Original Article

Knowledge, Attitude, and Perception Regarding Radiation Hazards and Protection among Saudi Arabia's General Population

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Abstract

Ionizing radiation is an important diagnostic and therapeutic tool in medicine, but it can also be harmful to patients and healthcare providers if it is used excessively or without taking safety measures under consideration. This study evaluates Saudi Arabia's general population's knowledge, awareness, and perception of radiation hazards and protection. A self-report online questionnaire in Arabic was conducted among Saudi Arabian public citizens who met our criteria while reserving participants' privacy and obtaining consent. The data was entered into the computer using the "Microsoft Office Excel software" (2016) for Windows. Then, the data analysis was conducted through Statistical Package of Social Science Software (SPSS) software version 20. The study included 1074 participants. There were more female participants (62.3%) than male participants (37.7%). Participants' knowledge scores of radiological imaging background were found as only 9.2% had good knowledge, 48.6% had moderate knowledge, and 42.2% had poor knowledge. As for radiation risks, 26.3% had good knowledge, 45.5% had moderate knowledge, and 28.2% had poor knowledge. Participants' knowledge about protective measures of radiation was reported as 24.1% had good perception, 49.2% had neutral perception, and 26.7% had poor perception. In conclusion, knowledge, attitude, and perception regarding radiation hazards and protection are inadequate among the Saudi general population. The general population needs to be well-informed, proactive, and accurately understand the risks associated with radiation to protect themselves and others from potential harm effectively. By promoting education and awareness on this topic, we can work towards creating a safer and healthier environment for all.

Keywords: Radiation hazards, Radiation protection, Knowledge, Saudi Arabia

Introduction

Radiation is the term for the particle or electromagnetic form of energy transferred via space and matter. Depending on their energy, electromagnetic radiation can be either ionizing or non-ionizing [1].

The ionizing radiation has adverse effects on living things despite its undeniable benefits. Free radicals, which are extremely energetic and chemically unstable particles, are released when an electron is removed from an atom or molecule, which is the beginning of ionizing radiation [2].

Additionally, Ionizing radiation is increasingly used in medical imaging for diagnostic and therapeutic purposes. Therefore, knowledge and understanding of radiation dangers are significant issues for people who work in radiation environments and other healthcare professionals and patients who visit hospitals and diagnostic centers [3].

As a result of this concurrent rise in radiation dangers, both patients and healthcare professionals can be exposed to the ionizing radiation's harmful effects [4]. Over time, we learned that radiation has harmful or detrimental effects on biological tissues. However, depending on the dose and the length of exposure, these effects may change [5].

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Justification, optimization, and dosage limitation are the three pillars of radiation protection. The justification principle stipulates that the specialist should be able to identify circumstances in which the benefit of exposing a patient to diagnostic information outweighs the risk of harm [6].

Additionally, multiple studies have been done in Saudi Arabia, showing that most patients have insufficient knowledge about radiation hazards [7]. A study conducted at Jimma University Hospital, Southwest Ethiopia, showed that about half (52.6%) of the respondents knew about radiation-related health hazards. Also, (75.6%) of the participants showed low knowledge regarding protective or precautionary measures during diagnostic imaging [8].

In 2019, an institutional study by S. Sharma *et al*. was done, and the results revealed that (69.3%) of the respondents had done an X-ray previously, and (24.7%) of them knew about the equipment or the procedures involved while doing an X-ray. In general, about (14.4%) of them had knowledge about the risks and hazards associated with radiation [9].

Additionally, a cross-sectional survey conducted at King Fahad Medical City Hospital in Saudi Arabia showed that (20.8%) of the patients knew that radiation might lead to cancer, and (49.3%) of them believed it could cause fetal anomalies [10].

If not properly understood and managed, radiation hazards can lead to adverse health effects and environmental contamination. By assessing the public's level of awareness and understanding, we can identify potential gaps in knowledge that may hinder effective protection measures.

In addition, accurate knowledge about radiation hazards and protection empowers individuals to make informed decisions about their exposure to radiation sources, contributing to personal health and well-being. A well-informed public can also take preventative actions to minimize unnecessary exposure.

To promote the general population's health, as low as reasonably achievable (ALARA) principle must be practiced, which means that we should keep the dose of radiation as low as possible. Moreover, reducing the time, increasing the distance, and using safety shielding are the three main components of ALARA [11].

Furthermore, the perception of radiation risks can influence behaviors related to waste disposal, handling of radioactive materials, and support for sustainable energy sources. Understanding public attitudes and perceptions can inform policies and educational initiatives that encourage responsible behavior to safeguard the environment.

For these reasons, government agencies, educational institutions, and public health organizations must effectively communicate radiation-related information to the public. Therefore, this study can identify gaps in communication strategies and highlight areas where targeted public education efforts are needed in Saudi Arabia.

