

Evaluation of Knowledge and Perceptions Concerning Radiographic Contrast Media for Saudi Population

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Abstract Even with the wide use of contrast media in computed tomography procedures, there is lack of awareness about its advantages and safety among patients and public. If the patients know what contrast media is and what is the risk factor and complication and how it was administrated, they will not show any anxious and frightened during the contrast procedure and then reluctant cases will be decrease. This study aimed to explore the knowledge of Saudi community about contrast media and its complications. A descriptive and questionnaire-based survey was designed to evaluate knowledge of contrast media among citizens of Saudi community. Three hundred ninety-nine participants were enrolled in the study. Their age was range between 18 to 65. The male participants were greater than female. Most contributors were at university level. Members who had a low level of knowledge regarding contrast were 62.2%. 33.3% of candidates said there was harm from using contrast, while (28.1%) of candidates feel afraid from taking contrast and (30.3%) said the reason of fear is the method of introducing contrast media. Number of participants who did contrast procedure before were 20.1%. 37.8% of them received explanation from technologist about the method to give contrast media before the exam. Previous experience of other people is found to be the main source of information for contrast media (42.9%). Most candidates do not have enough authenticated knowledge about contrast and its safety and this make them afraid and hesitant from taking radiologic procedures with contrast media. There is a need for awareness programs for public people and good demonstrations of CM injection to the patients to overcome the anxiety and fear.

Key Words Contrast Media, Radiology, Computed Tomography, Complications

INTRODUCTION

Contrast agent is substance with high or low density used to differentiate the target structure or tissues and organs [1]. This substance has different absorption capabilities in different tissues and can be noticed in x-ray in soft tissue [2]. It plays an important role in radiographic imaging techniques because it improves image resolution and enhances pathology detection [3].

At present, most common contrast media used in CT scan is organic molecule containing iodine such as iodide ion or nonionic contrast agent. Non-ionic contrast media are well tolerated and have a better safety profile due to low osmolality than ionic agents. Iodized molecule can give a good CT scan contrast enhancement, they have fast renal clearance rate, short circulation time in the body and allergenic properties, which limit further applications. [4, 5].

Because of the Rapid removal of iodine developer, the effective time window of imaging the blood flow is significantly limited [6]. The use of contrast media causing anxiety and fear of the scanning process for the patients.

Conversely, physiological responses such as flushing, nausea, high blood pressure, headache and changes in taste may arise from the direct toxic effects of the contrast agent or from changes in vascular volume, particularly with hyperosmolar contrast media [4]. These reactions are generally self-limiting and seldom require intervention. It is important to note that, unlike allergic reactions, physiological responses typically do not improve with steroid treatment [7].

Over the last years, the use of contrast media has been increased due to better availability, border range of examination and the use of new technologies in sectional

imaging. Concerns about radiation exposure to the population resulted in numerous technical innovations aiming to reduce radiation dose and maintain adequate diagnostic performance of X-Ray facilities [3]. Therefore, guidelines concerning intravenous iodinated contrast media (CM) examinations are important to minimize the risk for post-contrast media reactions especially acute kidney injury [8].

There was little effort implemented to assess patient awareness to contrast media and its associated risk. There was a study conducted to assess the awareness of clinicians about the risk of contrast media when referring patients [9]. Medical awareness is considered an important procedure in person's life; through this awareness a person can enter a new face of life and experience to avoid many diseases and prevent his family from these diseases. The knowledge of society concerning radiology services especially contrast media is very important, because the majority of cases in radiology including Computed tomography (CT), Magnetic resonance imaging (MRI), fluoroscopy and even Ultrasound were using contrast media [1]. In addition to that skin testing before contrast examination does not predict the occurrence of hypersensitivity reactions to iodinated contrast media [10]. If the patients know what contrast media is and what is the risk factor and complication and how it was administered, they will not show any anxious and frightened during the contrast procedure and then reluctant cases will be decrease. Furthermore, the image quality will be high and the patient problem can be diagnosed probably. For the technologist who is making radiology procedure the patient will also be cooperative and the exam will finish in a short time.

Comprehensive reviews and expert guidelines provide in-depth discussions on the adverse effects associated with radiographic contrast media, including the pathogenesis of hypersensitivity reactions, thyroid dysfunction and contrast-induced nephropathy. These sources outline both modifiable and non-modifiable risk factors and offer evidence-based recommendations for risk assessment, patient screening and preventative measures, such as hydration protocols, dose minimization and the management of high-risk individuals. Furthermore, they address the latest advances in contrast media safety, the management of immediate and delayed reactions and updated best practices for the safe administration of contrast agents in clinical settings. Readers seeking a detailed understanding of these aspects are referred to these authoritative reviews and guidelines [11-15].

