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Full Length Research Paper

Radiation awareness among sixth-year medical students and interns at University of Tabuk, Saudi Arabia

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ABSTRACT

Objectives: This study aimed to explore the awareness and knowledge of future and newly graduated physicians in Tabuk City regarding radiation and its hazardous impact on human health. Methods: A cross-sectional comparative study was conducted among one hundred thirty-seven medical students and medical interns randomly selected at one medical school in Tabuk City, Saudi Arabia during the period from January 2016 to March 2016. A well structured questionnaire was used based on awareness and general knowledge of radiation exposures associated with diagnostic imaging studies, The Ethical Committee of the Faculty of Medicine, University of Tabuk approved the research, and the Statistical Package for social sciences (SPSS) was used for data analysis. Results: The majority of medical students and interns in Tabuk City had poor radiation knowledge (radiation knowledge score = 36.65 and 31.78 % respectively). Socioeconomic factors including gender, age and position were not associated with radiation knowledge of students. Students in the 6th academic years had higher general information about chest x-ray, conventional fluoroscopy and angiography compared to interns. Less than 30% of medical students and interns knew the correct answer when they asked some information about MRI, US, CT and chest x-ray of the abdomen. Conclusion: Most of the medical student's Interns have weak ionizing radiation and radiation protection knowledge. The inclusion of one radiation protection instruction course into the undergraduate medical curriculum may not be adequate to obtain optimal radiation knowledge.

Keywords: Radiation knowledge, Medical Students, Interns, Saudi Arabia.

INTRODUCTION

There is a dramatic revolution in the field of ionizing irradiation and radiology with an increasing use of modalities like Computed Tomography (CT) as diagnostic tools in clinical Medicine. The CT scans are to blame in 50% of the total radiation burden in the medical field (Mettler Jr et al., 2009; Miglioretti et al., 2013). There are

increasing awareness about the radiation effects on the patients especially the young in terms of cancer risk and death, particularly with the use of Computed Tomography. Depending on the radiation dose various radiological examinations have been linked to the DNA damage (Faggioni et al., 2017).

A proper knowledge about the radiation dose and protective measures from ionizing irradiation is of paramount importance to the guideline adherence (Shaw et al., 2015). And patients health.

The knowledgeable and well-trained medical students and junior house staff could play a significant role in the creation of a positive radiation safety culture. To our best of knowledge few researchers have studied the radiation knowledge among medical students and interns in Tabuk City, Saudi Arabia, so we conducted this research to assess the radiation awareness among sixth-year medical students and interns at the University of Tabuk.

MATERIAL AND METHODS

A cross-sectional descriptive study was conducted among 137 medical students (N=69) and Interns (N=68), randomly selected from the Medical College, University of Tabuk during the period from January to March 2016. The participants were invited to sign a written inform consent form then responded to a structured self-administrated English version questionnaire. The questionnaire was developed after extensive literature review, then modified and based on the authors knowledge and observations. The following information were collected: Demographic data and radiation dose in (MRI, CT, and Ultrasound), the organ sensitivity to radiation (eight questions), the association of various radiological procedures with ionizing irradiation, medical physics, and radiation protection. The total score for each participant was calculated out of 100%, then a comparison between the medical students and Interns was made. The Ethical Committee of the Medical College, University of Tabuk approved the research.

Statistical analysis

Data were processed using the SPSS software version 19.0 (2009; Chicago, IL, USA). The Independent samples t-test was used to compare two variables. Chi-square tests of independence were used to analyze individual questions. A P-value of < 0.05 was considered the cut-off level for statistical significance.

RESULTS

This study included 137 medical students. Socio-demographic characteristics of participants are presented in Table (1). Seventy-three were female (50.3 %), and sixty-four were male (53.3%). More than two-thirds of them were less 24 years of age (80.3%). Participants were in sixth years (50.4 %), and 49.6 % were interns.

Table 1. Characteristics of the study sample (n= 137).

Variable†	N (%)
Gender	
Male	64 (46.7)
Female	73 (53.3)
Age (years)	
21-24	110 (80.3)
>24	27 (19.7)
Position	
6th medical student	69 (50.4)
Intern	68 (49.6)

†Numbers expressed as frequencies (%).

Table 2 shows the background of the study sample. More than half of the survey sample had inadequate (Average/poor/none) knowledge of radiology and medical physics (65.0% and 64.2% respectively). The majority of the sample (97.1%) had been exposed to lectures or teaching in diagnostic radiology. On the other hand, about half of the sample, 53.3% considered that they had never been exposed to lectures or teaching focused on radiation protection.

Table 2. Background of the study sample (n= 137).

