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Patient Awareness and Attitudes Toward Intravenous Contrast Materials (IVCMs) Risks at King Abdulaziz Medical City (KAMC), Riyadh, Saudi Arabia.

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Abstract

Aim of the Study

This research seeks to comprehensively explore the levels of knowledge and attitude among patients at King Abdul-Aziz Medical City in Riyadh, Saudi Arabia, regarding intravenous contrast materials (IVCMs) and their associated risks.

Specific Objectives

To assess the knowledge and attitude levels of patients concerning intravenous contrast media, including an exploration of risk factors and side effects.

Materials & Methods

A cross-sectional study was conducted using a self-administered questionnaire in King Abdul-Aziz Medical City, Riyadh, Saudi Arabia. The 180 participants were exposed to 14 items to assess their knowledge and attitudes towards their risk and about the IVCMs and their role in the diagnosis of some diseases. Eligible patients who had undergone contrast radiological study in Fluoroscopy and CT imaging modality. The mean percentage scores were correlated with the specialty, level of age, gender, education, use of radiation protective tools and frequency of contrast study requisition.

Results

Out of 180 participants, 59.4% were males, and 68.3% underwent angiography as the primary radiological exam. Participants expressed agreement on the harmful effects of IVCM (47.2%) and the necessity of removing metallic objects during radiological procedures (82.2%). The mean

knowledge score was 1.14 with a standard deviation of 0.85. No statistical significance was found between knowledge scores and demographic variables (p value < 0.05).

Conclusions:
Overall, the findings underscore the importance of improving communication and education efforts to support informed decision-making and enhance patient safety in radiological practices

Keywords: Pateint Awareness, Attitudes, Intravenous Contrast Material, Contrast Media Side effects, Patient Safety

Background

Intravenous contrast media (IVCM) are indispensable in modern diagnostic imaging, significantly enhancing the visualization of anatomical structures and pathological changes across various modalities such as computed tomography (CT) and angiography. Since their introduction, these agents have transformed radiological diagnostics and facilitated earlier, more accurate clinical decision-making [1,3]. The widespread application of iodinated contrast agents, however, is not without risk. While generally considered safe, IVCM can provoke a range of adverse reactions—from mild hypersensitivity to severe anaphylactoid responses and nephrotoxicity [1,4,5].

Despite advancements in contrast media formulation and the establishment of safety guidelines by expert committees, including the European Society of Urogenital Radiology (ESUR), late adverse reactions continue to be reported in clinical settings [1]. The potential for anaphylaxis remains a concern, necessitating appropriate risk assessment and pre-procedural screening [5,6]. Furthermore, the risk of contrast-induced nephropathy (CIN), particularly in patients with pre-existing renal impairment or other risk factors, continues to be a critical issue in clinical practice [4,7,8].

Patient awareness and education surrounding the use and risks of IVCM are crucial components in minimizing adverse outcomes and enhancing compliance. Unfortunately, evidence suggests that many patients lack adequate knowledge about contrast media and their potential effects, particularly regarding allergic reactions and renal complications [7,9,10]. Studies have shown that while consent forms and verbal explanations are typically provided, these are often insufficient for ensuring true patient understanding [2,12]. A significant proportion of patients remain unaware of

their susceptibility to adverse reactions, including those with previous contrast allergies, reflecting a gap in communication between healthcare providers and patients [9,10]. Understanding public knowledge and perceptions surrounding IVCM is vital, especially considering the increasing use of imaging studies worldwide. This study aims to assess patients' awareness, attitudes, and knowledge of intravenous contrast media, associated risks, and the extent of their understanding of precautionary measures, including informed consent and radiation safety protocols. By identifying knowledge gaps, this research seeks to contribute to improved educational strategies and clinical communication regarding the safe use of IVCM. In this paper, the main objectives are to assess the knowledge and attitude levels of patients concerning intravenous contrast media, including an exploration of risk factors and side effects.

Aim of the Study

The aim of this study is to determine the level of knowledge and attitude about the intravenous contrast materials (IVCMs) and their associated risk at King Abdul-Aziz Medical City, Riyadh, Saudi Arabia.

Specific Objectives

To determine patient's knowledge and attitude level about the intravenous contrast media, and their associated their risk factors and side effects among patients attending King Abdul-Aziz Medical city in Riyadh.