Awareness plays an important role in increasing the efficiency of the care given; it is beneficial for controlling anxiety, improving communication with professionals, and encouraging cooperation. Therefore, Patients with insufficient knowledge about the risks are more likely to ignore the instructions, which require a repeat exam. Additionally, as evidenced by the literature, most patients had prior radiological exams. They weren't aware enough about ionizing radiation [10]. The authors have observed that while there is a dearth of information regarding the amount of patient understanding regarding the risk of ionizing radiation, numerous studies have examined the level of knowledge of healthcare workers towards diagnostic radiation hazards. To our knowledge, no studies have been done to explore Saudi Arabia's public citizens' knowledge about radiation risks and methods of protection. Therefore, this research assesses awareness and knowledge regarding radiation hazards and protection among Saudi Arabia's general population.

Objective

This study aimed to evaluate the awareness and knowledge regarding radiation hazards and protection among Saudi Arabia's general population.

Materials and Methods

Study Design

This is a cross-sectional study conducted on Saudi Arabia's general population.

Study Setting

Participants, Recruitment, and Sampling Procedure

The study's population consisted of Saudi Arabia's general population of adults 18 years old and above who agreed to participate in this research. Participants were recruited starting from September 2023 after getting final ethical approval.

Inclusion and Exclusion Criteria

The inclusion criteria were met by the general population, who were 18 years old and above in Saudi Arabia. All healthcare personnel with a radiation environment background or younger than eighteen years were excluded.

Sample Size

The sample size was estimated using the Rasosoft calculator with a confidence level of 95% and a significant level of 5%; we will need to enroll at least 385 participants in this study. To reach a better result, we aim to increase the sample size to a minimum of 700 participants.

Method for Data Collection and Instrument (Data Collection Technique and tools)

We aimed to collect data via a questionnaire, which is simple, serves the study's purpose, and is easy to understand by the target population. The questions were collected based on a literature review [8, 10-14]. We intend to do a pilot study on 15 individuals who fit our inclusion criteria to ensure its validity. The survey consists of multiple-choice questions; we grouped the items into four main parts: Sociodemographic data, radiological imaging background, knowledge about radiation hazards, and knowledge about protective measures against radiation. The questionnaire was distributed in Arabic and did not show any nominative information. An online questionnaire was designed using Google Forms. Participants who are matched in the inclusion criteria will receive electronic links accompanied by the objectives of the survey, the target population, and a request to participate voluntarily. After getting the final ethical approval, the questionnaire was distributed electronically via social media apps to all participants eligible for the inclusion criteria.

Scoring System

Part 1: Radiological imaging background

There are 7 questions in this part that test the participant's background knowledge of radiological imaging. Each question had two or more choices. A correct answer was given a 1 score, and a 0 score was given for wrong answers. The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-79.0%, and 0.0%-59.0%, were adapted and used to classify the results into three levels: 1. High level: 6-7 scores; 2. Moderate level: a score of 5; 3. Low level: 0-4 scores.

Part 2: Knowledge about radiation risks

This part includes 7 questions that test the participant's knowledge about radiation risks. Each question had two or more choices. A correct answer was given a 1 score, and a 0 score was given for wrong answers. The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-79.0%, and 0.0%-59.0%, were adapted and used to classify the results into three levels: 1. High level: 6-7 scores; 2. Moderate level: a score of 5; 3. Low level: 0-4 scores.

Part 3: Knowledge about protective measures of radiation

This part has 8 questions that assess the participants' knowledge of radiation protection methods. Each question had two or more choices. A correct answer was given a 1 score, and a 0 score was given for wrong answers. The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-79.0%, and 0.0%-59.0%, were adapted and used to classify the results into three levels: 1. High level: 6-8 scores; 2. Moderate level: a score of 5; 3. Low level: 0-4 scores.

Analyzes and Entry Method

Data was collected from any participant who met our criteria. Entered on the computer using the "Microsoft Office Excel software" (2016) for Windows, then the data analysis was conducted through Statistical Package of Social Science Software (SPSS) software version 20, to determine the statistical significance between variables, we will use a 95% confidence interval with a significance level of 5%, and a P-value of less than 0.05 was considered as significant.

Results and Discussion

Table 1 shows that most participants fall within the 20-30 age range, accounting for 47.7% of the total. This is followed by the 31-40 age range at 18.1% and the 41-50 age range at 16.1%. It's interesting to note that only 2.0% of participants are over 60 years old. Moving on to gender, the data shows that there are more female participants (62.3%) than male participants (37.7%). The location distribution reveals that the West has the highest number of participants at 27.0%, followed by the East at 21.2% and the South at 20.3%. In terms of education level, the majority of participants have a university education, accounting for 74.3% of the total. This is followed by secondary education at 17.7%. Regarding annual income, the data shows that most participants fall within the "Less than a thousand" and "One thousand – Four thousand" categories, accounting for 29.6% and 23.6%, respectively. Very few participants are in the higher income brackets, with only 0.9% earning more than 100 thousand Saudi Riyals annually. Finally, the marital status distribution reveals that almost an equal number of participants are married (47.9%) and single (47.8%).

