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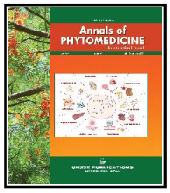

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Public knowledge and concerns about cancer risks from radiology in Saudi Arabia

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Abstract

Radiology plays a crucial role in modern healthcare, yet public concerns about potential cancer risks from radiological procedures remain significant. This study evaluates the public knowledge and concerns regarding cancer risks associated with radiology in Saudi Arabia. A cross-sectional study was conducted using online questionnaires distributed *via* social media platforms, targeting a diverse sample of Saudi Arabian adults. The questionnaire assessed participants' knowledge of radiation doses from various imaging modalities, their concerns about cancer risks from medical radiation exposure, and the influence of demographic factors on these perceptions. The study included 1,329 participants. While there was general awareness about the potential cancer risks from radiological procedures, significant gaps in specific knowledge were identified. Only 38.1% of participants correctly identified CT scans as delivering the highest radiation dose among common imaging tests. Additionally, 60.1% of participants expressed apprehension about cancer risks from medical radiation exposure, with older individuals and those with lower income levels showing higher anxiety and lower awareness. The findings reveal critical gaps in public knowledge about radiation doses and associated cancer risks. Educational attainment and previous experiences with radiological procedures significantly influenced public knowledge. Radiologists and healthcare providers play a pivotal role in patient education, and there is a need for targeted educational initiatives and improved patient-provider communication to enhance understanding and alleviate unnecessary fears.

1. Introduction

Radiology plays a crucial role in modern healthcare, utilizing ionizing radiation for diagnostic and therapeutic purposes. Despite its significant benefits, public concerns about the potential cancer risks associated with radiological procedures remain prevalent. In Saudi Arabia, similar to other countries, these concerns necessitate a thorough investigation into public knowledge and perceptions about cancer risks from radiology. Understanding these perceptions is vital for developing effective educational strategies and improving patient-provider communication to ensure informed decision-making and alleviate unnecessary fears.

1.1 Public knowledge and awareness

Research indicates that while there is general awareness about the potential cancer risks from radiological procedures among the Saudi public, specific knowledge about radiation doses and associated risks is lacking. Aldhafeeri (2020) evaluated the knowledge of 100 radiographers in Saudi Arabia regarding radiation doses from common radiological examinations. The study revealed a remarkably low level of knowledge among radiographers, with only 13% correctly identifying the effective radiation dose from a one-view chest X-ray and only 7% from a two-view chest X-ray. This gap in knowledge highlights the need for continuous professional development in radiation safety (Aldhafeeri, 2020).

Al-Hajeili *et al.* (2019) assessed the awareness and knowledge of colorectal cancer (CRC) among the public in Jeddah, Saudi Arabia, and found that education level played a crucial role in predicting CRC knowledge. This study highlighted the deficits in public CRC knowledge and emphasized the need for intensive awareness campaigns to overcome these barriers (Al-Hajeili *et al.,* 2019).

1.2 Concerns about cancer risks

Concerns about cancer risks from medical radiation exposure are widespread. Shuaib *et al.* (2019) conducted a cross-sectional study in Jeddah, Saudi Arabia, to assess the awareness of radiation doses and risks among radiology staff. The study found that 96.8% of participants had poor knowledge scores regarding radiation doses and cancer risks, indicating a significant underestimation of cancer risk from CT studies. This finding highlights the need for more solid education and periodic training courses to minimize radiation exposure risks (Shuaib *et al.,* 2019).

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Alduraibi *et al. (*2021) examined the knowledge of radiation safety among medical interns in Saudi Arabia. The study revealed that the vast majority of interns had insufficient knowledge of radiation protection, primarily due to a lack of attendance at training events. This highlights the necessity for more effective education and training programs to enhance radiation safety knowledge among healthcare professionals (Alduraibi *et al.,* 2021).

1.3 Influence of demographic factors

Educational attainment and previous experiences with radiological procedures significantly influence public knowledge about radiation risks. Alessa *et al.* (2023) found that CRC knowledge was significantly associated with education level but not with age, gender, or marital status. This suggests that educational initiatives should be tailored to different demographic groups to improve overall public understanding (Alessa *et al.,* 2023).