Secondary Objectives

Aim to highlight few needs of health education programs associated with the importance intravenous contrast media (IVCMs)

Materials & Methods

Study setting, subjects & setting

Patients who visited the Radiology department at King Abdul-Aziz Medical City in Riyadh, Saudi Arabia be eligible to participate in the study. A cross-sectional study designs using a suitably validated questionnaire covering a study period from 2023 to 2024. The number of subjects visiting the Radiology department for radiological contrast study in CT, fluoroscopy and Main x-ray units are estimated to be 1849 per month with 7% margin of error and 95% confidence interval. The

minimum required sample size was as 178; fixed to 180 calculated using Rao soft online sample size calculators.

Inclusion criteria

The study included both females and males.

Patient aged from15 year old and above, who underwent radiological study with IVCM in different imaging modalities included Fluoroscopy, and Computed tomography (CT).

Exclusion criteria

The study excluded patients who underwent non contrast radiological study

Pregnant woman, post-operative patients, and pediatric patients less than 15 years old

Data Collection

The data collection for this study was related to patient's knowledge and attitude about the intravenous contrast media, and their associated their risk factors and side effects who visited King Abdul-Aziz Medical city in Riyadh for radiological workup. Data were collected using suitably structured data collection form. Informed consent that explains the study objectives and the ethical considerations for study's participants and asking their voluntary participation in the study was obtained.

Statistical Analysis

The collected data were entered in Microsoft Excel and transferred to IBM SPSS Statistics for Windows, Version 29 (Released 2023; IBM Corp., Armonk, New York, United States) for statistical analysis. The data from this study was obtained using convenient sampling technique. Descriptive statistics were used to explain the demographic characteristics of the subjects including their level of awareness and attitude toward IVCMs Risks.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of King Abdullah International Medical Research Centre (KAIMRC), Riyadh, Saudi Arabia with the IRB number SP23R/054/05 and informed written consent was obtained from all the participants.

Results

Computed Tomography (CT) is the most common radiological procedure among patients (68.3%). Awareness of IVCM risks is limited with less than half of the participants (47.2%) are aware that IVCM can be harmful, and only 42.2% recognize the potential link between repeated IVCM exposure and renal failure. High awareness of procedural safety: A majority (82.2%) understand the need to remove metallic objects before imaging, and 73.3% agree that protective tools reduce radiation risks. Misconceptions about pregnancy and IVCM: Only 10.6% believe it is safe to use contrast media during pregnancy, indicating significant concern or lack of information. Knowledge gaps exist in identifying contrast-using modalities and organ sensitivity accounted to only 61.7% correctly identified CT as using contrast, and 34.3% recognized kidneys as the most sensitive organ. Uncertainty about pediatric sensitivity remain 40% of participants did not know whether pediatric patients are more sensitive to contrast media than adults. These points reflect a need for improved patient education on the safety, risks, and usage of contrast media in medical imaging. The brief summary of the table and figure are listed below. The findings from the provided tables contribute significantly to achieving the research objectives. **Table 1**, detailing demographic information of patients undergoing radiological examinations, offers insights into the diversity of the patient population and their potential exposure to intravenous contrast media (IVCM). Computed Tomography (CT) was the most used radiological technique among surveyed patients, with (68.3%) out of 180 individuals undergoing CT scans, indicating its critical role in diagnostics. Other modalities like X-ray, Angiography, and Fluoroscopy were less frequently used. A significant portion of patients were employed (55.6%). The varied job types among these patients suggest that radiological services cater to a diverse demographic. Over half had at least a bachelor's degree, reflecting higher healthcare awareness, although only (7.2%) had advanced degrees. Males predominated in exams (59.4%), indicating higher prevalence or healthcare utilization, with most patients under 40 (58.9%), suggesting early health management. Uncertainty about the harmfulness (33.9% unsure) and repetition risks (43.9% unsure) of Intravenous Contrast Media (IVCM) indicates a need for better patient education. Strong agreement on removing metallic objects (82.2%) and using protective tools (73.3%) shows good safety compliance. Concerns about contrast media in pregnancy (49.4% disagreeing with its safety) align with medical guidelines. Kidneys were seen as the most sensitive organ to contrast media (34.3%), though (22.2%) were

unsure. The (40%) unsure about pediatric sensitivity to IVCM highlights a knowledge gap needing improved communication for better healthcare outcomes.

