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AWARENESS OF INTERVENTIONAL RADIOLOGY AND THE ASSOCIATED RADIATION EXPOSURE RISK AMONG PUBLIC POPULATION AND PRIMARY CARE PHYSICIANS IN SAUDI ARABIA

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ABSTRACT

Introduction: The imperative for healthcare professionals to possess a comprehensive understanding of radiation doses and the associated risks of diagnostic imaging processes they recommend is underscored by the evolving landscape of medical diagnostics and treatment. Interventional radiology (IR) plays a crucial role in modern medicine, offering minimally invasive alternatives to traditional surgery. However, public and healthcare practitioner awareness of IR and its associated radiation risks remains inadequately explored, particularly in regions like Saudi Arabia.

Purpose: This study aimed to evaluate the awareness of interventional radiology (IR) and the associated risks of radiological procedures among the general public and healthcare practitioners in Saudi Arabia, identifying knowledge gaps and informing future educational initiatives. Conducting a study on the awareness of interventional radiology (IR) and associated risks among the public and healthcare practitioners in Saudi Arabia offers key benefits. It identifies misconceptions and knowledge gaps, guiding public health campaigns and training. It underscores the need for ongoing education for healthcare practitioners to keep up with advancements in IR, thus maintaining the health of individuals.

Methods: Participants undergoing radiological procedures were selected using a random sampling technique, with stratification based on gender, age, nationality, and education level. The survey, conducted in Saudi Arabia, comprised twenty-two questions in Yes or No and multiple-choice formats, covering demographic information, comprehension of interventional radiology, and awareness of radiation exposure risks.

Results: Out of 625 respondents, 62.7% had no prior knowledge of IR, and 94.2% had never undergone IR procedures. A significant proportion (55%) lacked information about the radiation exposure associated with IR, and 57.9% perceived risks from radi-

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ation in imaging devices. Post-educational video, 88.2% favored IR over traditional treatment methods, with 57.8% expressing willingness to undergo IR procedures in the future.

Conclusion: The study reveals a substantial lack of awareness and knowledge about interventional radiology and radiation risks among the Saudi Arabian population and healthcare practitioners.

الملخص:

المقدمة: تتزايد الحاجة إلى أن يمتلك المهنيون الصحيون فهماً شاملاً للجرعات الإشعاعية والمخاطر المرتبطة بعمليات التصوير التشخيصي التي يوصون بها, وذلك بسبب التطور المستمر في مجال التشخيص والعلاج الطبي. حيث تلعب الأشعة التداخلية (IR) دوراً حاسماً في الطب الحديث, حيث تقدم بدائل طفيفة التوغل للجراحة التقليدية. ومع ذلك, لا يزال الوعي العام والمهني بالمخاطر الإشعاعية المرتبطة بالأشعة التداخلية غير مستكشفة بشكل كافٍ, خاصة في مناطق مثل المملكة العربية السعودية.

الهدف: تهدف هذه الدراسة إلى تقييم الوعي بالأشعة التداخلية (IR) والمخاطر المرتبطة بالإجراءات الإشعاعية بين الجمهور العام والممارسين الصحيين في المملكة العربية السعودية, مع تحديد الفجوات المعرفية وتوجيه المبادرات التعليمية المستقبلية. إن إجراء دراسة حول الوعي بالأشعة التداخلية والمخاطر المرتبطة بها بين الجمهور والممارسين الصحيين في السعودية يقدم فوائد رئيسية. فهو يحدد المفاهيم الخاطئة والفجوات المعرفية, مما يوجه حملات الصحة العامة والتدريب. هذا يحسن النتائج الصحية من خلال تعزيز اتخاذ القرارات لدى المرضى وزيادة الثقة .وتؤكد الدراسة على الحاجة إلى التعليم المستمر للممارسين الصحيين لمواكبة التطورات في مجال الأشعة التداخلية.

الخطوات: تم اختيار المشاركين الذين يخضعون لإجراءات إشعاعية باستخدام تقنية العينة العشوائية, مع التصنيف بناءً على الجنس, العمر, الجنسية, ومستوى التعليم. شمل الاستطلاع, الذي أجري في المملكة العربية السعودية, اثنان وعشرون سؤالاً بصيغة نعم أو لا واختيارات متعددة, تغطي المعلومات الديموغرافية, وفهم الأشعة التداخلية, والوعي بمخاطر التعرض للإشعاع.

النتائج: من بين ٦٢٥ مستجيباً, لم يكن لدى ٦٢.٧% معرفة سابقة بالأشعة التداخلية, ولم يخضع ٩٤.٢% منهم لأي إجراءات أشعة تداخلية. وافتقر جزء كبير (٥٥%) إلى المعلومات حول التعرض للإشعاع المرتبط بالأشعة التداخلية, واعتبر ٥٧.٩% أن هناك مخاطر من الإشعاع في أجهزة التصوير. قمنا بعرض فديو تعليمي وبعد مشاهدة هذا الفيديو التعليمي, فضل ٨٨.٢% الأشعة التداخلية على الطرق العلاجية التقليدية, وأعرب ٥٧.٨% عن استعدادهم للخضوع لإجراءات الأشعة التداخلية في المستقبل.

الكلمات المفتاحية الأشعة التداخلية, التعرض للإشعاع, وعي الممارسين الصحيين, التصوير الطبي

Keywords: Interventional Radiology (IR), Radiation Exposure, Healthcare Practitioner Awareness, Medical Imaging.