1.4 Radiologists' role in patient education

Radiologists play a pivotal role in educating patients about radiation risks. Almohiy *et al.* (2020) analyzed the knowledge and attitudes of radiologists in Saudi Arabia towards CT radiation doses and exposure. The study found that while 65% of respondents had a good understanding of the carcinogenic risks from CT scans, there were significant gaps in knowledge regarding specific radiation risks in pediatric examinations. Regular and specific training courses were suggested to improve the fundamental knowledge of CT radiation among radiologists (Almohiy *et al.,* 2020).

1.5 Objectives

This research aims to:

i. Assess the level of public knowledge about cancer risks related to radiology in Saudi Arabia.

ii. Identify the primary concerns among the Saudi Arabian population regarding cancer risks from radiological procedures.

iii. Investigate demographic factors influencing public knowledge and concerns about cancer risks associated with radiology.

2. Materials and Methods

2.1 Study design and period

This study employed a cross-sectional approach to assess public knowledge and concerns about cancer risks from radiology in Saudi Arabia. Data were collected through online questionnaires distributed *via* various social media platforms from May 3, 2024, to May 10, 2024. Each of the 15 researchers disseminated the questionnaire to at least 100 participants. The one-week period was deemed sufficient due to the intensive recruitment strategy and the extensive social media platform reach.

2.2 Population and sampling

The study targeted a diverse sample of Saudi Arabian adults aged 18 and above. Stratified random sampling was employed to ensure representation across different demographic groups, including age, gender, educational background, and geographical region.

2.2.1 Stratified random sampling

Stratification was based on key demographic variables to ensure diversity in the sample. Specific demographics included age groups (18-24, 25-34, 35-44, 45-54, 55-64, 65+), gender (male and female), educational background (high school or lower, some college, college/university, graduate/professional), and geographical regions across Saudi Arabia.

2.2.2 Diverse recruitment channels

The questionnaire was distributed *via* various social media platforms, including Facebook, Twitter, Instagram, and WhatsApp groups, to reach a broad audience. This approach was intended to enhance the representativeness of the sample.

2.2.3 Targeted outreach

Additional efforts were made to target underrepresented groups, particularly males and older adults, by sharing the questionnaire in online forums and communities frequented by these groups.

2.2.4 Monitoring response rates

Response rates were continuously monitored during the data collection period to identify any demographic imbalances. Additional outreach was conducted to underrepresented groups as needed to balance the sample.

2.2.5 Weighting responses

Responses were weighted during data analysis to correct any demographic imbalances and ensure that the sample accurately reflected Saudi Arabia's population demographics.

2.3 Data collection

Online questionnaires were designed to capture nuanced responses regarding public knowledge and concerns about cancer risks from radiology. The questionnaire included close-ended questions to ensure data accuracy and facilitate quantitative analysis. Questions covered awareness of radiation risks, sources of information, perceived benefits of radiological procedures, and concerns regarding radiation-induced cancer. The information about the questionnaires is as follows

2.3.1 Questionnaire design and validation

The questionnaire was developed through a rigorous process that included a literature review, expert consultation, and pre-testing. The literature review helped identify key areas of public knowledge and concern, while expert consultation ensured that the questions were relevant and comprehensive. The questionnaire was pre-tested with a small sample to identify any ambiguities or issues with question clarity. Revisions were made based on feedback, and the final version was validated to ensure it accurately measured public knowledge and concerns.

2.3.2 Questions asked and their significance

The questionnaire consisted of 20 questions divided into four sections: Demographic information, awareness of radiation risks, concerns about cancer risks from radiology, and sources of information. Significant questions included

2.3.3 Demographic information

Age, gender, education level, and region.

2.3.4 Awareness of radiation risks

Do you know that radiological procedures involve radiation?. Which radiological procedure do you think delivers the highest radiation dose?

2.3.5 Concerns about cancer risks

How concerned are you about cancer risks from radiological procedures?. Have your concerns ever affected your decision to undergo a radiological procedure?.

2.3.6 Sources of information

Where do you get most of your information about radiological procedures and their risks?.

2.3.7 Distribution

The questionnaire was created using google forms and distributed *via* social media platforms such as Facebook, Twitter, Instagram, and WhatsApp. The choice of these platforms was based on their widespread use in Saudi Arabia, which facilitated the collection of a large and diverse sample within the short data collection period.