Background of medical students	n (%)
Self-rated knowledge of radiology	
Excellent/good	48(35.0)
Average/poor/none	89(65.0)
Self-rated knowledge of medical physics	
Excellent/good	49(35.8)
Average/poor/none	88(64.2)
Education in radiation protection	
Yes	64(46.7)
No	73(53.3)
Teaching in diagnostic radiology	
Yes	133(97.1)
No	4(2.9)

Radiation knowledge score of students according to their socio-demographic characteristics

Table 3 presents the differences between test scores of study sample with different socio-demographic characteristics. No relationship was found between test scores and gender, age or position. Participants within the ages between 21 and 24 had no significant higher scores compared with participants within the ages greater than 24 years old (p=0.129). Regarding the position of the study sample, the medical students in the sixth year had higher score compared with interns.

Table 3. Radiation knowledge scores of study sample according to their socio-demographic characteristics (n=137).

Variable	Mean score (mean±SD¶)	Mean scores (%)	p-value
Gender			0. 285
Male	5.87±2.75	32.63	
Female	5.72±2.80	35.75	
Age(years)			0.129
21-24	6.34±3.01	35.24	
>24	5.41±2.00	30.4	
Position			0.075
6th medical student	6.60±2.60	36.65	
Intern	5.72±2.79	31.78	

¶ SD; standard deviation.

Table 4. Percentage of study sample associating ionizing radiation with various modalities (n=137).

Imaging study	6th medical student	Interns	p-value
MRI	18(26.1)	16(23.5)	0.729
Chest x-ray	50(72.5)	38(55.9)	0.043
CT	33(47.8)	35(51.5)	0.670
Conventional fluoroscopy	41(59.4)	28(41.2)	0.033
Mammography	28(40.6)	23(33.8)	0.413
Angiography	29(42.0)	16(23.5)	0.021

Table 5. The distribution of correct answer of selected questions (n=137).

Test Question	%Correct	p-value
In a chest x-ray, the radiation dose is the same as natural background radiation received in		
6th medical student	13.0	0.333
interns	19.1	
In ultrasound of the abdomen, the radiation dose is approximately the same as how many chest x-rays?		
6th medical student	26.1	0.581
interns	22.1	
In CT of the abdomen, the radiation dose is approximately the same as how many chest x-rays?		
6th medical student	27.5	0.244
interns	19.1	
In MRI of the abdomen, the radiation dose is approximately the same as how many chest x-rays?		
6th medical student	8.7	0.750
interns	10.3	
Which of the following involves the highest radiation exposure for the patient?		
6th medical student	10.1	0.296
interns	16.2	
which one of the following is most sensitive to radiation:		
6th medical student	49.3	0.795
interns	47.1	
which organ is least sensitive to radiation		
6th medical student	30.4	0.125
interns	19.1	
Which of the following modalities is responsible for most of this radiation dose?		
6th medical student	21.7	0.190
interns	13.2	

Modalities using ionizing radiation

Participants had a reasonable understanding of issues surrounding radiation dose associated with MRI, mammography and angiography. About half of medical students in the sixth years and interns knew that chest x-ray, CT, and conventional fluoroscopy involved the use of x-rays (Table 4). Moreover, medical students in the sixth years had significantly (< 0.05) higher general information about chest x-ray, conventional fluoroscopy and

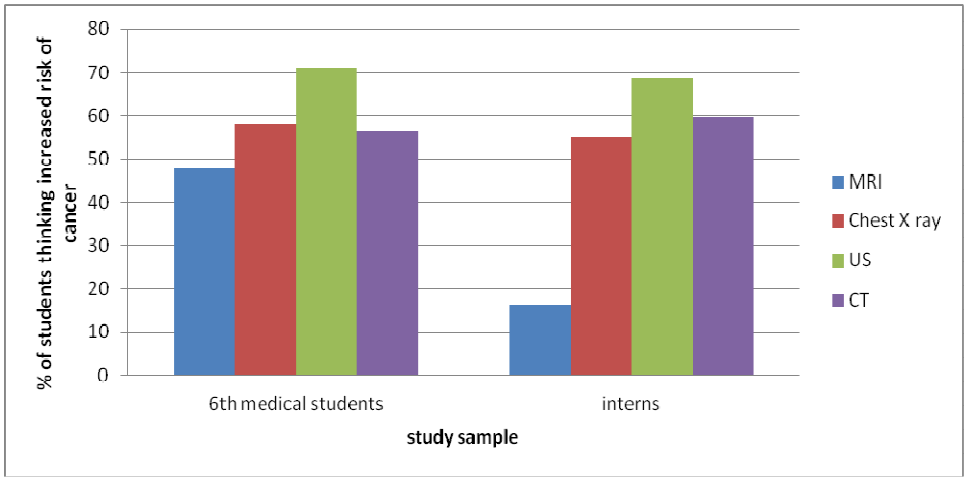

Figure 1. Student knowledge of the association between certain imaging modalities and an increased cancer risk.

angiography compared to interns (Table 4).