1. INTRODUCTION

The skin and surrounding tissues conceal the internal organs and bones from plain sight. The term 'medical imaging' encompasses various techniques enabling us to observe the inner workings of the body [1]. Diagnosis involves identifying specific diseases or ailments through a comprehensive examination of the patient. Unfortunately, most illnesses impact

parts of the body not visible to the naked eye. Diagnostic medical imaging assists in diagnosis by revealing any anomalies within the body [2]. For example, in patients who have suffered trauma, medical imaging can indicate if bones are fractured or dislocated [3]. This field relies on the utilization of 'invisible' waves like electromagnetic radiation, magnetic fields, or sound waves. Understanding these wave types is fundamental to comprehending medical imaging science [1]. Typically, these waves emanate from a source placed on one side of the body, traverse through the body and its region of interest, and interact with a detector positioned on the opposite side [2]. The waves are absorbed differently by various body tissues, enabling the detector to produce an image comprised of 'shadows' representing different body tissues [2].

While diagnostic purposes constitute a significant portion of medical imaging, its utility extends beyond diagnosis alone. Below are some prevalent alternative applications of medical imaging: Immediate diagnosis, Disease progression monitoring, planning treatments, Assessing treatment effectiveness, and Calculations related to age [4, 5]. Over the years, significant progress in the field of Medical Science and Diagnostic Imaging has greatly enhanced the quality of healthcare services [6]. Interventional Radiology (IR) is a specialized field utilizing minimally invasive techniques guided by medical imaging for both diagnosis and treatment, fundamentally transforming medical practice [7]. Interventional Radiology (IR) has become the preferred method for accurately diagnosing a wide range of diseases and providing essential life-saving treatments [8].

Interventional radiologists, who are expert physicians with specialized training in anatomy and image guidance, conduct examinations and procedures in the realm of interventional radiology (IR). Their primary emphasis lies in managing lymphatic system and vascular issues in pediatric patients, whether they are congenital or acquired. Employing advanced equipment and precise imaging techniques, these professionals diagnose and manage a range of conditions through minimally invasive interventions [9]. Despite its crucial significance in patient care, there seems to be insufficient awareness within the patient community. A study conducted in Canada to assess patient familiarity with Interventional Radiology revealed that only 28% and 6% of respondents were knowledgeable about the functions of Diagnostic Radiologists and Interventional Radiologists, respectively [10]. Moreover, an additional study examining awareness of IR among patients and the broader public revealed that 65% of outpatients at Radiology Departments had no previous understanding of IR, and 72% of the general population surveyed were unable to recognize an Interventional Radiologist as a medical practitioner [7].

Interventional Radiology, along with Diagnostic Imaging Radiology, represents the main sources of artificial ionizing radiation exposure for patients [11]. Many literature references suggest that ionizing radiation is associated with cancer and other negative

impacts [8]. A comprehensive analysis of radiation awareness found a general deficiency in understanding radiation exposure across all the studies reviewed [11]. On the contrary, a survey conducted in the Kingdom of Saudi Arabia (KSA) indicated that 65% of participants exhibited a commendable comprehension of the potential cancer risks linked to CT scans. Analysis of patient awareness highlighted a communication divide between healthcare providers and patients regarding radiation exposure [11, 12]. In a thriving clinical practice of Interventional Radiology (IR), it is crucial to thoroughly explain the advantages, drawbacks, and alternative options of procedures to patients in order to secure informed consent [13].

Based on the study presented by Paolicchi et al. [14], which aimed to assess basic knowledge of radiation protection and dose assessment for radiation procedures among Italian radiologists, we hypothesize that this tool is effective in identifying the gap in interventional radiology (IR) and radiation safety among the general public and healthcare practitioners in Saudi Arabia. Educational tools like videos might improve IR-targeted education, acceptance, and understanding. Additionally, this study aimed to explore clinicians' perceptions regarding the most effective method for conveying information about medical radiological exposure to individuals. Findings revealed that clinicians preferred visual communication methods for this purpose. The study's strength lies in its combined use of qualitative methodology and quantitative analysis to gain insight into the challenges clinicians encounter when communicating medical radiological exposure to patients in their everyday clinical settings. It is worth noting that clinicians who responded to the electronic survey may have a higher interest in medical radiological exposure compared to non-respondents. Furthermore, we developed our own survey to assess individuals' knowledge and awareness of medical radiological exposure, which may introduce potential validity concerns.

2. METHODS

Our investigation constitutes a cross-sectional survey undertaken at King Fahad Specialty Hospital Dammam (KFSHD) in Saudi Arabia, focusing explicitly on individuals aged 18 years and older within the public population. Exclusions were made for those under 18 years due to cognitive impairment, neurological conditions, or language barriers (inability to comprehend Arabic or English), which could hinder their ability to understand and respond to the survey queries. This study was conducted under the approval of Graduate Studies and Scientific Ethical Approval Board at Prince Nourah bint Abdulrahman University, IRB: H-01-R-059,

Participants were classified based on age, gender, nationality, and educational background. The survey, administered in Saudi Arabia, comprised 22 questions primarily in Yes or No format or multiple choices, segmented into three sections encompassing demographic details, knowledge regarding interventional radiology, and awareness of radiation exposure as shown in the (Appendix). Data gathering involved the distribution of a comprehensive questionnaire via email and social media platforms to ensure broad participation. Statistical analysis was employed in this study to manage and interpret the data, using SPSS, IBM SPSS Statistics for Windows, version XX (IBM Corp., Armonk, N.Y., USA). Mean values were presented, with corresponding percentages calculated for comparison purposes. Statistical techniques such as percent, valid percent, and cumulative percent were utilized to determine the significance of these values and explore associations among qualitative variables.