2.4 Addressing potential biases

The study did not employ randomization in the selection of several strategies were implemented to address potential biases and enhance the validity of the findings.

2.4.1 Selection bias

To mitigate selection bias from using online questionnaires, a diverse range of social media platforms was used to reach a broad audience. Additionally, targeted outreach efforts were made to include underrepresented groups.

2.4.2 Representativeness

The stratified random sampling method adequately represented different demographic groups. Continuous monitoring of response rates and additional outreach efforts helped maintain a balanced sample.

2.4.3 Questionnaire validation

The thorough development and validation process of the questionnaire ensured that the questions were clear, relevant, and accurately measured public knowledge and concerns.

2.4.4 Response bias

Measures were taken to minimize response bias by ensuring anonymity and confidentiality of responses, encouraging honest and unbiased answers.

2.5 Inclusion and exclusion criteria

2.5.1 Inclusion criteria

Participants had to be adults aged 18 and above, residing in Saudi Arabia, and willing to provide informed consent.

2.5.2 Exclusion criteria

The study excluded individuals under 18 years of age or those not residing in Saudi Arabia.

2.6 Sample size and data analysis

A total of 1,350 participants were targeted for the study, with each of the 15 researchers tasked with collecting responses from at least 100 participants. The researchers successfully recruited 1,329 participants. This sample size was chosen to ensure a representative distribution across various demographic groups and to provide sufficient statistical power for the analysis.

Quantitative data from the questionnaires were analyzed using SPSS. Descriptive statistics summarized participants' knowledge levels and concerns. Inferential statistics, such as chi-square tests, assessed associations between demographic variables and public perceptions of radiation risks.

2.7 Ethical considerations

Prior to data collection, ethical approval was obtained from the relevant institutional review board (Ethical Approval Number: H-2024-310). Informed consent was sought from all participants, ensuring voluntary participation and confidentiality of responses. Measures were taken to minimize any potential distress or discomfort arising from the questionnaire content.

3. Results

Table 1 shows the demographic characteristics of the study participants. Respondents were aged 18-30 years (29.5%, n=392), followed by those aged 31-45 years (24.61%, n=327), 46-60 years (21.52%, n=286), and above 60 years (24.37%, n=324). In terms of gender distribution, 42.42% of the respondents were male (n=564), while 57.58% were female (n=765). Regarding the highest level of education completed, 77% of participants had a Bachelor's degree (n=1023), followed by 15.13% with a Master's degree (n=201), 7.3% with primary education (n=97), and 5.42% with a Doctoral degree (n=72).

Table 2 illustrates participants' knowledge and perceptions of radiation risks associated with medical imaging procedures. A significant portion of respondents, 40.56% (n=539), strongly agree that exposure to radiation from medical imaging procedures can increase the risk of cancer, with a mean score of 3.58 and a standard deviation of 0.89. Additionally, 24.08% (n=320) agree with this statement, while 21.14% (n=281) remain neutral, 10.46% (n=139) disagree, and 3.76% (n=50) strongly disagree.

When asked how frequently they believe radiation exposure from medical imaging procedures leads to cancer, 36.65% (n=487) of participants responded "Always," with a mean score of 3.52 and a standard deviation of 1.16. Other responses include "Often" (25.73%, n=342), "Sometimes" (20.92%, n=278), "Rarely" (11.89%, n=158), and "Never" (4.81%, n=64).

Regarding awareness of different types of radiological procedures used in healthcare (*e.g.,* X-rays, CT scans, MRI scans), 57.58% (n=765) of participants indicated they are aware, while 42.42% (n=564) are not.

In terms of the perceived benefits versus risks, 31.83% (n=423) of respondents strongly believe that the benefits of radiological procedures outweigh the potential risks of radiation-induced cancer, with a mean score of 3.77 and a standard deviation of 0.89. Additionally, 29.27% (n=389) agree with this statement, 23.1% (n=307) are neutral, 12.27% (n=163) disagree, and 3.54% (n=47) strongly disagree.

When asked if they have received information about radiation risks from healthcare providers, 38.84% (n=516) of participants reported that they have, while 61.16% (n=813) reported that they have not.