The contrast media could cause anxieties and uncomfortable feeling to the patients due to the lack of information from the hospitals or public leading to poor cooperation or delay in screening the patients. Therefore, the aim of this study to evaluate the level of knowledge regarding contrast media among Saudi population in terms of fear of injection or potential harm due to the procedure.

METHODS

The study was descriptive and questionnaire-based survey conducted from March 2024 to June 2024. Three hundred ninety-nine participants were contributed to the study. The

participants aged greater than 18 years who completed an electronic self-administrated questioner to assess their knowledge about contrast media used in radiology. Before answering the questions, a written informed consent was applied at the beginning to take permission from participants after demonstrating the voluntary participation and the benefits of the study. Participants who refuse to engage were not addressed in the study, only members who filled the consent were included in the study.

The questioner was online self-developed and distributed through social media in Arabic language then it was translated to English language without any changes in the meaning. The questioner contains 14 questions divided into three sections; section one is about demographic data including age, gender and education level. The second part of the survey was measuring the knowledge of participants about CM and their experience, while the third part involved questions concerning the fear from CM for example, if they were afraid of taking contrast media or afraid of method used to introduce CM in the body and what's the most method they afraid from it. Then what's their thinking about the harm from CM, what are the expected questions before the CM procedure and what's the most influencer in their decisions.

The data was analyzed by using statistical package for social science (SPSS). Descriptive statistical analysis was taken to examine the frequency, distribution and percentage of the participants. Crosstabulation as apart from analysis was made between some variables to measure the relation between them.

RESULTS

The age of the study Groups was range between (18 to 65). The greater group of age was (18-29) 74.7%, while the others were (30-45) 15.5% and (over 45) 9.8% as shown in Figure 1.

The male participants 241(60.4%) were greater than female 158(39.6%). Regarding the level of education, the majority of participants were at university level 66.7%. While the other levels were as follow: intermediate 2%, high school 20.6%, postgraduate 8% and others 2.8% as shown in Table 1.

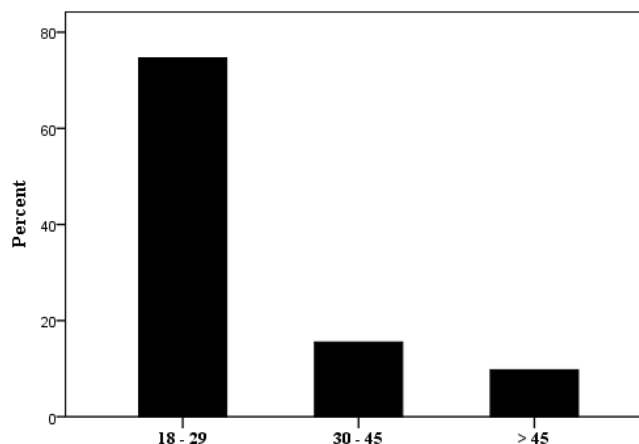


Figure 1: Age distribution

Concerning the previous examination performed with contrast media, frequency of participants who did not have contrast examination before was (79.9%), while participants who previously did contrast media examination were only (20.1%), as depicted in Table 2.

Table 3 showed the explanation about the contrast media used and the method that will be used to introduce it into the body before the examination, the participants who made the exam before; 37.8% of them answered yes, the explanation was made by technologist, 18.6% answered probably while 43.6% replied that no explanation was made for them.

Regarding the level of knowledge about the contrast media used in radiography, Table 4 revealed that the majority of contributors (62.2%) had low-level knowledge. The frequency of the medium level of knowledge was (28.3%). The high level of knowledge was found to be (9.5%).

With Regards to the source of information for participants who had knowledge about contrast media, previous experience of other people had the highest frequency 42.9%, then internet 41.4% and personal experience 15.8% (Table 5).

As shown in table 6, for thinking there is harm from contrast media, the greater group of participants (49.6%) said maybe, (33.3%) declared that there is harm from using contrast media and (17%) said there is no harm.

A question was designed to ask about consent to take contrast media; (51.9%) said may be, (39.6%) were agreed to take it while (8.5%) were disagreed (Table 7).

To evaluate afraid of contrast media, the greater amount said maybe 41.6% and 30.3% stated that the do not feel afraid while 28.1% feel afraid (Table 8).

