

ORIGINAL ARTICLE

Awareness and knowledge of interventional radiology among clinical years medical students of Umm Al-Qura University

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ABSTRACT

Background: Although the last few years showed growth in the role of interventional radiology (IR) in treating various conditions, the specialty faces several difficulties including a shortage of interventional radiologists and inadequate awareness among undergraduate students because of the limited exposure during medical school. Therefore, this study aims to evaluate the level of knowledge and awareness of IR among clinical years medical students of Umm Al-Qura University.

Methods: This was a cross-sectional, survey-based study at Umm Al-Qura University, Makkah, Saudi Arabia, which included 358 medical students.

Results: Most of the participants rated their knowledge of IR as either adequate or poor (39.1% each), and 7.3% reported that they knew nothing about IR, while 3.4% responded that they had excellent knowledge of IR. Many of the respondents (58.7%) were not interested in considering a career in IR. Only a few students (10.3%) received elective radiology training. In addition, 55% thought the correct route for training interventional radiologists was from both surgical and radiological fields, while 36% thought they were only radiologically trained.

Conclusion: This study demonstrated that medical students' knowledge and awareness of IR are poor. This can be improved by rotations, electives, and attendance at IR conferences, which will increase undergraduate awareness and promote IR as a career.

Keywords: Future career, interventional radiology, knowledge, medical specialists.

Background

Interventional radiology (IR) is a subspecialty of diagnostic radiology that uses image guidance to perform procedures, such as embolization, angioplasty, stent insertion, drainage, and ablation, which can be utilized to treat and diagnose various illnesses [1,2]. The role of IR in dealing with various conditions has expanded in the last few years to include a variety of organ systems [3,4]. However, the specialty faces several challenges, including increased demand and complexity, a lack of interventional radiologists, and inadequate awareness among undergraduate students due to limited exposure during medical school [5-8]. A previous study in Spain showed that a survey of 313 participants from the second and fourth years of medical school revealed that medical students had poor knowledge of IR [9]. In addition, another published study on 103 medical students in

Canada revealed that 53% of medical students had poor knowledge, and only 18% of them would consider IR as a profession, and the main reasons that they did not consider IR as a profession were lack of knowledge or lack of interest [10]. Moreover, a study conducted at two American medical schools showed that only 15% of the participants felt that they would consider IR as a career

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[11]. Concerning medical students in the Western region of Saudi Arabia, we found one study that evaluates the level of medical students' awareness and knowledge of IR, which showed that IR awareness and knowledge are poor among medical students [12]. Therefore, more investigation on this issue is necessary in the western region of Saudi Arabia. To address this issue, our study aims to assess the knowledge and awareness of clinical years medical students at Umm Al-Qura University of IR.

Material and Methods

Study design and participants

This cross-sectional study included medical students of Umm Al-Qura University. We enrolled fourth and sixth-year medical students and excluded preclinical years, interns, and medical students from other universities.

Ethical considerations and sample size

A self-administered questionnaire was distributed between September 2022 and November 2022, via social media using Google Forms to collect the data after ethical approval was obtained from the Biomedical Ethics Committee at the College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia (Approval number: HAPO-02-K-012-2022-09-1172).

The sample size was calculated using the OpenEpi (version 3.01) website, considering keeping the confidence interval at 95% and a 50% prevalence of the sample size [13]. The minimal calculated sample size was 259. However, we included more than 300 to improve the result's generalizability and accuracy.

Study tool

The questionnaire was based on a validated anonymous assessment tool employed in a previous study [7]. The electronic survey included two sections. The first section collected socio-demographic characteristics (age, gender, nationality, university, and college). The second section consisted of 11 questions about the knowledge of IR procedures, training routes, and clinical duties. Furthermore, we asked the students about their knowledge of radiology in general and their interest in it as a future career.

Statistical analysis

After data were extracted, they were revised, coded, and fed into the statistical software Statistical Package for the Social Sciences (SPSS) version 22 (IBM SPSS Statistics, Armonk, NY). Statistical analysis was conducted using two-tailed tests. A *p*-value of less than 0.05 was considered statistically significant.

Results

Overall, 358 medical students at Umm Al-Qura University were included in the current study; 31% were in their

fourth year, 33.2% were in their fifth year, and 35.8% were in their sixth year. Participants were nearly equally distributed by gender, with male predominance (51.4%). Most of the students (89.6%) did not receive elective radiology training, and only 10.3% did. Additional demographic data are demonstrated in Table 1.