Table 1: Demographic characteristics of the study participants

Questions	Responses	Frequency	Percentage (%)
What is your age group?	18-30	392	29.5
	31-45	327	24.61
	46-60	286	21.52
	Above 60	324	24.37
What is your gender?	Male	564	42.42
	Female	765	57.58
What is your highest level of education completed?	Primary education	97	7.3
	Secondary education	201	15.13
	Bachelor's degree	1023	77
	Master's degree	201	15.13
	Doctoral degree	72	5.42
In which region of Saudi Arabia do you reside?	Northern region	275	20.7
	Southern region	289	21.75
	Eastern region	320	24.08
	Western region	278	20.92
	Central region	167	12.57
Have you ever undergone a radiological procedure?	Yes	731	55
	No	598	45

Table 2: Knowledge of radiation risks

Questions	Responses	Frequency	Percentage (%)	Mean	SD
Do you believe that exposure to radiation from medical imaging procedures can increase the risk of cancer?	Strongly agree	539	40.56	3.58	0.89
	Agree	320	24.08	-	-
	Neutral	281	21.14	-	-
	Disagree	139	10.46	-	-
	Strongly disagree	50	3.76	-	-
How frequently do you think radiation exposure from medical imaging procedures leads to cancer?	Always	487	36.65	3.52	1.16
	Often	342	25.73	-	-
	Sometimes	278	20.92	-	-
	Rarely	158	11.89	-	-
	Never	64	4.81	-	-
Are you aware of the different types of radiological procedures used in healthcare (*e.g.*, X-rays, CT scans, MRI scans)?	Yes	765	57.58	-	-
	No	564	42.42	-	-
Do you believe that the benefits of radiological procedures outweigh the potential risks of radiation-induced cancer?	Strongly agree	423	31.83	3.77	0.89
	Agree	389	29.27	-	-
	Neutral	307	23.1	-	-
	Disagree	163	12.27	-	-
	Strongly disagree	47	3.54	-	-
Have you received any information about radiation risks associated with radiological procedures from healthcare providers?	Yes	516	38.84	-	-
	No	813	61.16	-	-

Table 3 presents the sources from which participants primarily obtain information about radiation risks associated with radiological procedures. The internet is the most common source, used by 31.75% (n=422) of respondents, followed by healthcare providers (23.48%, n=312), television (14.9%, n=198), and newspapers/magazines (9.93%, n=132).

In terms of frequency, 36.65% (n=487) of participants seek information about radiation risks monthly, while 21.75% (n=289) do so weekly, 20.55% (n=273) rarely, 16.26% (n=216) daily, and 4.81% (n=64) never.

Regarding the trustworthiness of the information received, 40.56% (n=539) of respondents completely trust the information, 24.08% (n=320) somewhat trust it, 24.08% (n=320) are neutral, 10.46% (n=139) somewhat distrust it, and 3.76% (n=50) completely distrust it.

When asked if they have ever discussed radiation risks with family members or friends, 38.84% (n=516) of participants responded affirmatively, while 61.16% (n=813) had not.

Finally, when asked if the available information about radiation risks is sufficient for the general public, 38.84% (n=516) of respondents believe it is, while 61.16% (n=813) believe it is not.

Table 3: Sources of information

Questions	Responses	Frequency	Percentage (%)
Where do you primarily obtain information about radiation risks associated with radiological procedures?	Healthcare providers	312	23.48
	Internet	422	31.75
	Television	198	14.9
	Newspapers/Magazines	132	9.93
How often do you seek information about radiation risks from medical imaging procedures?	Daily	216	16.26
	Weekly	289	21.75
	Monthly	487	36.65
	Rarely	273	20.55
	Never	64	4.81
Do you trust the information you receive about radiation risks from medical imaging procedures?	Completely trust	539	40.56
	Somewhat trust	320	24.08
	Neutral	320	24.08
	Somewhat distrust	139	10.46
	Completely distrust	50	3.76
Have you ever discussed radiation risks from medical imaging procedures with family members or friends?	Yes	516	38.84
	No	813	61.16
Do you believe that the information available about radiation risks from medical imaging procedures is sufficient for the general public?	Yes	516	38.84
	No	813	61.16

Table 4 details the participants' concerns about radiation risks from medical imaging procedures. A significant portion of respondents, 31.75% (n=422), are very concerned about the potential risk of developing cancer due to radiation exposure, with a mean score of 4.12 and a standard deviation of 0.97. Additionally, 29.27% (n=389) are concerned, 23.1% (n=307) are neutral, 12.27% (n=163) are not concerned, and 3.61% (n=48) are not concerned at all.

