

Physicians' Knowledge about Radiation Dose in Radiological Investigation in Iran

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ABSTRACT

Background: Although ionizing radiation is very important in diagnostic and treatment of many diseases, the hazards of this radiation are considerable and irrefutable. One of the main stages in radiation protection is knowledge about radiation dose in radiological investigation. The aim of this study was to determine the physicians' knowledge in radiological examinations.

Material and Methods: The data collected by questionnaire were designed and the most commonly requested radiological investigations were listed. The questionnaire was distributed among 106 consultant physicians. The survey was conducted on the awareness about the radiation dose and risks among health professionals in Iran.

Results: The results indicated that the majority of physicians did not know about ionizing radiation and evaluation of absorbed dose in patients. Many of these physicians were not aware of radiations risks and the most important aspects of radiation protection; although, they have passed some courses in radiobiology and medical physics.

Conclusion: Since radiological examinations play an indispensable role in medicine, knowledge about radiation doses and hazards is very important. Generally, this study showed that knowledge of radiation doses is inadequate among physicians.

Keywords

Ionizing Radiation, Physicians' Knowledge, Radiation Protection

Introduction

The fact that ionizing radiation can cause biological damage has been known for years. The average dose received by the public is 2.5 mSv per year; 15 percent of which is related to medical exposures [1, 2]. Although radiological imaging in medical diagnosis in hospitals plays an important role and benefits millions of people, promotion of awareness about the dangers of ionizing radiation is important [3, 4]. The most important effects of radiation on the health are deterministic effects which occur in high doses and stochastic effects at low doses of radiation [5, 6]. Recently, concerns about the awareness of physicians about the radiation dose during diagnostic radiological procedures are increasing [1, 7]. Therefore, it is essential that doctors and radiographers pay special attention to the patient's dose in different imaging procedures. A study showed that awareness about the radiation dose among radiologists is insufficient and among non-radiol-

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ogists it is dramatically poor [4]. In general, various evaluations indicate low to moderate levels of knowledge of physicians in relation to radiation doses and health risks [8-12]. In this study, a survey about the radiation protection in hospitals in Iran was done to assess the knowledge of doctors (interns, MDs, assistant juniors, assistant seniors and medical specialists) about x-rays taken routinely in hospitals, and the physicians' knowledge about radiation dose received by patients during prescribed diagnostic radiography.

Material and Methods

106 MDs, interns, junior and senior assistants and medical specialists participated in this study; all of them were randomly selected (Figure 1). For this study, a questionnaire was designed to make a list of questions. In the questionnaire, knowledge about radiation protection and effective dose of radiation in patients was evaluated based on the number of routine diagnostic radiographies. A section of the questionnaire consisted of multiple-choice and in another part, the estimated radiation dose was compared to the dose of chest X-ray for 11 routine diagnostic radiographies.

Results

In this study, 106 out of 150 questionnaires sent out were returned. According to the results (Table 1), 25.5% of the physicians indicated that they had never asked patients about their previous radiographies and 22.6% of them responded they always did so. The purpose of the question about the previous X-ray investigations in 48% of respondents was reported clinical needs and only 7% for dangers of radiation. Despite the fact that the patients did not receive a specific dose, the majority of them (93%) declared a certain amount of dose received by patients in a year. They were not aware of the principle of ALARA due not to passing radiation protection courses. For evaluating the dose received by the patients, we used the effective dose and its measurement unit, Sievert (Sv). Only 37% of the respondents responded correctly. In response to the accidental effects of radiation, the majority of respondents (70.8%) expressed carcinogenic and genetic effects. About 80% of the doctors stated that insufficient education about the biological effects of radiation during medical education had led to the increase in the demands of radiography and CT-scans. 35.8%