Radiation Knowledge

Table 5 shows the percentage of study sample that replies the correct answers according to their position. There were no significant different between the response of medical students and interns ($p > 0.05$). About half of medical students and interns in study sample knew that children are most sensitive to radiation. One third of medical students in the study sample knew that kidney is an organ that is least sensitive to radiation, while only 19.1% of interns knew that (Table 5).

When participants were asked, "In MRI of the abdomen, the radiation dose is approximately the same as how many chest x-rays?" Only 8.7% of medical students and 10.3% of interns knew that abdominal MRI was equivalent to 0 chest radiographs. A majority of study sample didn't know that plain film of the abdomen is the highest radiation exposure for the patient (>80.0 %). Less than one-quarter of study sample knew that CT is responsible for most of this radiation dose received by the population.

Figure 1 represents the percentage of study sample thinking that MRI, Chest X-ray, US, and CT increased the risk of cancer. Regarding MRI, 47.8% of medical students in the sixth year thougth that MRI increased the lifetime risk of cancer compared with only 16.4% of interns ($p<0.001$). Only one-third of medical students in the sixth year or interns correctly answered that ultrasound did not increase the risk of cancer. On the other hand, more than half of medical students in the sixth year or interns correctly replied that Chest X-ray and CT did not increase the risk of cancer.

DISCUSSION

The International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP) established guidelines for the safe application of all types of radiological procedures and personnel safety. Several types of research proved that the knowledge of medical students on ionizing radiation and radiation protection is extremely poor.

This study demonstrated that medical students have a shortage of knowledge about ionizing radiation, medical physics, and radiation safety. It shows that more than half of the survey sample had inadequate knowledge of radiology and medical physics. It means that these deficiencies in knowledge should be taken into consideration when designing undergraduate curriculum. Findings of our study agree with that of (O'Sullivan et al., 2010; Hagi and Khafaji, 2011), that showed a deficience in knowledge regarding ionizing radiation, diagnostic imaging, and radiation safety. Our results also revealed that (97.1%) of the sample had been exposed to lectures or teaching in diagnostic radiology, While, about half of our sample 53.3% considered that they had never been exposed to lectures or teaching focused on radiation protection that is similarly to (O'Sullivan et al., 2010) some showed that 82% received diagnostic radiology teaching while 87% had not received radiation protection instruction. This may be partially explained by the lack of dedicated radiation protection module in the CICR syllabus. On the other hand, results of our study revealed that medical student in the sixth year had higher score compared with interns, this may be due to their previous undergraduate studies, age and life experience, although this difference was not statistically significant. Also, we could note from this that students' knowledge regarding

radiation protection improve year after year with those in our study population in the sixth year whose performance where significantly better than others this reflected the contribution of the intensive clinical radiology teaching delivered to final-year medical students by clinical radiologists in preparation for their final exams.

Differences in knowledge level among genders found that female students had slightly lower knowledge about ionizing radiation demonstrated in their overall score of 32%, while male students scored 35%. However, these differences were not statistically significant. Similarly, Arslanoglu et al. (2007) found that female students score was 42%, while male students scored 57% with regards to ionizing radiation. (Else and colleague, 2011) Confirmed this, they found slight differences in the score between male and females, were female score was 43%, male score was 51%.

Regarding the students' knowledge, our results showed that participants had a moderate understanding of issues surrounding radiation dose associated with MRI, mammography, and angiography. While, about half of medical students in the sixth years and interns knew that chest x-ray, CT and conventional fluoroscopy involved the use of x-rays. These results were revealed with those of (Hagi and Khafaji, 2011), their results showed that about40% of the students thought that objects in the room would still emit radiation after completion of exposure. As the dose from CT procedures was under-estimated by 30% of the students. In addition, only 47% of the students knew that MRI does not involve ionizing radiation. Additionally, O'Sullivan et al. (2010) doubted the same, whereas approximately 40% of their student population believed that objects in the x-ray room emit radiation after an x-ray procedure, and 18% of the students thought that MRI involves ionizing radiation. Also, 60% of them were not sure of the radiosensitivity of the human body organ about radiation. Zhou et al. (2010) reported that 25.5% of the sixth year students incorrectly believed that ultrasound and MRI emit ionizing radiation.