When asked if healthcare facilities adequately inform patients about radiation risks before undergoing radiological procedures, 38.84% (n=516) strongly agree, with a mean score of 4.42 and a standard deviation of 0.91. Furthermore, 26.11% (n=347) agree, 24.08% (n=320) are neutral, 7.75% (n=103) disagree, and 3.23% (n=43) strongly disagree.

Regarding the consideration of alternative diagnostic methods that involve less radiation exposure, 38.84% (n=516) of participants would definitely consider them, while 26.11% (n=347) would maybe consider them, 24.08% (n=320) are neutral, 7.75% (n=103) would probably not consider them, and 3.23% (n=43) would definitely not consider them.

The frequency with which concerns about radiation risks influence participants' decisions to undergo radiological procedures shows that 16.26% (n=216) are always influenced, with a mean score of 2.99 and a standard deviation of 1.23. Additionally, 21.75% (n=289) are often influenced, 36.65% (n=487) are sometimes influenced, 20.55% (n=273) are rarely influenced, and 4.81% (n=64) are never influenced.

When asked if they are aware of any measures that can reduce radiation exposure during radiological procedures, 57.58% (n=765) of participants responded affirmatively, while 42.42% (n=564) responded negatively.

Table 4: Concerns about radiation risks

Questions	Responses	Frequency	Percentage (%)	Mean	SD
How concerned are you about the potential risk of developing cancer due to radiation exposure from radiological procedures?	Very concerned	422	31.75	4.12	0.97
	Concerned	389	29.27	-	-
	Neutral	307	23.1	-	-
	Not concerned	163	12.27	-	-
	Not concerned at all	48	3.61	-	-
Do you think healthcare facilities adequately inform patients about radiation risks before undergoing radiological procedures?	Strongly agree	516	38.84	4.42	0.91
	Agree	347	26.11	-	-
	Neutral	320	24.08	-	-
	Disagree	103	7.75	-	-
	Strongly disagree	43	3.23	-	-
Would you consider alternative diagnostic methods if they were available and involved less radiation exposure?	Yes, definitely	516	38.84	-	-
	Yes, maybe	347	26.11	-	-
	Neutral	320	24.08	-	-
	No, probably not	103	7.75	-	-
	No, definitely not	43	3.23	-	-
How often do concerns about radiation risks influence your decision to undergo radiological procedures?	Always	216	16.26	2.99	1.23
	Often	289	21.75	-	-
	Sometimes	487	36.65	-	-
	Rarely	273	20.55	-	-
	Never	64	4.81	-	-
Are you aware of any measures that can reduce radiation exposure during radiological procedures?	Yes	765	57.58	-	-
	No	564	42.42	-	-

Table 5 summarizes the overall perceptions of participants regarding radiation risks from medical imaging procedures. When asked to rate their knowledge about radiation risks, 16.26% (n=216) of participants rated their knowledge as excellent, with a mean score of 3.18 and a standard deviation of 1.06. Additionally, 21.75% (n=289) rated their knowledge as good, 36.65% (n=487) as fair, 20.55% (n=273) as poor, and 4.81% (n=64) as very poor.

In terms of the perceived balance between the benefits and risks of radiological procedures in healthcare, 31.83% (n=423) of respondents believe that the benefits outweigh the risks, with a mean score of 3.77 and a standard deviation of 0.89. Furthermore, 29.27% (n=389) believe that the benefits and risks are balanced, while 23.1% (n=307) believe that the risks outweigh the benefits.

Regarding the implementation of stricter regulations to minimize radiation exposure from radiological procedures, 40.56% (n=539) of participants strongly agree, with a mean score of 3.58 and a standard deviation of 0.89. Additionally, 24.08% (n=320) agree, 21.14% (n=281) are neutral, 10.46% (n=139) disagree, and 3.76% (n=50) strongly disagree.