Regarding educational methods in IR, the greater part favored departmental attachments (37%) or lectures provided by interventional radiologists (33%). With 9% each, research, outpatient clinics, and ward rounds are the least effective teaching methods. Table 2 presents the pattern of student preference.

Compared with other specialties, most participants (45.8%) rated their knowledge of radiology as adequate compared to IR, for which most of the students believed their knowledge of IR was either adequate or poor (39.1% each). A small percentage believed they had no knowledge of IR and radiology (7.3% and 4.5%, respectively). Only 5.6% of the students thought their knowledge of radiology was excellent, while 3.4% thought they had excellent knowledge of IR (Table 3). Most students rated the prospects for this specialty as good (35.8%), excellent (24.9%), or adequate (24.3%), and only a slight minority of respondents did not know or felt the prospects were poor (7.5% for each; Table 3).

Although most of the students believed the prospects for this career were promising, a sizable percentage of respondents (58.7%) were not willing to even consider a career in IR (Figure 1).

The students' knowledge of procedures performed by interventional radiologists is demonstrated in Table 4. Students correctly recognized an interventional radiologist inserting Hickman lines, doing uterine fibroid embolization (UFE), and performing lower limb angioplasty (60.9%, 61.2%, and 70.7%, respectively). The percentage of students who thought that interventional radiologists performed cardiac angioplasty, performed

Table 1. Characteristics of the participants.

Factors	Mean	SD
Age	22.24	1.11
	Number	%
Gender		
Male	184	51.4
Female	174	48.6
Academic year		
Fourth year	111	31.0
Fifth year	119	33.2
Sixth year	128	35.8
GPA		
4-3.5	223	62.3
3.49-2.75	125	34.9
2.74-1.75	9	2.5
<1.75	1	0.3

Table 2. Student ratings of the various teaching methods in IR, ranging from 1 (best) to 8 (worst).

Method	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)
Ward rounds	28	16	15	15	9	5	4	9
Radiology department attachments	37	19	17	10	9	1	3	5
Lectures from interventional radiologists	34	17	22	11	8	2	3	5
Multidisciplinary meetings	19	19	21	16	10	5	5	7
Outpatient clinics	18	21	19	12	11	5	5	9
Self-directed learning websites	21	20	20	15	10	6	3	5
Study modules	21	21	21	13	8	6	3	6
Clinical research projects	21	22	19	14	7	4	4	9

Table 3. Students' ratings of their radiology and IR knowledge, as well as their ratings of their career prospects in IR.

	Radiology in general		IR		Career prospects in IR	
	N	%	N	%	N	%
Excellent	20	5.6	12	3.4	89	24.9
Good	52	14.5	40	11.2	128	35.8
Adequate	164	45.8	140	39.1	87	24.3
Poor	106	29.6	140	39.1	27	7.5
No knowledge	16	4.5	26	7.3	27	7.5

arterial bypasses, and created AV fistulas was 75.4%, 57.5%, and 47.2%, respectively.

Regarding training, the majority of the students (55%) believed that interventional radiologists are trained in both surgical and radiological fields. Some of the students (36%) thought that interventional radiologists were radiologically trained, while a small group (2.2%) thought that they were surgically trained. Figure 2 shows the students' knowledge of interventional radiologists' training.

Figure 3 demonstrates the students' familiarity with procedures performed by an interventional radiologist. Image-guided biopsy was the most familiar procedure to medical students (52.8%) performed by an interventional radiologist, followed by endovascular repair of aortic aneurysms (49.2%), radiofrequency ablation (36.6%), and percutaneous nephrostomy (33%). Students' familiarity with percutaneous vertebroplasty was the lowest at 27.4%.

More than half of the students (63.4%) were familiar with angioplasty, and most of them (49.3%) primarily learned about angioplasty from a cardiologist, followed by an interventional radiologist (22.7%) and a vascular surgeon (18.2%). Other resources, such as books, lectures, and social media, were used by less than 10% of the students. Figure 4 illustrates the students' familiarity with "angioplasty" and their exposure sources.

Concerning the components of IR practice, 70.4% of students believed that interventional radiologists treat major and minor illnesses, respectively. Meanwhile, 43% believed that interventional radiologists do ward rounds, 43.9% believed that interventional radiologists have admitting rights, and 40.5% believed that interventional radiologists run outpatient clinics. Only 26% of respondents believed that interventional radiologists do not treat patients at all (Figure 5).

Discussion

IR is a nascent and rapidly growing specialty with many clinical applications, such as cardiology, oncology, urology, trauma, and medicine [14]. IR procedures have better results and are less invasive, with fewer complications than traditional surgeries. The number of IR procedures has increased by 3.5% annually, and potential annual savings of \$108.3 million could be achieved by replacing eight surgical procedures with IR procedures [15].

