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Research Article

Medical Radiation Knowledge among Patients in Local Hospitals

Mustafa Alhasan, PhD[a*], Mostafa Abdelrahman, PhD[a], Haytham Alewaidat, PhD[a] and Yousef Khader, PhD[b]

[a] *Department of Allied Medical Sciences-Radiology, Faculty of Applied Medical Sciences, Jordan University of Science and Technology, Irbid, Jordan*
[b] *Department of Public Health-Community Medicine, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan*

ABSTRACT

Objective: Evaluation of patient knowledge regarding radiation and its associated risks can identify knowledge gaps, providing an opportunity to increase patient awareness and understanding of medical radiation. The aims of this study were to evaluate the awareness level of patients regarding medical radiation types used in medical diagnostic imaging and to correlate them with the availability of radiation information provided upon examination.

Methods: A qualified radiographer distributed a multiple choice questionnaire in four major Jordanian hospitals, including three governmental hospitals and one university hospital. The questionnaire included demographic and radiation awareness sections. The sample included 400 patients who were undergoing routine x-ray imaging, computed tomography, fluoroscopy, magnetic resonance imaging, ultrasound, or nuclear medicine.

Results: Less than 50% of the participants had received information on radiation awareness upon examination. The average scores of the radiation awareness questionnaire ranged from 56% to 70%. There was a significant correlation ($r = 1.00$, $P < .05$) between those who were provided radiation information upon examination and the radiation awareness questions score.

Conclusions: Most of the patients did not receive the radiation awareness information upon examination, which reflected the low level of general radiation knowledge in most hospitals. Patient education and awareness should be improved to reduce unnecessary exposure from medical imaging examinations.

Keywords: Radiation; dose; awareness

RESUMÈ

Objectif : L'évaluation des connaissances des patients en matière de radiation peut permettre de recenser les lacunes potentielles de façon à augmenter le niveau de sensibilisation et à augmenter la compréhension de la radiation médicale. Cette étude vise à évaluer le degré de sensibilisation des patients à l'égard des types de radiation médicale utilisés en imagerie diagnostique et à corréler ces connaissances avec l'information sur la radiation fournie au moment de l'examen.

Matériel et méthodologie : Un radiographe qualifié a distribué un questionnaire à choix multiples dans quatre grands hôpitaux de Jordanie, dont trois hôpitaux gouvernementaux et un hôpital universitaire. Le questionnaire comprenait des questions démographiques (sexe, expérience et emploi) et des questions sur la sensibilisation à la radiation médicale. L'échantillon comprenait 400 patients provenant de tous les hôpitaux. Un formulaire de consentement a été signé par tous les patients ayant répondu au questionnaire.

Résultats : Le pourcentage de patients ayant reçu une information de sensibilisation sur la radiation au moment de l'examen est inférieur à 50 % dans tous les hôpitaux. La note moyenne des questions sur la sensibilisation varie de 56 à 70 %. On observe une corrélation significative ($r = 1{,}00$, $p < 0{,}05$) entre l'information fournie au moment de l'examen et les notes aux questions sur la sensibilisation à la radiation.

Conclusion : La plupart des patients n'ont pas reçu d'information de sensibilisation sur la radiation au moment de l'examen, ce qui peut refléter le faible niveau général de connaissances sur la radiation dans la plupart des hôpitaux. le niveau de sensibilisation pourrait être rehaussé si une plus grande attention était portée à l'information sur la radiation fournie par le personnel de radiologie.

Introduction

Medical imaging is considered a useful, noninvasive technique for diagnosis purposes. However, medical radiation that includes ionizing radiation, such as the x-rays used in computed tomography (CT) and fluoroscopy, can cause cancer [1–5]. In contrast, other imaging modalities, like magnetic resonance imaging (MRI) and ultrasound (US), are considered much safer because they use nonionizing radiation techniques. The number of CT examinations has continued to increase because a CT scan can be performed faster than MRI and provides more organ details than US. It was

* Corresponding author: Mustafa Alhasan, PhD, Department of Allied Medical Sciences-Radiology, Faculty of Applied Medical Sciences, Jordan University of Science and Technology, PO Box 3030, Irbid 22110, Jordan.
E-mail address: mkalhasan@just.edu.jo (M. Alhasan).