To identify the reason of fear, participants were asked if the method used to introduce the contrast media is the reason of fear. As (43.1%) of participants thought that may be the method was the reason of fear, (30.3%) said yes, the method was the reason of fear, while 26.6%) declared that the method of introduction did not cause afraid of contrast media (Table 9).

With reference to the influencer in the decision to undergo the contrast examination, 38.6% choose previous experience of other people, 22.6% select previous personal experience, 19.5% pick books and certified sources while 19.3% decide internet (Table 10).

Cross tabulation was performed to show correlation between the gender and the agreement to take contrast media. The result showed that 36.5% of males have agreed to take it and 53.9% of males said maybe while 9.5% disagreed. Regarding females 44.3% were agreed, 47.7% said maybe while 7% disagreed (Table 11).

Another cross tabulation was performed between gender and the fear from taking contrast media and the result showed that 31% of females worried to take contrast media while 26.1% of males were worried to take contrast media (Table 12).

Table 1: Level of education among participants

Parameters	Frequency	Percent
Intermediate education	8	2.0
High School	82	20.6
Undergraduate	266	66.7
Postgraduate	32	8.0
Others	11	2.8
Total	399	100.0

Table 2: Previous contrast examinations

No	319	79.9
Yes	80	20.1
Total	399	100.0

Table 3: Explanation about Contrast Media

Answer	Frequency	Percent
Yes	65	37.8
Probably	32	18.6
No	75	43.6
Total	172	100.0

Table 4: The level of knowledge about the contrast media

Parameters	Frequency	Percent
Low	248	62.2
Medium	113	28.3
High	38	9.5
Total	399	100.0

Table 5: The source of information

	Frequency	Percent
Internet	165	41.4
Previous personal experience	63	15.8
Previous experience of other people	171	42.9
Total	399	100.0

Table 6: Thinking there is harm from using contrast media

Parameters	Frequency	Percent
Yes	133	33.3
May be	198	49.6
No	68	17.0
Total	399	100.0

Table 7: Participants' agreement to take CM

Parameters	Frequency	Percent
Yes	158	39.6
May be	207	51.9
No	34	8.5
Total	399	100.0

Table 8: Feeling afraid of using contrast media

Parameters	Frequency	Percent
Yes	112	28.1
May be	166	41.6
No	121	30.3
Total	399	100.0

Table 9: Is the method used to introduce the contrast media is the reason of fear

Parameters	Frequency	Percent
Yes	121	30.3
May be	172	43.1
No	106	26.6
Total	399	100.0

Table 10: the influencer of the decision to take contrast media

Parameters	Frequency	Percent
Internet	77	19.3
Books and certified sources	78	19.5
Previous personal experience	90	22.6
Previous experience of other people	154	38.6
Total	399	100.0

Table 11: cross tabulation between gender and agreement to take contrast media

Agree to take the contrast examination		Yes	Maybe	No	Total
Male	Count	88	130	23	241
	% within Gender	36.5%	53.9%	9.5%	100.0%
Female	Count	70	77	11	158
	% within Gender	44.3%	48.7%	7.0%	100.0%
Total	Count	158	207	34	399
	% within Gender	39.6%	51.9%	8.5%	100.0%

Table 12: Cross tabulation between gender and feeling afraid of contrast media

Feeling afraid of taking the contrast media		Yes	Maybe	No	Total
Male	Count	63	95	83	241
	% within Gender	26.1%	39.4%	34.4%	100.0%
Female	Count	49	71	38	158
	% within Gender	31.0%	44.9%	24.1%	100.0%
Total	Count	158	112	166	121
	% within Gender	39.6%	28.1%	41.6%	30.3%

DISCUSSION

The use of intravenous iodinated contrast media has increased dramatically in the last two decades particularly in CT examination because of the clinical benefit of contrast enhanced CT [9]. Awareness and knowledge about contrast media and its adverse reaction will decrease anxiety during contrast examinations and then reluctant cases will also be decreased. This study was designed to explore the level of knowledge regarding contrast media among Saudi population.

Our results demonstrated that knowledge related to contrast media is insufficient among Saudi people, which is consistent with previous studies both locally and internationally [13,14,16].

For instance, a large Italian survey similarly showed that most patients have limited understanding of medical imaging risks, with higher knowledge associated with education level and direct communication from healthcare professionals [11]. In the United States, Brewer-Hofmann *et al* [12] also found that educational attainment was the main predictor of patient understanding of radiology information and that simplifying written materials alone was insufficient to improve comprehension.