3. RESULTS

The initial phase of this research relied on comprehensive demographic information, focusing on public descriptive statistics such as gender, age, nationality, and education. The population under scrutiny included 625 individuals: 470 females and 155 males.Table 1 outlines the age distribution (18 to 66 years), and Figure 1 describes the population distribution based on gender and nationality, presenting frequency, percentage, valid percentage, and cumulative percentage figures for this cohort.

Table 1 Detail the distribution of age groups.

Age Group	Frequency	Percent	Valid Percent	Cumulative Percent
18-25	229	36.6	36.6	36.6
26-35	152	24.3	24.3	61.0
36-45	105	16.8	16.8	77.8
46-55	76	12.2	12.2	89.9
56-65	47	7.5	7.5	97.4
> 66	16	2.6	2.6	100.0
Total	625	100.0	100.0	

Among all of participant we have Saudi (89%) and non-Saudi (11%). Participants' educational backgrounds ranged from high school to PhD degrees, with bachelor's degrees making up the highest proportion at 59%. Figure 2 illustrates this distribution using a pie chart.

The second segment of the study examined interventional radiology. Initially, 62.7% of respondents were unfamiliar with it, while 37.3% had some awareness. Among those familiar, most learned about interventional radiology from physicians, although 64.2% of

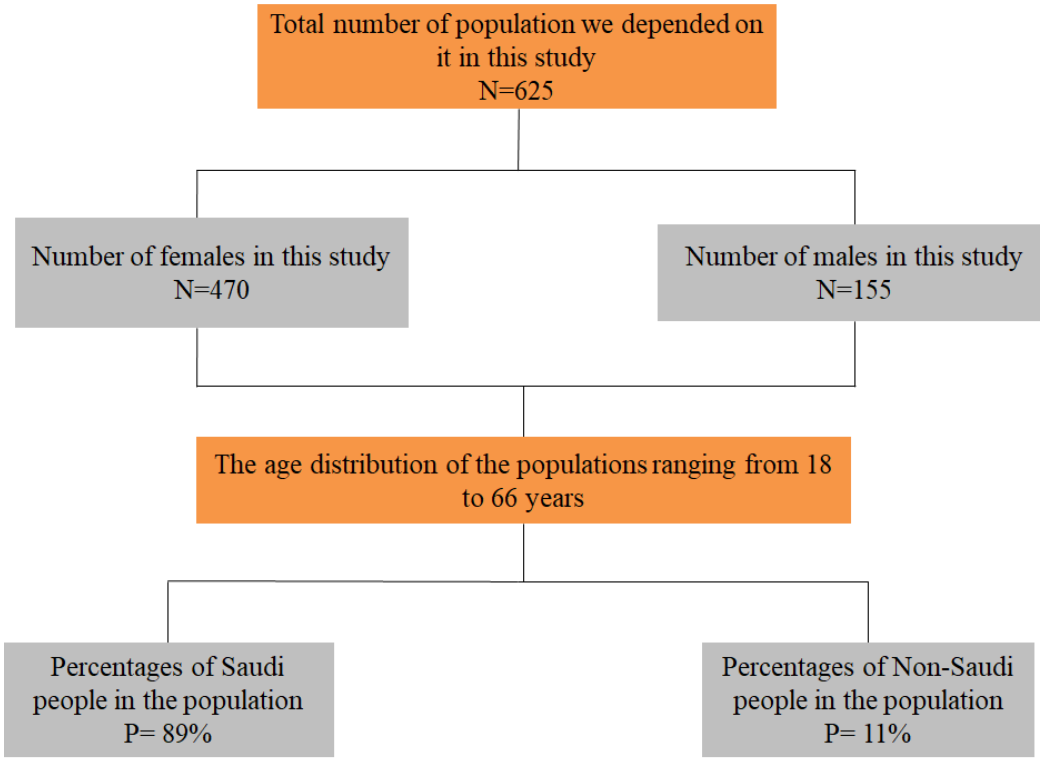

Figure 1 Population distribution based on number of male and female and saudi and non-saudi people.

data was missing. Table 2 lists all potential information sources. Participants were also asked about their understanding of interventional radiologists. 42.1% believed these doctors both diagnose and treat using minimally invasive procedures, 18.1% thought they only diagnose, and 34.6% had no knowledge of their functions. Figure 3 depicts the distribution of these opinions.

Table 2 The potential channels through which information about interventional radiology may be acquired.