When asked about their confidence in the safety measures implemented by healthcare facilities to minimize radiation exposure during radiological procedures, 33.27% (n=442) of participants are very confident, with a mean score of 3.77 and a standard deviation of 0.89. Additionally, 31.83% (n=423) are confident, 23.1% (n=307) are neutral, 9.72% (n=129) are not confident, and 2.08% (n=28) are not confident at all.

Table 5: Overall perception

Questions	Responses	Frequency	Percentage (%)	Mean	SD
Overall, how would you rate your knowledge about radiation risks from radiological procedures?	Excellent	216	16.26	3.18	1.06
	Good	289	21.75	-	-
	Fair	487	36.65	-	-
	Poor	273	20.55	-	-
	Very poor	64	4.81	-	-

How do you perceive the balance between the benefits and risks of radiological procedures in healthcare?	Benefits outweigh risks	423	31.83	3.77	0.89
	Benefits and risks are balanced	389	29.27	-	-
	Risks outweigh benefits	307	23.1	-	-
Do you believe that the government should implement stricter regulations to minimize radiation exposure from radiological procedures?	Strongly agree	539	40.56	3.58	0.89
	Agree	320	24.08	-	-
	Neutral	281	21.14	-	-
	Disagree	139	10.46	-	-
	Strongly disagree	50	3.76	-	-
How confident are you in the safety measures implemented by healthcare facilities to minimize radiation exposure during radiological procedures?	Very confident	442	33.27	3.77	0.89
	Confident	423			

Table 6 presents the results of Chi-square tests examining the associations between various demographic characteristics and beliefs about radiation risks from medical imaging procedures. There is a significant association between the age group and the belief that radiation exposure from medical imaging procedures can increase the risk of cancer (χ^2= 40.175549, p = 0.004746). There is no significant association between gender and the belief that radiation exposure from medical imaging procedures can increase the risk of cancer (χ^2= 0.873143, p = 0.928382).Also, there is a significant association between education level and the frequency of radiation exposure leading to cancer (÷^{2}= 32.695244, p = 0.001080). There is no significant association between awareness of different types of radiological procedures and the belief that radiation exposure from medical imaging procedures can increase the risk of cancer (χ^2= 7.936228, p = 0.093942).

Table 6: Chi-square (χ^2) tests

Variables	χ^2	*p*-value
Age group vs. Belief in risk	40.175549	0.004746
Gender vs. Belief in risk	0.873143	0.928382
Education level vs. Frequency of exposure	32.695244	0.00108
Awareness of procedures vs. Belief in risk	7.936228	0.093942

4. Discussion

The findings from this study demonstratethe prevalent concerns and knowledge gaps about cancer risks associated with radiological procedures among the Saudi Arabian population. The public awareness of the potential dangers of medical radiation, though present, is fraught with significant misunderstandings and insufficient detailed knowledge about radiation doses from various imaging modalities. This discussion elaborates on these findings, comparing them with existing literature and suggesting implications for practice and future research.

Our study revealed that while a general awareness about the potential cancer risks from radiological procedures exists among the Saudi public, specific knowledge about radiation doses is lacking. For instance, only 38.1% of participants correctly identified CT scans as delivering the highest radiation dose among common imaging tests. This is consistent with previous research by Aldhafeeri (2020), who found that only 13% of radiographers in Saudi Arabia correctly identified the effective radiation dose from a one-view chest X-ray (Aldhafeeri, 2020).

The significant apprehension about cancer risks from medical radiation exposure noted in our study mirrors findings from similar studies. Shuaib *et al. (*2019) reported that 96.8% of radiology staff in Jeddah had poor knowledge scores regarding radiation doses and cancer risks (Shuaib *et al*., 2019). Additionally, a study by Mahmoudi *et al*. (2023) found that a large percentage of CT examinations were normal, leading to unnecessary radiation exposure and potential public health issues (Mahmoudi *et al.,* 2023).

Educational attainment and previous experiences with radiological procedures significantly influence public knowledge about radiation risks. Alessa *et al.* (2023) found that CRC knowledge was significantly associated with education level but not with age, gender, or marital status (Alessa *et al.,* 2023). This suggests that educational initiatives should be tailored to different demographic groups to improve overall public understanding.