Similarly, recent research in Saudi Arabia has introduced a radiology literacy tool and confirmed that education level is a key determinant of radiology report comprehension [17]. Simple interventions, such as printed informational leaflets, have been shown to improve patient understanding, particularly for those with lower educational backgrounds [18].

Multimedia strategies, including short animated videos in waiting rooms, are also effective in correcting misconceptions and reducing anxiety among patients [19].

Importantly, similar approaches have been applied in pediatric radiology, where a variety of noninvasive interventions, including smartphone apps, storybooks, educational videos and mock scanner experiences, have been shown to enhance children's knowledge, reduce anxiety and lower the need for sedation or general anesthesia. However, the literature remains heterogeneous regarding optimal

methods and outcome measures, highlighting the need for more standardization in future research [20].

Furthermore, effective communication by radiology staff is increasingly important in the digital age. The expansion of electronic patient portals allows patients to access their radiology reports and images directly, often before consulting their referring physicians. This shift creates both challenges and opportunities for patient-centered radiology, as many patients struggle to understand standard radiology reports, which are typically written for medical professionals and use technical terminology. International guidance suggests that radiologists and radiology departments should adapt their communication strategies to provide simplified, patient-friendly summaries, potentially supported by multimedia tools or explanatory hyperlinks [21]. Such approaches can reduce patient anxiety, improve understanding and foster trust, which are key elements of high-quality, patient-centered care [21].

In our study, 82.9% of participants believed that contrast media could cause harm or may cause harm. A probable explanation for this issue is lack of awareness among population from governmental and private sectors. This could cause fear and anxiety during their contrast media procedures. For more confirmation a direct question has been asked to the participants if they were agreed to undergo contrast examination. Less candidate Said no and the majority were hesitated, this is because of lack of recognition about the nature and adverse reactions of contrast media. Regarding the influencer for the participants when they need to take a decision about contrast media examination, the greater factor which was selected is previous experience from other people (38.6%). This is due to absent of official bodies concerning the awareness of radiology services specially administration of contrast media so experiences from patients who have been examined with contrast studies can replace the official bodies in making awareness for participants if the procedures were explained clearly and all information regarding the contrast media have been clearly identified. But there was lack of explanation of the procedures by radiologic technologist as shown in Table 3, 37.8% of the patients have been informed with the procedures and contrast media.

Regarding the question about the method of contrast media administrated is the reason of fear, a close proportion (30.3%), (43.4%). (26.6%) was observed with candidate answered the question. Most of participants were hesitated; this confusion demonstrates loss of information regarding the use of contrast media. In this study the most method of administration of contrast media which makes fear to population is found to be intravenous injection. A genuine explanation for this is fear from its complication and absent of sufficient explanation from the technologists and nurses before contrast administration. This in line with the literature which stated that intravenous injection is the most cause of fear for the population [13,14,16].

Regarding the correlation between the participants who agree to take contrast media and their gender, the study show

that the high frequency of contributor agree and (may agree) to take contrast media was (90%) of males and (53%) of females, although they found to be more hesitant than female. Meanwhile the females who are disagreed to take the contrast media are less than male. On the other hand, the number of males who did not feels afraid from taking contrast media is greater than female. This may be due to the number of males in the study were greater than female and may also be due to culture of Saudi society and the nature of females concerning the fear and hesitant toward hospitals and medical services. To aid in identifying a relationship between level of education and knowledge of contrast media, a contingency table was made between them. The result showed that university level had the highest percentage of knowledge (10.5%). This is because they are self-educated and can get the information needed.

CONCLUSIONS

Most people do not have sufficient knowledge about contrast media and its reactions. Although there is a wide spread of internet as source of knowledge the few insights of population regarding contrast media comes from previous experience of other people. Large numbers of populations think that there is harm from using contrast media and this makes them afraid of taking contrast examinations. Although the inform consent improve patient understanding of contrast media and its related reactions, it lacks empathically delivered reassurance and increase their fear. The most common reason of fear is the method used to introduce contrast media which is intravenous injection. There is a need for awareness programs for public people and good demonstrations of CM injection to the patients to overcome the anxiety and fear.

Limitations

Several limitations should be acknowledged. The sample size was suboptimal despite online questionnaire distribution, potentially limiting the generalizability of results. Additionally, the questionnaire did not capture the regional distribution of participants, precluding an assessment of regional differences in contrast media knowledge across Saudi Arabia.

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