Table 1: Demographic details of patients

Demographic	No. (Percent)
Area of Radiological Exam:	
Angiography	16(8.9)
Computed Tomography	123(68.3)
X-Ray	34(18.9)
Fluoroscopy	7(3.9)
Job Type:	
Employed	100(55.6)
Unemployed	16(8.9)
Student	17(9.4)
Housewife	28(15.6)
Other	19(10.6)
Educational Level:	
Less Than High School	23(12.8)
High School	53(29.4)
Bachelor	91(50.6)
Master	8(4.4)
PhD	5(2.8)
Gender:	
Male	107(59.4)
Female	73(40.6)
Age:	
15-30	50(27.8)
31-40	56(31.1)
41-50	44(24.4)
50 and more	28(15.6)

Table 2 highlights the patient's awareness of intravenous contrast media (IVCM) and its potential risks and its impact on renal failure, alongside considerations for metallic object removal during radiological procedures and the effectiveness of protective tools against radiation side effects, and the pregnant women towards the intravenous. Contrast Media Regarding high awareness questions most respondents agree on the need to remove metallic objects (82.2%) and the usefulness of protective tools (73.3%). On Uncertainty or concern related question a large proportion are unsure or believe IVCM could be harmful or lead to renal failure. Similarly, pregnancy caution question nearly 90% either disagreed or were unsure about the safety of contrast media during pregnancy

Table 2: Patients' awareness of IVCM risks, its link to renal failure, metallic object removal, radiation protection measures, and concerns during pregnancy.

Characteristics	Agree	Disagree	I don't know
Can IVCM cause harmful to the body?	85(47.2)	34(18.9)	61(33.9)
Do you think Repetition of IVCM examination may increase the chances of renal failure?	76(42.2)	25(13.9)	79(43.9)
Does the Radiological procedures required to remove any metallic objects from the body?	148(82.2)	10(5.6)	22(12.2)
Do you think using the protective tools can minimize the side effect of radiation to the body?	132(73.3)	15(8.3)	33(18.3)
Does is it safe to have injection of contrast media during pregnancy?	19(10.6)	89(49.4)	72(40)

Additionally, **Table 3** provides valuable information on patients' knowledge of radiology modalities using contrast media and their awareness of IVCM sensitivity in different organs, emphasizing the importance of informed decision-making in IVCM usage. Most respondents (61.7%) correctly identified computed tomography (CT) as using contrast media, while other modalities such as ultrasound, X-ray, nuclear medicine, and interventional radiology were less commonly associated with its use. When asked which organ is most sensitive to contrast media, the kidneys were most frequently identified (34.3%). In terms of age-related sensitivity, 38.3% believed pediatric patients are more sensitive to intravenous contrast media than adults, while 40% admitted they did not know, indicating a significant gap in knowledge among respondents. Together, these findings support the objectives of assessing patient knowledge and attitudes toward IVCM, evaluating its diagnostic role in various diseases, and highlighting the need for health education programs associated with IVCM

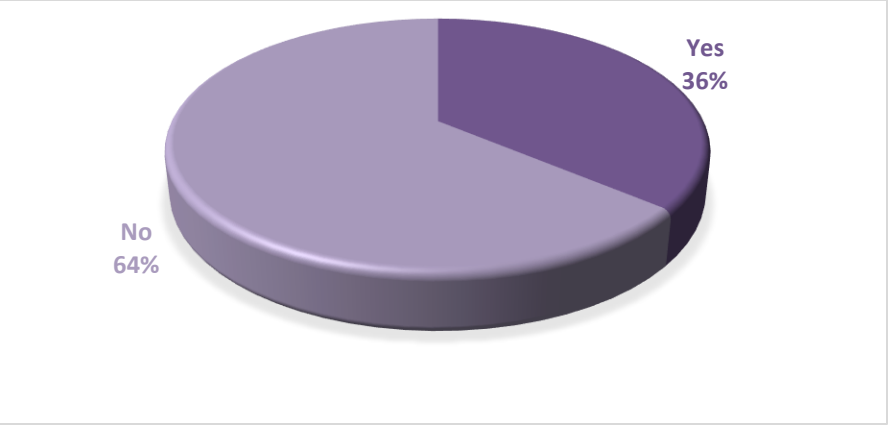
Characteristics	Frequency (Percent)
Which of the following imaging modalities Does use contrast media?	
Computed Tomography Ultrasound X-Ray Nuclear Medicine Interventional Radiology I do not know	111(61.7) 12(6.7) 22(12.2) 25(13.9) 24(13.3) 39(21.7)
Which of the following organs is most sensitive to contrast media?	

Heart Lungs Kidneys Reproductive Organs I do not know	24(13.9) 23(12.8) 78(34.3) 25(13.9) 40(22.2)
Sensitivity to intravenous contrast media in the pediatric compared to adult patients:	
More than adult Same as adult Less than adult I do not know	69(38.3) 17(9.4) 22(12.2) 72(40)

Table 3: Knowledge of radiology modalities using IVCM, identifies the most sensitive organs, and compares sensitivity between pediatric and adult patients.

