures are indispensable in medical clinical practice. Exposure to radiation at any dose could have serious adverse effects. Anesthesiologists working in interventional radiology suites are at a higher risk of radiation exposure than other personnel. The aim of this study was to assess the knowledge and attitude of anesthesiology trainees towards the radiation hazards and current safety practices.

**Methods:** This prospective cross-sectional survey was conducted at the department of anesthesiology at Aga Khan University. All anesthesiology trainees working in the department were given a 12-question paper-based survey after getting ethical review committee approval and informed consent. The questionnaire contained requests for personal demographic data and specific questions regarding radiation protection.

**Results:** A total of 54 participants were included in this survey. Thirty-two (59.3%) were male, and 22 (40.7%) were female. The average year of experience working in anesthesia of the participants was  $2.8 \pm 1.65$  years (range, one to eight years). Frequency of radiation exposure of 32 (59.3%) participants was 1-5 times per week. Approximately 68.5% (37/54) of participants believed they took adequate precautions for protection against radiation. Only 20.4% (11/54) used both a lead apron and a thyroid shield for prevention of radiation exposure. Most participants using the radiation shield or clothing (70.4%; 38/54) cited concerns about cancer.

**Conclusions:** A lack of knowledge persists among anesthesiology trainees in our institute regarding the risks associated with ionizing radiation. This study also serves to highlight the need for anesthesiology trainees to protect themselves properly. Radiation dose, hazards, and protection strategies must be included in the basic curriculum of medical colleges.

**Key words:** Knowledge; radiation; trainees

## Introduction


In the more than 120 years since the discovery of Roentgen Rays, their use has dramatically increased in clinical practice from diagnosis to radiological guided procedures.<sup>[1]</sup> Unfortunately, the advancements in protection from the effects of this ionizing radiation are still a matter of neglect. The widespread use of radiation in

clinical practice exposes anesthesiologists to their harmful effects in everyday practice.<sup>[2,3]</sup> Awareness regarding the potentially hazardous effects of radiation, as well as better knowledge of radiation protection strategies, is an essential element for all health care professionals including anesthesiologists.

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Anesthesiologists in interventional radiology suites are 6 times more prone to radiation exposure than other personnel and 3 times than the radiology personnel.<sup>[4]</sup> The International Commission on Radiological Protection recommends 20 mSv/year over 5 years as the maximum dose limits for exposure.<sup>[5]</sup> The potential risks associated with prolonged radiation exposure can not only cause localized damage to a certain area of the body such as the cataract, but also can affect the entire body.<sup>[6]</sup> The limit dose below which a neoplasm will not occur is not known.<sup>[7]</sup> Therefore, it is necessary for clinicians, especially anesthesiologists, to know of radiation risks.<sup>[8]</sup> Unfortunately, protective measures and relevant habits adopted by anesthesiologists to guard against radiation exposure are inadequate.<sup>[9]</sup>

There is a dearth in literature regarding the awareness of radiological protection among health care professionals.<sup>[4,10]</sup> Due to its widespread use not only in radiological suites but also in ORs, anesthesia providers are frequently exposed to radiation during routine patient care in ORs and remote anesthetizing locations. The use of fluoroscopy has immensely increased in orthopedic procedures, thereby increasing the anesthesiologist's exposure to beyond the recommended dose limit of radiation (i.e., 15 mSv/yr).<sup>[4]</sup> Therefore, it is necessary that anesthesia trainees know about protection from radiation. The aim of this study was to determine the attitude and knowledge of anesthesiology trainees towards radiation hazards and current safety practices. This study also served to highlight the need for young anesthesiologists to protect themselves properly.

## Methods

All anesthesiology trainees working in the department of anesthesiology were invited to participate in the cross-sectional survey.

After getting approval from the ethical review committee (4691 Ane ERC 17), a 12-item paper based questionnaire was distributed among trainees of the anesthesiology department (see appendix). The trainees completed the questionnaire after providing written informed consent. The survey consisted of closed-ended questions regarding basic knowledge of radiation hazards and protective equipment used along with demographic data.

Data were analyzed IBM SPSS Statistics for Windows, Version 19.0. (IBM Corp., Armonk, NY). Mean and standard deviation were computed for quantitative observation. Frequency and percentage were computed for qualitative

observations and questions regarding the adequate preparation for radiation protection and practice along with reasons for using radiation shielding or clothing.

## Results

A total of 54 participants were included in this survey and none of the trainees declined to participate. There were 32 (59.3%) male and 22 (40.7%) female respondents. The average year of experience of the participants was  $2.8 \pm 1.65$  years (range, 1-8 years). 32 participants (59.3%) reported a frequency of radiation exposure of 1-5 times per week [Table 1].

37 participants (68.5%) believed that they took adequate precautions for protection against radiation. Only 11 participants (20.4%) used both a lead apron and thyroid shield for prevention of radiation exposure. Regarding the knowledge about precautions for protection against radiation, 15 participants (40.5%) gathered knowledge during their medical school years, 19 participants (51.4%) during anesthesia training, and only three participants (8.1%) reported seeking knowledge via personal study. 38 participants (70.4%) reported using the radiation shield or clothing citing cancer as the main concern while 16 participants (29.6%) presented other reasons [Figure 1].