Different channels	Frequency	Percent	Valid Percent	Cumulative Percent
Media (newspaper, television, social media network).	42	6.7	18.8	18.8
Friend or family.	27	4.3	12.1	30.8
Magazine or article.	17	2.7	7.6	38.4
A physician.	89	14.2	39.7	78.1
Other health care provider.	49	7.8	21.9	100.0
Total	224	35.8	100.0	
Missing System	401	64.2		
Total	625	100.0		

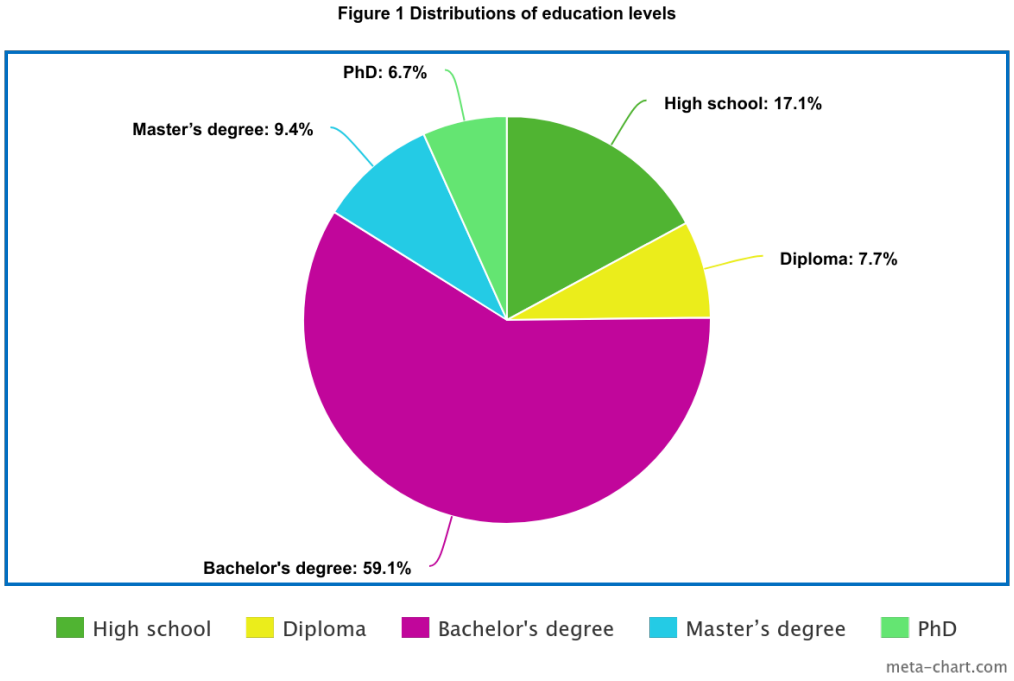

Figure 2 Pie chart depicting the educational levels of survey participants. The majority, 59.1%, hold aBachelor's degree, followed by 17.1% with a high school education, 9.4% with a Master's degree, 7.7% with a diploma, and 6.7% with a PhD.

Respondents were asked whether they believed IR doctors received formal training. Among them, 41% thought training occurred during residency and/or fellowship, 24% believed it happened during medical school, and 35% were uncertain or uninformed. We also inquired about familiarity with procedures like uterine fibroid embolization, radiofrequency ablation, or ultrasound-guided biopsy. The results showed that 61.6% lacked knowledge of these procedures, while 38.4% had some understanding. Regarding preferences for IR procedures versus open surgery, approximately 70.6% preferred minimally invasive IR procedures, 4.5% preferred open surgery, 4% had no preference, and 21% were uncertain. Participants were asked if they had ever undergone an interventional radiology procedure, with 94.4% reporting no experience and 5.4% having undergone such a procedure, and 0.2% of data missing. In contrast, 59.5% had experienced medical imaging radiological procedures. When specifying the type of medical imaging procedure, X-rays were the most common at 23.5%, as shown inTable 3. Regarding awareness of radiation exposure risks, 22.9% had poor knowledge, 45.3% had average understanding, 21.6% were well-informed, and 9.9% had no knowledge. Additionally, 47% had received information on radiation exposure benefits and risks, 44.2% had not, and 8% were uncertain, as illustrated in Figure 4.

Table 3 Describe the choice percentages for each medical imaging radiological procedure.

Imaging Modalities		Frequency	Percent	Valid Percent	Cumulative Percent
	No	225	36.0	60.5	60.5
	Yes	147	23.5	39.5	100.0
X-ray	Total	372	59.5	100.0	
	Missing System	253	40.5		
Total		625	100.0		
	No	317	50.7	85.4	85.4
	Yes	54	8.6	14.6	100.0
Computed Tomography (CT)	Total	371	59.4	100.0	
	Missing System	254	40.6		
Total		625	100.0		
	No	293	46.9	79.0	79.0
	Yes	78	12.5	21.0	100.0
Magnetic Resonance imaging (MRI)	Total	371	59.4	100.0	
	Missing System	254	40.6		
Total		625	100.0		
Ultra Sound (U/S)	No	326	52.2	88.1	88.1
	Yes	44	7.0	11.9	100.0
	Total	370	59.2	100.0	
	Missing System	255	40.8		
Total		625	100.0		
	No	359	57.4	97.3	97.3
	Yes	10	1.6	2.7	100.0
Nuclear imaging	Total	369	59.0	100.0	
	Missing System	256	41.0		
Total		625	100.0		