Despite its rapid growth, the field of IR still faces several difficulties, including a lack of qualified professionals and a lack of undergraduate medical students' knowledge [5,16]. Many international and local studies have been conducted to assess the knowledge level of medical students of IR, and all the studies agreed that there is a lack of knowledge of this specialty [1,7,17,18].

The literature shows a lack of studies on medical students' knowledge of IR in the western region of Saudi Arabia. Although it is believed that medical students have a significant role in the prosperity of IR, to the best of our knowledge, there are no such studies conducted locally among Umm Al-Qura University medical students. Hence, we conducted this study to evaluate Umm Al-Qura University's medical students' IR knowledge and awareness levels.

Among 358 surveyed students, our study demonstrated insufficient knowledge and awareness of IR. These results concurred with many international and local studies, which could be explained by medical

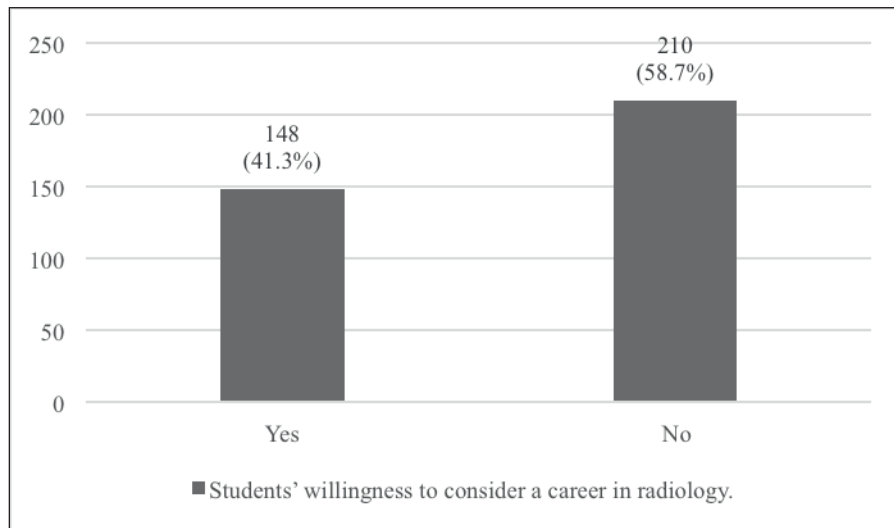


Figure 1. Students' willingness to consider a career in IR.

Table 4. Students' knowledge of procedures performed by interventional radiologists.

Procedure		N	%
Cardiac angioplasty or stenting	Yes	270	75.4
	No	88	24.6
Femoral-popliteal arterial bypass	Yes	206	57.5
	No	152	42.5
Venous access procedures (e.g., Hickman line)	Yes	218	60.9
	No	140	39.1
Arteriovenous fistulas for dialysis	Yes	169	47.2
	No	189	52.8
Uterine artery embolization for fibroids	Yes	219	61.2
	No	139	38.8
Lower limb angioplasty and stenting	Yes	253	70.7
	No	105	29.3

students' limited exposure to IR during medical school [1,7,17,18].

Upon asking the students to identify their preferred methods of gaining knowledge of IR, we found that radiology department attachments and lectures provided by interventional radiologists were the most cited methods (37% and 33%, respectively). These findings agree with the Alshumrani [1] and Abohmed et al. [18] studies, as their students choose lectures from interventional radiologists as the preferred means of gaining IR knowledge (67% and 23%, respectively).

Furthermore, 46.4% of the students reported poor or no knowledge of IR. These results agreed with Abohmed et al.'s [18] study, with a much higher percentage of knowledge deficit (83%). In addition, multiple international studies concurred with these findings [9,19]. This was an expected result given that this subspecialty is

not covered in medical college, which is concerning for such a newly emerging subspecialty [17].

Even though most of our sample students believed the prospects for this career were promising, less than half were willing to consider IR as a career option (41.3%). This finding is consistent with several local studies [1,17,18]. For instance, an American study conducted by Commander et al. [11] compared two medical colleges, one of which offered radiology training to the other, which did not. The percentage of medical students interested in IR as a career was 54% in the former medical school and 38% in the latter, which demonstrates that the earlier medical students are introduced to IR, the more probable they are to choose IR as a career.