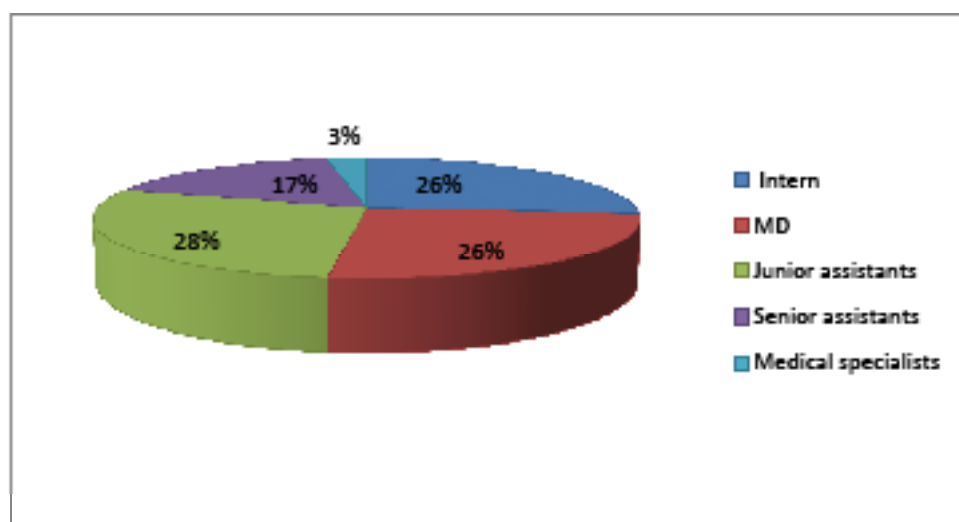


Figure 1: Number of Physician's Consulted in this Study (Percentage)

Table 1: Percentage of doctor's estimations about received effective dose by patients in commonly requested radiological examinations proportional to the effective dose delivered in a routine radiography of chest x-ray.

Radiological Examinations	Percentage of Physician's Estimation (%)			Missing Data
	Underestimate	Correct Estimate	Overestimate	
Hand	0	43.4	52.8	3.8
Abdomen(KUB)	87.3	5.7	0	3.8
Lumbosacral(LAT)	96.2	0	0	3.8
Barium Enema	94.4	.9	0	4.7
Chest CT	95.2	1	0	3.8
Brain CT	92.4	2.8	.9	3.8
Skull(PA)	9.4	80.2	6.6	3.8
Pelvic & Abdomen CT	87.7	2.8	2.8	3.8
Skull(LAT)	10.4	74.5	11.2	3.8
Brain MRI	0	60.4	35.8	3.8
Cardiac CT Angiography	94.3	1.9	1.9	3.8

of the doctors thought that MRI is exposed the patients to ionizing radiation. The results of this study also showed that only 36.4% of doctors were aware of radiation dose and dose assessment of patients despite medical physics and radiobiology courses. More participants in this study stated that retraining programs of radiation protection are necessary and the presence of a radiation safety officer (RSO) in hospitals and educational centers is essential.

Discussion

Radiological examinations play an important role in medical diagnostics and have significantly increased during the last twenty years. Reliance on radiological assessments that are used more than ever and awareness about the damages and risks are well known and controversial. According to the results of this study, a small number of doctors had enough knowledge about the risks of radiation to which the patients are exposed during diagnostic radiology procedures. Based on the results of this study, approximately one third of doctors did not realize the absence of radiation in MRI; this is in the same line with the results of different studies indicating physicians' insuffi-

cient knowledge in this regard [11, 13]. Based on the data, we can conclude that knowledge of physicians about routine radiology examination doses is very poor and inadequate. Also, inaccurate estimates of radiation dose of patients can expose them to additional exposure and increase the risks of radiation. Awareness about the dangers of radiation for doctors during radiology procedures should be constantly considered an important part of medical education. In general, it can be concluded that the knowledge of doctors was insufficient, and educational courses on radiation protection and radiobiology are necessary to be held. This way, patients would receive lower doses, and also the effective dose of the population is reduced. This has also been indicated in previous studies [11, 14, 15].