Figure 2 The public perception of the duties of IR doctors

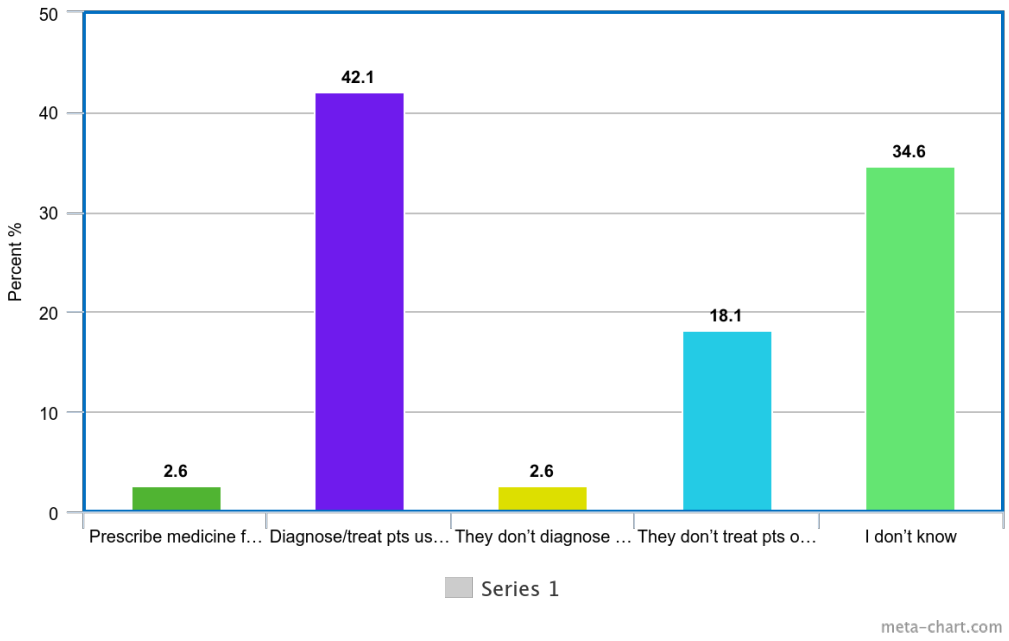

Figure 3 Bar chart showing the percentage of participants' understanding of the roles of interventional radiologists. A significant 42.1% of participants correctly identify that interventional radiologists both diagnose and treat using minimally invasive procedures. In contrast, 18.1% believe these specialists only diagnose, and 34.6% admit to having no knowledge of their functions. Small percentages (2.6%) have other perceptions or are not represented in the data.

Respondents were asked about their perceptions of radiation exposure from interventional radiology procedures. Findings showed that 55% had no knowledge, 32.8% believed some procedures involved no radiation while others had potentially harmful doses. Table 4 presents the distribution of these opinions.

Table 4 Outlined the perspectives of individuals regarding the radiation exposure from interventional radiology procedures.

Radiation exposure	Frequency	Percent	Valid Percent	Cumulative Percent
All their procedures don't have radiation exposure.	27	4.3	4.3	4.3
All procedures have high radiation exposure.	48	7.7	7.7	12.0
Some procedures don't have radiation exposure and some have potentially harmful doses	205	32.8	32.9	44.9
I don't know	344	55.0	55.1	100.0
Total	624	99.8	100.0	
Missing System	1	0.2		
Total	625	100.0		

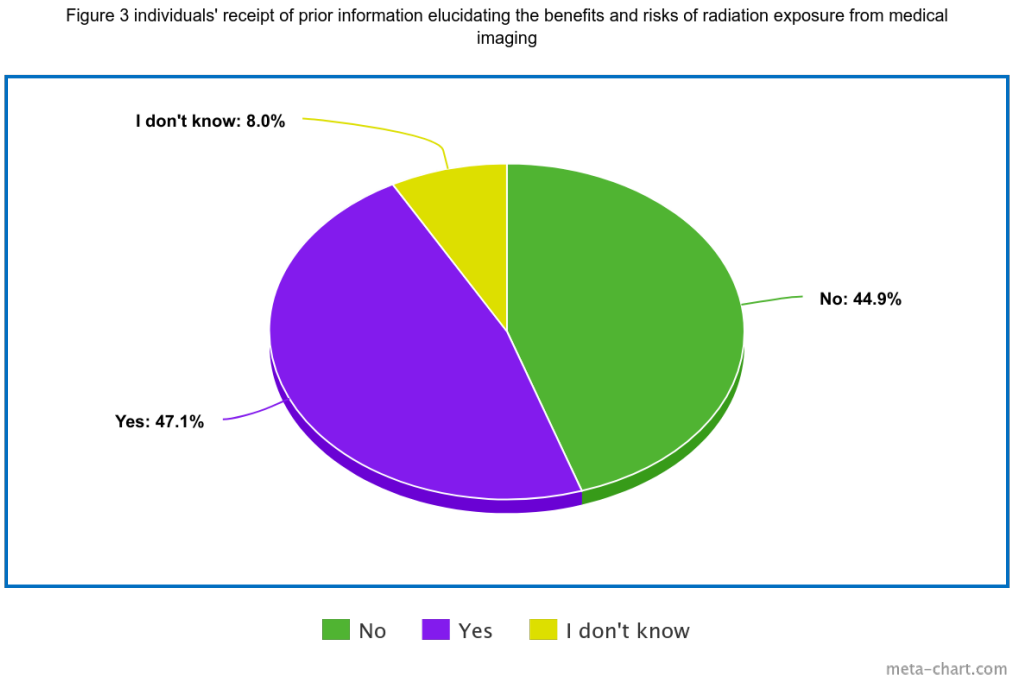

Figure 4 Pie chart illustrating participants' responses to whether they have received information on the risks and benefits of radiation exposure from medical imaging. Nearly half of the respondents (47.1%) reported receiving such information (Yes), while a close 44.9% have not (No), and 8% are unsure (I don't know).