Nonetheless, 75.4% and 70.7% of our surveyed students thought that cardiac and lower limb angioplasty or stenting were performed by interventional radiologists, respectively. Moreover, most respondents failed to identify arteriovenous fistula for dialysis (52.8%), along with other procedures performed by interventional radiologists. The lack of information on the clinical side of radiology, including IR practice, may discourage medical graduates from considering a career in this field [20].

Furthermore, a huge misunderstanding among medical students was observed regarding the training route of interventional radiologists. More than half (55%) of the respondents believed that one must complete training in both radiology and surgery, similar to a study conducted in Hail and Abha regions [1,17]. In contrast, the training path was correctly determined by only 36%, unlike Abohmed et al.'s [18] study, in which half of the participants knew the correct path. Most medical schools assign IR lectures to surgeons, which may cause this false assumption that one cannot be an interventional radiologist through radiology training alone [18].

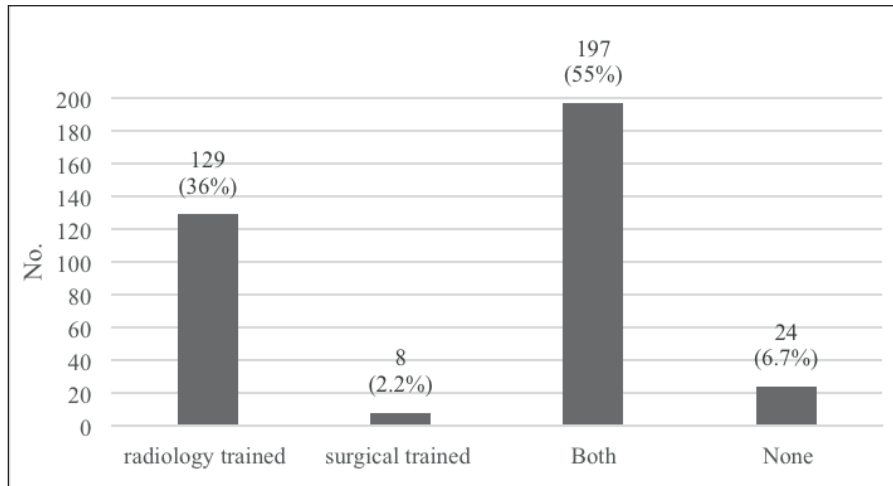


Figure 2. Students' knowledge of interventional radiologists' training.

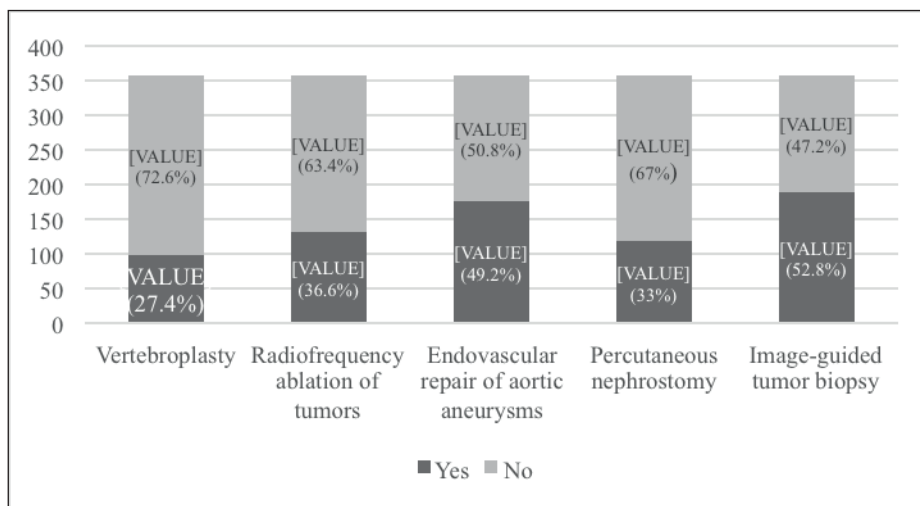


Figure 3. Students' familiarity with procedures performed by interventional radiologists.