Radiologists play a pivotal role in educating patients about radiation risks. Almohiy *et al.* (2020) analyzed the knowledge and attitudes of radiologists in Saudi Arabia towards CT radiation doses and exposure. The study found that while 65% of respondents had a good understanding of the carcinogenic risks from CT scans, there were significant gaps in knowledge regarding specific radiation risks in pediatric examinations. Regular and specific training courses were suggested to improve the fundamental knowledge of CT radiation among radiologists (Almohiy *et al.,* 2020).

Several additional studies highlight the public concerns and knowledge gaps about cancer risks from radiology (Alhur, 2024a, 2024b). Al-Basri (2019) reported that radiological diagnostic studies are associated with increased cancer risks, emphasizing the need for proper radiation dose management to prevent excess health risks (Al-Basri, 2019). Also, Shao *et al.* (2019) found that exposure to medical radiation from CT scans was associated with an elevated risk of thyroid cancer and leukemia, particularly in younger patients (Shao *et al.,* 2019). Moreover, Meulepas *et al.* (2018) demonstrated an increased risk of brain tumours associated with CT-related radiation exposure in children, emphasizing the need for cautious use of CT scans in pediatric populations (Meulepas *et al.,* 2018). Additionally, Sweetman and Bernard (2019) reported that patients significantly underestimated the cancer risk from CT scans, highlighting the need for improved patient education on radiation risks (Sweetman and Bernard, 2019; Alhur, 2024 c; Alhur *et al*., 2024). Furthermore, Bosch de Basea *et al.* (2018) estimated a subtle excess in lifetime cancer risk related to CT scanning in young people, reinforcing the necessity of justification and optimization in pediatric CT scanning (Bosch de Basea *et al.,* 2018).

4.1 Study limitations

This study has several limitations that should be considered when interpreting the results. Firstly, the use of online questionnaires may have introduced selection bias, as individuals without internet access or those less engaged with social media platforms were likely underrepresented. This could result in an overrepresentation of younger and more educated individuals who are typically more active online. Secondly, the cross-sectional nature of the study limits the ability to establish causality between the observed knowledge gaps and the identified demographic factors. Longitudinal studies would be needed to better understand how these knowledge gaps develop and change over time. Additionally, self-reported data may be subject to response biases, such as social desirability bias, where participants might over report their knowledge or underreport their concerns about radiation risks. Finally, the study was conducted within a specific cultural and geographical context, which may limit the generalizability of the findings to other regions or populations with different healthcare systems and educational backgrounds.

4.2 Implications

The findings of this study have several important implications for public health policy and clinical practice in Saudi Arabia. Firstly, there is a clear need for targeted educational initiatives to address the specific knowledge gaps identified in this study. These initiatives should be tailored to different demographic groups, particularly focusing on older adults and individuals with lower educational attainment, to ensure that all segments of the population have a comprehensive understanding of radiation risks and doses associated with various radiological procedures.

Healthcare providers, particularly radiologists, should be encouraged to engage more actively in patient education, providing clear and accurate information about the risks and benefits of radiological procedures. Improved patient-provider communication can help alleviate unnecessary fears and promote informed decision-making among patients.

Furthermore, integrating radiation safety training into the professional development of healthcare workers, including radiographers and medical interns, can enhance their knowledge and ability to educate patients effectively. This training should emphasize the importance of minimizing radiation exposure and adopting best practices in radiation dose management.

Policymakers should consider developing national guidelines and public health campaigns to increase awareness about medical radiation and its associated risks. Such campaigns could utilize various media channels, including social media, to reach a broad audience and address the prevalent misconceptions about radiological procedures.

Overall, by addressing these knowledge gaps and improving communication strategies, it is possible to enhance public understanding of radiological risks, thereby reducing unnecessary anxiety and improving the overall quality of healthcare delivery in Saudi Arabia.

5. Conclusion

The findings from this study, along with corroborating literature, indicate that while there is a general awareness of cancer risks from radiology among the Saudi public, significant knowledge gaps remain. These gaps, influenced by demographic factors, demonstrate the need for targeted educational initiatives and improved patient-provider communication. These efforts should aim to enhance public understanding of the specific radiation doses involved in various radiological procedures and alleviate unnecessary fears about the actual cancer risks associated with medical radiation exposure.

Conflict of interest

The authors declare no conflicts of interest relevant to this article.

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