Participants were asked whether certain medical imaging modalities emit radiation. Results showed that 78.6% believed X-rays do not emit radiation, 62.4% thought ultrasound (U/S) emits radiation, 81% believed CT scans do not emit radiation, and 58.9% thought MRI does not emit radiation. Regarding which interventional radiology procedures emit the highest radiation, 35% of respondents perceived MRI as the highest, followed by CT scans at 33%, conventional radiography at 23.7%, and U/S at 7.2%, as shown in Figure 5. When asked about the health risks of ionizing radiation from imaging devices, 57.9% expressed concern, 33.9% were uncertain, and 6.9% believed there was no risk.

We inquired about potential risks of radiation exposure, offering options such as anemia, cancer, burns, cataracts, fertility problems, and "I do not know." The majority, 74.2%, identified cancer as a potential risk, while 9.8% chose anemia, 34.2% thought burns could result, 25.1% mentioned cataracts, and 43.8% acknowledged fertility problems. Additionally, 19.7% had no knowledge of radiation effects. We also explored precautionary measures physicians can take, including using radiation detectors, minimizing exposure time and distance, using shielding, wearing respirators or face masks, being aware of all radiation sources, and considering procedure avoidance. A significant 77.1% supported these measures, 3.4% opposed, and 19.4% were undecided. Regarding radiation detectors, 25.4%

Figure 4 Detailing the procedure within Interventional Radiology associated with the highest radiation dosage

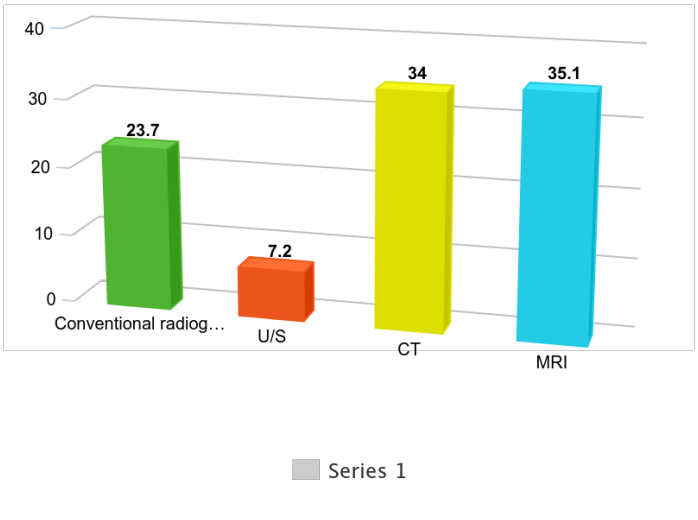

Figure 5 Bar chart showing participants' perception of radiation emission from different medical imaging modalities. MRI is perceived to emit the highest radiation (35.1%), closely followed by CT scans (34%), while conventional radiography (23.7%) and ultrasound (U/S) (7.2%) are seen as emitting less radiation.

confirmed their use, while 74.6% did not. On the ALARA principle for radiologists' protection, 69.9% agreed with its effectiveness, and 30.1% disagreed.

Regarding the use of respirators or face masks by radiologists, 24.5% supported their use, while 75.5% did not. Additionally, 34.6% believed radiologists should be mindful of all radiation sources, and 65.4% disagreed. On whether radiologists should avoid certain procedures, 93.3% disagreed, and 6.7% agreed. Participants were also asked if they had a clearer understanding of interventional radiologists' responsibilities, with 90.7% feeling well-informed and 9.1% not. In comparing interventional radiology to alternative treatments, respondents preferred it for its diagnostic and treatment accuracy, reduced risks, and faster recovery. However, 72.8% felt it was more costly. When asked if interventional radiology offers no benefits compared to open surgery, 96% disagreed, highlighting differences between the procedures, as shown in Figure 6.

Participants watched an instructional video on medical imaging modalities, including X-ray, ultrasound (U/S), CT, MRI, and interventional procedures. After viewing, 35.4% believed interventional procedures emitted the least ionizing radiation, 29.6% thought U/S emitted the least, and 12.8% believed MRI did. Conversely, 7.5% perceived CT as having the highest ionizing radiation production. Regarding preferences for undergoing procedures, 88.2% favored interventional radiology over other modalities, while 11.8% did not.