Figure 1 illustrates the level of patient interest in asking physicians about the side effects of intravenous contrast media (IVCM) with 36% of patients responded "Yes", indicating they are interested in inquiring about IVCM side effects followed by 64% responded "No", showing a lack of interest or initiative in seeking information about potential side effects. A significant majority of patients (64%) do not actively engage with physicians regarding the risks of IVCM, which suggests a gap in communication and patient education. This underlines the need for healthcare providers to proactively inform patients about the potential risks and safety measures related to contrast media used in radiological procedures.

Figure 1: The level of patient interest in asking physicians about IVCM side effects.



Discussion

The study conducted at King Abdul-Aziz Medical City yielded valuable insights into patient perceptions and knowledge concerning IVCMs. A notable portion of patients exhibited limited awareness of the specific risks associated with IVCMs. Notably, 43.9% of patients expressed uncertainty about the dangers related to repeated exposure, while 33.9% were unclear about the potential impacts of IVCMs. Most patients (82.2%) agreed to remove metallic objects during treatments, and 73.3% consented to using protective equipment, indicating a higher level of general safety awareness. This discrepancy underscores a crucial area where patient education could be enhanced. The findings of this study significantly advance understanding of patient awareness regarding intravenous contrast media (IVCM), especially its use in radiological procedures and associated risks such as renal impairment. The predominance of Computed Tomography (CT) usage (68.3%) among respondents aligns with global trends, where CT scans are increasingly favored for their diagnostic precision and speed [13]. This supports CT's central role in clinical decision-making but also highlights the importance of educating patients on the contrast agents frequently used in such procedures. Demographic data reflect a relatively young and educated patient population, with a majority under 40 years of age and over half holding at least a bachelor's degree. Despite this, a considerable portion of respondents demonstrated limited knowledge regarding the potential adverse effects of IVCM. These findings echo similar results from previous studies, where even well-educated populations exhibited gaps in understanding the risks associated with radiologic contrast use [14,15]. Notably, 33.9% of participants were unsure about IVCM harmfulness, and 43.9% were uncertain about risks related to repeated exposure, emphasizing a pressing need for improved patient education. The strong agreement on safety protocols—such as the removal of metallic objects (82.2%) and the use of protective tools (73.3%)—suggests that general procedural awareness is high. However, this knowledge did not extend to the more nuanced risks of IVCM use, particularly its nephrotoxicity. Previous research indicates that although contrast-induced nephropathy (CIN) is rare, it remains a concern among radiologists and patients alike, especially those with pre-existing renal impairment [16,17]. However, updated guidelines suggest that the risk may be overestimated, especially with modern low-osmolar contrast agents which makes patient misperceptions a critical target for educational intervention [18]. Concerns about contrast media during pregnancy were prominent in the current study, with nearly 90% of respondents either disagreeing or expressing uncertainty about its safety. These attitudes reflect existing clinical guidelines that advocate caution in administering IVCM to pregnant women due to potential risks to the fetus [19]. However, when necessary, contrast use during pregnancy is not absolutely

contraindicated, especially if benefits outweigh the potential harm—underscoring the importance of case-by-case clinical judgment and informed consent [20]. The awareness that kidneys are the most sensitive organ to IVCM was correctly identified by 34.3% of participants, but 22.2% were unsure revealing a significant knowledge gap. This corresponds with findings from other international studies, which show that patients often lack clarity about IVCM's impact on renal function and the organs most at risk [21]. Furthermore, 40% of respondents were unsure about pediatric sensitivity to IVCM, suggesting another critical area for targeted education. Pediatric patients often require tailored contrast dosing and have different physiological vulnerabilities, thus requiring greater public and parental awareness [22]. Lastly, the study reinforces the need for comprehensive, accessible educational resources that explain both the benefits and risks of IVCM. Healthcare professionals should ensure that informed consent includes clear discussions about renal risks, modality-specific contrast use, and considerations for vulnerable populations such as pregnant women and children. The study's substantial sample size of 180 patients bolstered the validity of its conclusions. Conducted at a large medical facility with a diverse patient base, the study's findings held broader relevance. Comprehensive analysis using the qualitative data thorough understanding of patient knowledge and attitudes was attained. This highlights a moderate level of awareness among patients regarding the use and risks of IVCM, with notable gaps in knowledge about its potential harm, particularly concerning renal effects and pediatric sensitivity.

Conclusion

The predominance of CT as a contrast-enhanced modality further emphasizes the need for targeted patient education. Overall, the findings underscore the importance of improving communication and education efforts to support informed decision-making and enhance patient safety in radiological practices.

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