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estimated that about 2% of cancer cases in the United States may result from the frequent use of CT [6]. In addition, a study from 2002 estimated that CT scans are responsible for about 75% of the radiation dose to the population [7]. It was suggested that a CT scan of the abdomen or head for a young child can cause a fatal cancer risk of approximately 1 in 1,000 [8]. Biological effects of high radiation dose (100 mSv) can lead to cancer, whereas radiation effects of routine examinations with low doses ranging from 3 to 30 mSv are not well understood [9].

There are many studies that have evaluated the awareness and knowledge of expected radiation doses and associated risks among physicians, radiologists, and patients from different backgrounds and educational levels. Most of the reported results indicated a significant underestimation of radiation dose and its risks among patients [10–17]. The knowledge and awareness of the radiation doses and risks can help in making decisions regarding the frequency of scans [18]. According to the recommendations of the international commission on radiologic protection, medical x-ray exposures for specific groups, including children, must be justified because they can elevate the lifetime cancer risk [17].

The US Food and Drug Administration aims to maximize the benefits of medical imaging use and to reduce its associated radiation risks. Accordingly, the initiative to reduce unnecessary radiation exposure from medical imaging was launched in 2010. The goals were to ensure that the patient receives the necessary imaging examination with the minimum radiation dose. One approach to achieve these goals was to involve patients in the process of decision making through raising their awareness about the benefits and risks associated with exposure to medical radiation. Educating patients can improve patient compliance during examinations and help avoid image repeats. Therefore, a medical imaging record card was recommended to enable patients to track their medical imaging examination history.

Inadequate patient knowledge can introduce challenges to the efforts of reducing unnecessary radiation exposure [19]. There is a dearth of literature investigating the radiation knowledge level among patients [6]. Accordingly, the aim of this study was to investigate the awareness level of general radiation knowledge among patients in major Jordanian hospitals.

Materials and Methods

Subjects and Study Design

This study was approved by the Institutional Review Board at Jordan University of Science and Technology, Irbid, Jordan. The survey included two parts: a consent form explaining the aims of the research and indicating acceptance of participation and a multiple choice questionnaire distributed by a qualified radiographer with 2 years' experience. The questionnaire was available in both Arabic and English languages. The survey was performed in four major Jordanian hospitals, including three governmental hospitals (GH1, GH2, and GH3) and one university hospital (UH). The inclusion criteria were patients aged 18 years or older referred by doctors for a radiologic examination including routine x-ray imaging, CT, fluoroscopy, MRI, US, or nuclear medicine. Patients who were unable to provide consent or who needed urgent examination were excluded. Incomplete questionnaires were also excluded. The sample included 400 patients (100 from each hospital).

The questionnaire included a demographic information section (to identify sex, job type, and years of work experience) and a question about receiving radiation information upon examination from the radiology personnel. It also included a seven-question radiation awareness section about imaging modalities used in the radiology department (Table 1). Job type and work experience were included in the demographic section because this may affect the understanding level of medical radiation risks. Medically employed participants with many years of work experience were expected to score higher than those in a nonmedical profession. The question about receiving information upon examination was another important variable that influenced the level of patient knowledge. Patients who received this information were expected to have a better understanding of medical imaging examination risks and benefits. The seven-question radiation awareness section tested knowledge of ionizing and nonionizing radiation and radiation-induced cancer, which represents the basic aspects underlining radiation safety awareness. These seven questions were designed based on the authors' experience.

Statistical Analysis

One-way analysis of variance was used to test the numerical variables such as age, and the chi-square test was used to

Table 1
Questionnaire Sections

1. Do you know that there are two types of radiation (ionizing and nonionizing)?
a. Yes
b. No
2. Do you think that MRI uses ionizing radiation?
a. Yes
b. No
3. Do you think that CT uses ionizing radiation?
a. Yes
b. No
4. Do you think that US uses ionizing radiation?
a. Yes
b. No
5. Do you think that fluoroscopy uses ionizing radiation?
a. Yes
b. No
6. Do you think that the radiation hazards come only from medical radiation?
a. Yes
b. No
7. Do you think that radiation can induce cancer?
a. Yes
b. No

CT, computed tomography; MRI, magnetic resonance imaging; US, ultrasound.