Figure 5 Gauged public opinion on whether interventional radiology offers no benefits or differs from open surgery, or if there are notable distinctions between the two approaches

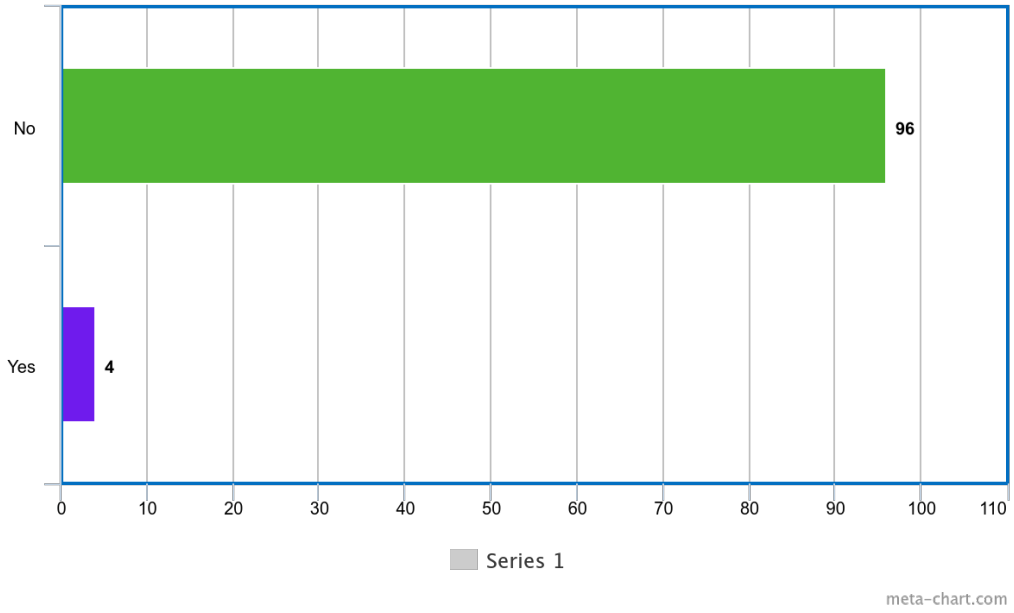

Figure 6 Bar chart representation of participants' agreement with the statement that interventional radiology offers advantages over open surgery. A vast majority (96%) agree that interventional radiology has benefits over traditional surgery, while a small fraction (4%) do not recognize or are uncertain of any benefits.

Following the completion of the survey, participants were questioned about their comfort level regarding the possibility of undergoing an interventional radiology (IR) procedure in the future. The results indicated that 57.8% of respondents felt completely convinced that opting for an IR procedure would be a more beneficial treatment option and were willing to undergo it. Additionally, 34.4% expressed being almost convinced but harbored concerns about the risks outweighing the benefits. Conversely, 7.8% admitted to feeling hesitant about undergoing the procedure, believing that the risk of radiation exposure was not justified.

4. DISCUSSION

This study reveals a significant gap in awareness regarding interventional radiology (IR) and its associated radiation risks among both the Saudi Arabian public and healthcare practitioners. The finding that 62.7% of respondents were unfamiliar with IR is concerning and mirrors similar issues observed in other regions. The limited awareness about IR highlights a global challenge in effectively communicating the role and benefits of this critical medical specialty to the general public and even within the healthcare community.

A notable finding of this study is the inadequate understanding of radiation risks associated with IR. With 55% of participants lacking information about radiation exposure and 57.9% expressing concerns about radiation risks from imaging devices, it is evident that there is a significant gap in radiation education. Despite the advancements in medical imaging and IR, the general public's grasp of radiation risks remains insufficient. This deficiency is alarming given the established links between ionizing radiation and potential health hazards, including cancer. The study underscores the urgent need for improved communication strategies to enhance public awareness about radiation safety and risk management.

The effectiveness of educational interventions is evident from the study's results. After viewing an educational video, 88.2% of respondents preferred IR over traditional methods, and 57.8% expressed a willingness to undergo IR procedures in the future. This positive shift demonstrates the impact that targeted education can have on changing perceptions and increasing acceptance of advanced medical treatments. The findings are consistent with existing literature, which suggests that enhanced knowledge can lead to more informed decision-making and greater acceptance of medical innovations.

The study also highlights the preference for IR over traditional surgical methods, with 70.6% of participants favoring minimally invasive procedures. This preference reflects the recognized benefits of IR, such as reduced risks and faster recovery times, which are well-documented in medical research. However, the perception of higher costs associated with IR (reported by 72.8% of respondents) indicates a need for further research into the cost-effectiveness of these procedures and their impact on patient access.

The implications for healthcare practice in Saudi Arabia are significant. The high percentage of respondents who had never undergone IR procedures (94.2%) and the lack of knowledge about specific IR techniques suggest that there is a pressing need for healthcare professionals to actively educate patients about the benefits and risks of IR. Additionally, the identified knowledge gaps among healthcare practitioners themselves highlight the importance of ongoing education and training in IR to ensure that practitioners are well-informed and can effectively communicate with patients. Future research should focus on developing and assessing educational programs aimed at both the public and healthcare professionals to address these knowledge gaps. These programs should provide clear and up-to-date information about IR, correct misconceptions about radiation risks, and enhance overall understanding of new IR techniques. Exploring effective communication strategies to bridge the gap between healthcare providers and patients regarding radiation safety and IR procedures is also crucial. While the study provides valuable insights, it is important to acknowledge its limitations. The reliance on self-reported data may introduce biases, and the focus on a specific region might limit the generalizability of the findings.

Future studies should consider a more diverse sample across different regions and healthcare settings to validate and expand upon these results.

In conclusion, this study underscores the critical need for increased awareness and education about interventional radiology and radiation risks. Addressing the identified knowledge gaps through targeted educational initiatives can improve patient understanding, enhance the quality of care, and promote safer medical practices. The positive response to educational interventions indicates the potential for knowledge dissemination to significantly impact public and professional attitudes towards IR.