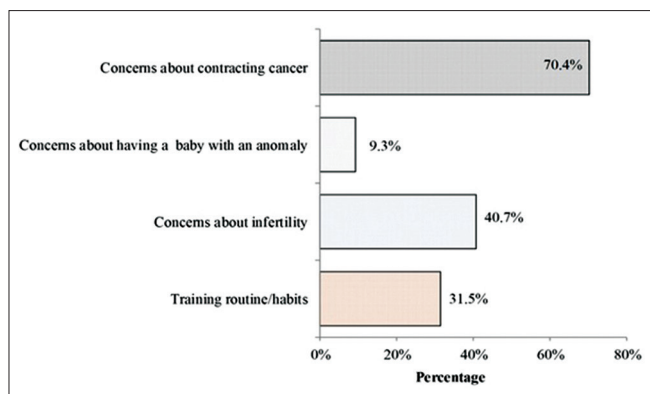
Regarding the reasons for not using protection, 50% participants cited the non-availability of lead aprons or thyroid collar, 20% said it was not practical and rigid, 11% said leaving the room during radiation, while 9.3% said they had no time to wear protective devices [Figure 2].

## Discussion

The knowledge of anesthesiology trainees reported in our study is slightly better than quoted for physicians of other

**Table 1: Radiation exposure of the participants (n=54)**

Variables	Point Estimate
Frequency of Radiation exposure per week	
<1	7 (13%)
1-5	32 (59.3%)
>5	15 (27.8%)
Number of hours of radiation exposure per week	
<1 h	10 (18.5%)
1-5 h	25 (46.3%)
5-10 h	12 (22.2%)
>10 h	7 (13%)
You believe you need to have adequate preparation for radiation protection?	
Yes	37 (68.5%)
No	17 (31.5%)



**Figure 1: Anesthesiologists' reasons for using radiation shielding or clothing (n = 53)**

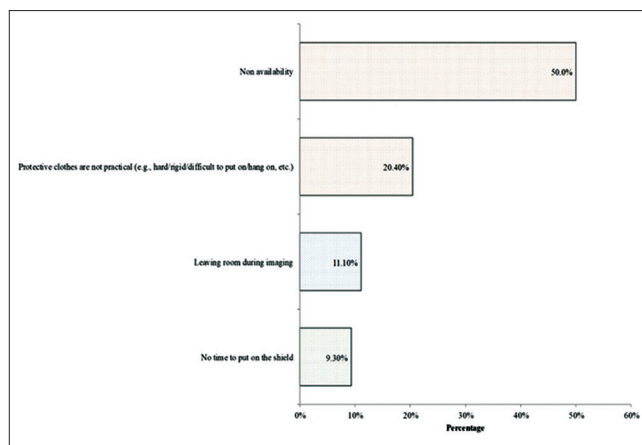
specialties in prior studies,<sup>[11]</sup> but the level of knowledge is still inadequate with only 20% of participants using adequate radiation protection. According to a systematic literature review on physician's knowledge about radiation doses and risk associated with radiation, radiation hazards awareness among physicians is moderate to low and should be increased to maximize the protective strategies used.

A cross-sectional study, conducted among 110 radiology, radiotherapy and dentistry staff by Awosan *et al.* reported that although health care providers had good knowledge of radiation hazards, the use of protection was still low.<sup>[12]</sup>

Another study assessed the knowledge of final year medical students regarding radiation dose and the associated risks with ionizing imaging examinations. They also reported that knowledge of radiation dose and the risks associated with it was not adequate.<sup>[13]</sup> Another survey of knowledge and understanding of medical imaging radiation among health care staff concluded that knowledge of radiation doses is poor across all specialties.<sup>[14]</sup>

Even though our results are slightly better in terms of knowledge, still the use of protective shields is very low. Reasons for not using the protective shields should be looked at and availability of the devices should be made more common as 50% participants cited non availability as the primary reason.

There are certain limitations in our study. First, this study was conducted in a single tertiary care teaching institute; hence, results cannot be extrapolated to small community and non-teaching hospitals. As it was conducted in one institute, the sample size could not be increased. Another limitation is the use of a self-reported questionnaire, which may lead to some participants exaggerating their knowledge and introducing bias in the results. We suggest larger nationwide



**Figure 2: Participant responses for not using radiation shield**

survey studies should be done on the awareness among health care professionals regarding the use of protection against radiation.

### Conclusions

There is a lack of knowledge among trainee anesthesiologists in our institute regarding the risks associated with ionizing radiation. This study also serves to highlight the need for anesthesiology trainees to protect themselves properly. Radiation dose, hazards, and protection strategies must be included in the basic curriculum of medical colleges. We recommend routine monitoring of radiation exposure, especially for anesthesia personnel working in a high-risk radiological environment along with the proper use of protective equipment and continuing educational awareness sessions for those at risk.

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### Conflicts of interest

There are no conflicts of interest.

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## Appendix

### Survey Questionnaire

1. **Gender:** Male/Female
2. **Year of training:**
3. **Frequency of radiation exposure per week:** >5 1-5<1
4. **Number of hours of radiation exposure per week:** -----
5. **You believe to have an adequate preparation for radiation protection**  
Yes No.
6. **If yes it's due to:**
  - a. Knowledge during medical school
  - b. Knowledge during anaesthesia training
  - c. Personal study or knowledge.
7. **In case of pregnancy radiation exposure could be done**  
No never yes yes but wearing a shield.
8. **Recommended maximum dose limit of radiation per year in mSv is**  
5 15 50.
9. **Do you wear protective cloths during radiation exposure?**  
Yes No.
10. **What protective cloths do you wear?**
  - a. Lead apron only
  - b. Thyroid shields only
  - c. Both of them.
11. **Reason for using radiation shielding or clothing is**
  - a. Concerns about contracting cancer
  - b. Training routine/habits
  - c. Concerns about having a baby with an anomaly
  - d. Concerns about infertility.
12. **Reason for not using radiation shielding or clothing is**
  - a. Leaving room during imaging
  - b. Protective cloths are not practical (hard/rigid/put on/hang on etc)
  - c. Non availability
  - d. Not protective effect against radiation
  - e. No time to put on the shield.
13. **Do you use dosimeter in your routine practice?**  
Yes No.