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Conflict of Interest

The authors have no potential conflict of in-

terest with regard to the content of this article.

References

1. Quinn AD, Taylor CG, Sabharwal T, Sikdar T. Radiation protection awareness in non-radiologists. *Br J Radiol.* 1997;**70**:102-6. doi.org/10.1259/bjr.70.829.9059306. PubMed PMID: 9059306.
2. Wootton R. The POPUMET regulations: careless radiology costs lives. *Br J Hosp Med.* 1991;**45**:133. PubMed PMID: 1953848.
3. Marx MV. The radiation dose in interventional radiology study: knowledge brings responsibility. *J Vasc Interv Radiol.* 2003;**14**:947-51. doi.org/10.1097/01.RVI.0000084840.28889.11. PubMed PMID: 12902552.
4. Lee RK, Chu WC, Graham CA, Rainer TH, Ahuja AT. Knowledge of radiation exposure in common radiological investigations: a comparison between radiologists and non-radiologists. *Emerg Med J.* 2012;**29**:306-8. doi.org/10.1136/emered-2011-200481. PubMed PMID: 21873321.
5. Radiation UNSCotEoA. Sources and effects of ionizing radiation. UNSCEAR 1994 Report to the General Assembly, with scientific annexes. 1994.
6. Frigerio N, Stowe R. Carcinogenic and genetic hazard from background radiation. Biological and environmental effects of low-level radiation. 1976.
7. Sani KG, Jafari M, Mohammadi M, Mojiri M, Rahimi A. Iranian physicians' knowledge about radiation dose, received by patients in diagnostic radiology. *Iranian Journal of Radiation Research.* 2009;**6**:207-12.
8. Heyer CM, Hansmann J, Peters SA, Lemburg SP. Paediatrician awareness of radiation dose and inherent risks in chest imaging studies--a questionnaire study. *Eur J Radiol.* 2010;**76**:288-93. doi.org/10.1016/j.ejrad.2009.06.014. PubMed PMID: 19581064.
9. Thomas KE, Parnell-Parmley JE, Haidar S, Moineddin R, Charkot E, BenDavid G, et al. Assessment of radiation dose awareness among pediatricians. *Pediatr Radiol.* 2006;**36**:823-32. doi.org/10.1007/s00247-006-0170-x. PubMed PMID: 16699764.
10. Arslanoglu A, Bilgin S, Kubal Z, Ceyhan MN, Ilhan MN, Maral I. Doctors' and intern doctors' knowledge about patients' ionizing radiation exposure doses during common radiological examinations. *Diagn Interv Radiol.* 2007;**13**:53-5. PubMed PMID: 17562506.
11. S Shiralkar S, Rennie A, Snow M, Galland RB, Lewis MH, Gower-Thomas K. Doctors' knowledge of radiation exposure: questionnaire study. *BMJ.* 2003;**327**:371-2. doi.org/10.1136/bmj.327.7411.371. PubMed PMID: 12919987. PubMed PMCID: 175104.
12. Lee CI, Haims AH, Monico EP, Brink JA, Forman HP. Diagnostic CT scans: assessment of patient, physician, and radiologist awareness of radiation dose and possible risks. *Radiology.* 2004;**231**:393-8. doi.org/10.1148/radiol.2312030767. PubMed PMID: 15031431.
13. McCusker MW, de Blacam C, Keogan M, McDermott R, Beddy P. Survey of medical students and junior house doctors on the effects of medical radiation: is medical education deficient? *Ir J Med Sci.* 2009;**178**:479-83. doi.org/10.1007/s11845-009-0341-5. PubMed PMID: 19820903.
14. Rahman N, Dhakam S, Shafqut A, Qadir S, Tipoo FA. Knowledge and practice of radiation safety among invasive cardiologists. *J Pak Med Assoc.* 2008;**58**:119-22. PubMed PMID: 18517114.
15. Tavakoli M, Seylanian TF, Saadat JS. Knowledge of medical students on hazards of ionizing radiation. 2003.