Regardless of medical students in the sixth year had significantly (< 0.05) higher general information about chest x-ray, conventional fluoroscopy and angiography compared to interns, this may explain according to their experience and the clinical radiology teaching at the final year. According to students who reply the correct answers in related to their position, results showed that about half of medical students and interns in study sample knew that children are most sensitive to radiation. While, one third of medical students in the study sample knew that kidney is the organ that is least sensitive to radiation, while only 19.1% of interns knew that. In the study of (O'Sullivan et al., 2010) over 80% of the studied group compared correct answer that children are more sensitive to the effects of ionizing radiation than adolescents, adults or the elderly, and 51% of the study group answer correctly that the kidney is less sensitive to radiation than the thyroid, breast or gonads. Also, only 8.7% of medical students and 10.3% of interns knew that abdominal MRI was equivalent to 0 chest radiographs. Additionally, the majority of our study sample (>80.0 %) didn't know that plain film of the abdomen is the highest radiation exposure for the patient. Our results was similar to that of Lee et al. (2004) who found that only 13% of radiologists identified this. This is in contrast to Ramanathan and Ryan (2015) who's found a better knowledge of radiation exposure from CT abdomen among all the groups indicated. 72% of the participants correctly identify that chest X-ray is the equivalent of CT abdomen. While less than one-quarter of study sample knew that CT is responsible for most of this radiation dose received by the population. That's similarly to (O'Sullivan et al., 2010) results that found only two-thirds of the studied population know that CT use ionizing radiation.

In contrast, Figure 1 results shows that 47.8% of medical students in the sixth year thought that MRI increased the lifetime risk of cancer compared with only 16.4% of interns ($p<0.001$). Also, only one-third of medical students in the sixth year or interns correctly answered that ultrasound did not increase the risk of cancer. On the other hand, more than half of medical students in the sixth year or interns correctly replied that Chest X-ray and CT did not increase the risk of cancer. Similar results were found by O'Sullivan et al. (2010), whom reported that 23% of the studied population thinking that MRI increased lifetime risk of cancer compared with 31.8% of controls while 70% of the survey population was aware that CT potentially increased the lifetime cancer risk compared with only 34% of controls. In general, their results proved that Students who had received teaching/instruction in diagnostic radiology were less likely to associate ultrasound and MRI with an increased cancer risk compared with those who had not received an education. A fact that proves our hypothesis that student should receive teaching courses to increase their knowledge about ionizing radiation.

CONCLUSION

we demonstrated that medical students worldwide have a shortage of knowledge about ionizing radiation, radiation safety and protection, a fact that can also be seen in our research results. With relation to this, we can say that this gap in knowledge should be taken into consideration when designing undergraduate curriculum. The overall results revealed that the unexpected findings regarding student knowledge of many of the core principles of radiation protection were interpreted as being due to a lack of formal focused teaching/instruction in radiation protection. Consequently, our results recommended that radiological protection should be taught as a priority to

improve students' knowledge and additional lecture in radiation protection and ionizing radiation must be provided for students to enhance their medical knowledge.

REFERENCES

Arslanoglu A, Bilgin S, Kubal Z, Ceyhan MN, Ilhan MN, Maral I (2007). Doctors' and intern doctors' knowledge about patients' ionizing radiation exposure doses during common radiological examinations. DiagnInterv Radiol, 13: 53-55.

Faggioni L, Paolicchi F, Bastiani L, Guido D, Caramella D (2017). Awareness of radiation protection and dose levels of imaging procedures among medical students, radiography students, and radiology residents at an academic hospital: Results of a comprehensive survey. Eur. J. Radiol. 86:135-142. doi: 10.1016/j.ejrad.2016.10.033.

Hagi SK, Khafaji M A (2011). Medical students' knowledge of ionizing radiation and radiation protection. Saudi Medical Journal; Vol. 32 (5):520-524.

Lee CI, Haims AH, Monico EP, Brink JA, Forman HP (2004). Diagnostic CT scans assessment of patient, physician, and radiologist awareness of radiation dose and possible risks. Radiology, 231(2):393–39

Mettler Jr FA, Bhargavan M, Faulkner K (2009). Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources-1950-2007, Radiology. 253:520–531

Miglioretti DL, Johnson E, Williams A (2013). The use of computed tomography in pediatrics and the associated radiation exposure and estimated cancer risk, JAMA. 167: 700–707

Ramanathan S, Ryan J (2015). Radiation awareness among radiology residents, technologists, fellows, and staff: where do we stand?. Insights Imaging, 6:133–139.

Shaw PV, Croüail P, Paynter R, Coeck M (2015). Education and training in radiation protection: improving ALARA culture, J. Radiol. Prot. 35: 223–227.

Zhou GZ, Wong DD, Nguyen LK, Mendelson RM (2010). Student and intern awareness of ionising radiation exposure from common diagnostic imaging procedures. J Med Imaging Radiat Oncol. 54(1):17-23. doi: 10.1111/j.1754-9485.2010.02132.x.