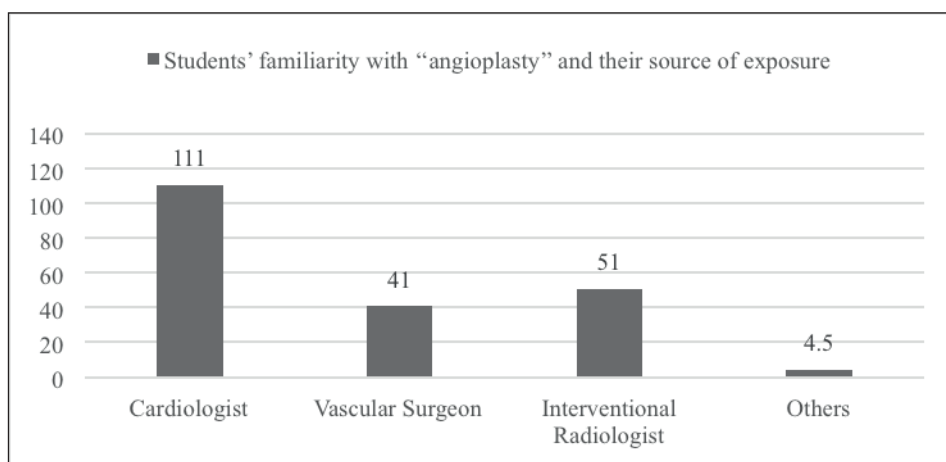


Figure 4. Students' familiarity with "angioplasty" and their source of exposure.

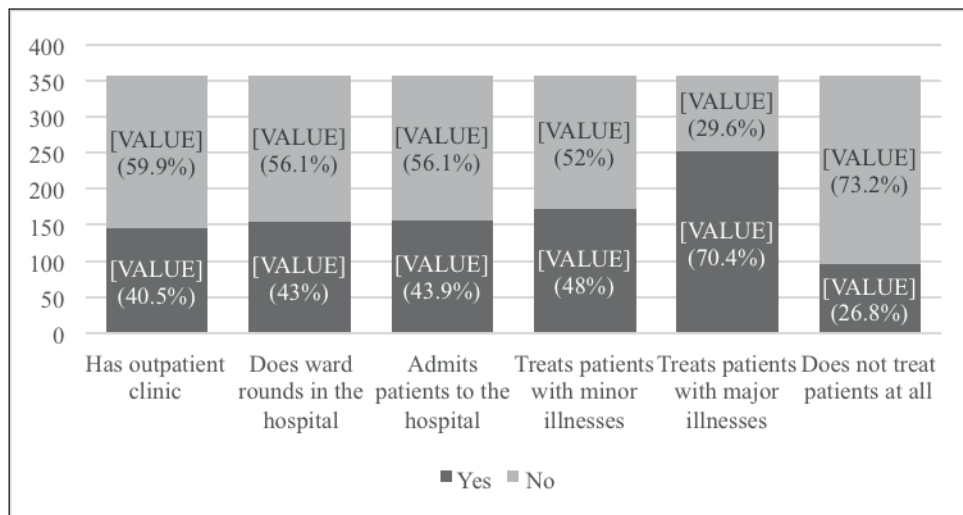


Figure 5. Students' knowledge of tasks performed by interventional radiologists.

In addition, the most recognized procedures performed by radiologists are image-guided tumor biopsy and endovascular repair of aortic aneurysm (52.8% and 49.2%, respectively). More than two-thirds of students did not know that radiologists could perform vertebroplasty (72.6%) or percutaneous nephrostomy (67%). A similar misconception was noted in many other studies conducted in regions of Saudi Arabia [1,18].

Nevertheless, many students (63.4%) were familiar with angioplasty, although only 22.7% had heard about it from interventional radiologists, similar to Leong's study [7]. This dismal fact can be explained by the absence of interventional radiologists in undergraduate education [7]. In contrast to a study conducted in Abha, 70% of exposure sources were from interventional radiologists; this high percentage is caused by their participation in medical education at the studied university and the recent expansion of radiology in its curriculum [1].

Moreover, there was a clear misunderstanding among undergraduate medical students regarding the advantages of interventional radiologists. For example, the majority agreed that interventional radiologists do not have outpatient clinics, do not have morning ward rounds, and cannot admit patients to the hospital, while half of them believed that interventional radiologists could not treat minor illnesses, as opposed to a large percentage who presumed they interfered in major illnesses. Indeed, this level of unawareness may affect the students' choice of IR as a career, especially among those who want more contact with their patients. This reason is strongly supported by a study conducted in the United States that demonstrated a lack of personal contact with patients as a reason why students would not choose radiology as a career [21].

Conclusion

This study showed insufficient awareness and knowledge of IR among medical students during their clinical years,

which correlates with medical schools' underexposure to IR. Therefore, we recommend introducing electives and rotations in IR in the undergraduate curriculum to increase IR awareness.

List of Abbreviation

IR Interventional radiology

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent to participate

Online consent was provided for each participant before starting the survey.

Ethical approval

Ethical approval was obtained from the Biomedical Ethics Committee at the College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia (Approval number: HAPO-02-K-012-2022-09-1172).

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