5. CONCLUSION

This study highlights a significant deficiency in awareness and understanding of interventional radiology (IR) and the associated radiation risks among both the general public and healthcare practitioners in Saudi Arabia. The findings reveal that a majority of participants were unfamiliar with IR and its radiation implications, emphasizing the need for comprehensive educational initiatives. Enhancing knowledge and awareness through targeted programs is essential to facilitate informed decision-making and ensure patient consent, ultimately improving the acceptance and application of IR as a viable alternative to traditional surgical procedures. In the future, research should focus on developing and evaluating the effectiveness of specific educational interventions aimed at increasing awareness and understanding of IR and its associated radiation risks. Longitudinal studies could assess the long-term impact of these educational programs on both the public and healthcare practitioners' knowledge and attitudes. Additionally, exploring the barriers to knowledge dissemination and identifying strategies to overcome them in different regions and demographics within Saudi Arabia could provide further insights into optimizing educational efforts.

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1. APPENDIX

Public survey

Q1. Age:

a. 18-25

b. 26-35

c. 36-45

d. 46-55

e. 56-65

Q2. Nationality:

a. **Saudi**

b. **Non-Saudi**

Q3. Education :

a. High school or any school grade.

b. Diploma.

c. Bachelor's degree.

d. Master's degree.

e. PhD.

Q4. Please describe what do you think IR doctors do?

a. Prescribe medicine for treatment of patients.

b. Diagnose and treat patients using minimally invasive incisions.

c. They don't diagnose disease only facilitates enhancement of health.

d. They don't treat patients only diagnose.

e. I don't know.

Q5. What training do you think an interventional radiologist received?

a. During medical school bachelor's degree.

b. During residency and/or fellowship.

c. I don't know.

Q6. Are any of the following procedures known to you? (Uterine fibroid embolization or radiofrequency ablation or U/S guided biopsy)?

a. No

b. Yes

Q7. "Minimally-invasive Interventional radiology procedures are performed through tiny skin incisions and guided by radiology imaging, with faster recovery. "Open surgery" is performed through large incisions, requiring a longer time for healing." According to the statement, what would you decide if you have to choose?

a. **Minimally-invasive IR procedures.**

b. **Open surgery.**

c. **Neither.**

d. **I don't know.**

Q8. Have you ever undergone an interventional radiology procedure before?

a. No

b. Yes

Q9. How much do you know about radiation exposure risks?

a. Nothing.

b. Poor.

c. Average.

d. Very Good.

Q10. Have you previously received information explaining benefits/ risks of radiation exposure from medical imaging?

a. No

b. Yes

c. I don't know

Q11. How much radiation do you get from interventional radiology procedures?

a. All their procedures don't have radiation exposure.

b. All procedures have high radiation exposure.

c. Some procedures don't have radiation exposure and some have potentially harmful doses

d. I don't know

Q12. Which of the following do you think doesn't produce radiation (you can choose more than one option)?

1. **Conventional radiography:**

i. No

ii. Yes

2. **US:**

i. No

ii. Yes

3. **CT:**

i. No

ii. Yes

4. **MRI:**

i. No

ii. **Yes**

Q13. Which of the following has the highest dose of radiation in Interventional radiology procedures?

1. Conventional radiography.

2. MRI.

3. U/S.

4. CT.

Q14. Can ionizing radiation that's produced from imaging devices be dangerous to your health?

a. No

b. Yes

c. I don't know

Q15. Are there any precautions the physician can take before and after the procedure?

a. No

b. Yes

c. I don't know

Q16. What do you think are the risks of radiation exposure (you can choose more than one option)?

1. **Anemia.**

a. **No**

b. **Yes**

2. **Cancer.**

a. **No**

b. **Yes**

3. **Burns or skin injury.**

a. **No**

b. **Yes**

4. **Cataract.**

a. **No**

b. **Yes**

5. **Fertility problems.**

a. **No**

b. **Yes**

6. **I don't know.**

a. **No**

b. **Yes**

Q17. Are there any precautions the physician can take before and after the procedure?

1. No

2. Yes

3. I don't know

Q18. What are the benefits compared to other treatment options (you can choose more than one option)?

1. Increased effectiveness by increasing the accuracy of the diagnosis and improves patient treatment:

a. No

b. Yes

2. Reduced risks compared to conventional surgery:

a. No

b. Yes

3. Less Pain:

a. No

b. Yes

4. No benefits or no different than open surgery:

a. No

b. Yes

5. Lower Costs:

a. No

b. Yes

6. Quicker Recovery Time:

a. No

b. Yes

Q19. Do you now have a better idea of what interventional radiologists do?

a. No

b. Yes

Q20. After watching the video, which of the following do you think doesn't produce ionizing radiation?

a. X-ray.

b. U/S.

c. CT.

d. MRI.

e. Interventional procedures

Q21. After watching the video, do you think you would prefer going through an IR than other methods of treatment?

a. No

b. Yes

Q22. After answering this survey, in the future if ever needed how comfortable are you to undergo IR procedure?

a. I am completely convinced this is a more beneficial option for treatment and welling to go through.

b. I am almost convinced but worried about the risks more than the benefits.

c. I am hesitant to undergo this procedure and think risk of exposure radiation is not worth it.

The public survey is available on this link https://ir-radiology.surveysparrow.com/s/publicawareness/tt-96144234de .