Table 1. Sociodemographic characteristics of participants (n=1074)

Parameter		No.	Percent
Age	less than 20	83	7.7
	20_30	512	47.7
	31_40	194	18.1
	41_50	173	16.1
	51_60	90	8.4
	more than 60	22	2.0
Gender	Male	405	37.7
	Female	669	62.3
Location	East	228	21.2
	Middle	175	16.3
	North	163	15.2
	South	218	20.3
	West	290	27.0
Education Level	uneducated	6	.6
	primary	3	.3
	middle	14	1.3
	secondary	190	17.7
	University	798	74.3
	Even higher	63	5.9
Annual Income (in Saudi Riyals)	Less than a thousand	318	29.6
	One thousand - four thousand	253	23.6
	5 thousand - 9 thousand	201	18.7
	10 thousand - 29 thousand	267	24.9
	30 thousand - 59 thousand	21	2.0

	60 thousand - 100 thousand	4	.4
	More than 100 thousand	10	.9
Marital Status	Married	514	47.9
	Single	513	47.8
	Divorced	36	3.4
	Widowed	11	1.0

According to **Table 2**, 77.1% of the respondents had undergone previous x-rays, while 22.9% had not. Out of those who had undergone previous x-rays, the most common type of radiology performed was x-ray (53.1%), followed by trans-sectional rays (37.3%), magnetic resonance (29.1%), and ultrasound imaging (30.4%). Interestingly, 13.3% of the respondents did not know the type of radiology performed. When asked if they had obtained any information from the health staff before exposure to radiation, 58.7% of the respondents answered yes, while 41.3% answered no. Similarly, when asked if they had basic information about radiology from any different sources, 46.2% of the respondents answered yes, while 53.8% answered no.

The majority of the respondents (87.8%) believed that exposure to radiation is necessary to save lives, while only 12.2% did not believe so. When asked if they had heard the term ionizing radiation before, only 11.2% of the respondents answered yes, while 88.8% answered no. Out of those who had heard the term ionizing radiation before, 13.8% believed that it meant any type of energy capable of ionizing matter, while 5.2% believed that it meant any type of electromagnetic radiation that does not carry enough energy for the whole quantity. Interestingly, 77.6% of the respondents did not know the meaning of ionizing radiation.

Table 2. Participants' radiological imaging background (n=1074).

Parameter		No.	Percent
Previous x-rays before	Yes	828	77.1
	no	246	22.9
If yes, what type of radiology performed	Magnetic resonance	241	29.1
	X-ray	440	53.1
	trans sectional rays	309	37.3
	Ultrasound imaging	252	30.4
	I don't know	110	13.3
If answered previous questions, obtain any information from the health staff before exposure to radiation	Yes	486	58.7
	no	342	41.3
Have basic information about radiology from any different sources	Yes	496	46.2
	no	578	53.8
Believe that exposure to radiation is necessary to save lives	Yes	943	87.8
	no	131	12.2
Heard the term ionizing radiation before	Yes	120	11.2
	no	954	88.8
Ionizing radiation means	Any type of electromagnetic radiation that does not carry enough energy for the whole quantity	56	5.2
	Any type of energy capable of ionizing matter	148	13.8
	Ultraviolet radiation is ionizing radiation	37	3.4
	I don't know	833	77.6

According to **Table 3**, 20.5% of the respondents are aware of these dangers, while 79.5% are not. Furthermore, it is encouraging to see that 67.0% of the respondents think that ionizing radiation is dangerous to health. However, a significant portion (33.0%) still do not share this belief. Additionally, the data shows that 64.6% of the respondents believe that exposure to diagnostic X-rays increases the probability of developing cancer. When it comes to different imaging methods, it is interesting to note that there is some confusion among the respondents. For example, 41.8% believe that an X-ray of the skull is associated with a greater dose of radiation, while 40.4% think that a CT scan carries a greater dose. Furthermore, it is concerning that 55.6% of the respondents believe that the x-ray room emits X-ray radiation after completing the x-ray examination. It is also worth noting that there is a lack of understanding about which imaging methods involve ionizing radiation. For example, 25.4% believe X-rays include ionizing radiation, while 21.2% think CT scans do. Finally, 85.2% of the respondents believe that performing more than one X-ray examination for one person increases the risk of radiation.

Table 3. Participants' Knowledge about radiation risks (n=1074).

Parameter		No.	Percent
Aware of the dangers of ionizing radiation	Yes	220	20.5
	no	854	79.5
Think that ionizing radiation is dangerous to health	Yes	720	67.0
	no	354	33.0
Think that exposure to diagnostic x-rays increases the probability of developing cancer	Yes	694	64.6
	no	380	35.4
Which of the following is associated with a greater dose of radiation?	X-ray of the skull	449	41.8
	Chest X-ray	184	17.1
	CT scan	434	40.4
	I don't know	7	.7
The X-ray room emits X-ray radiation after completing the X-ray examination	Yes	597	55.6
	no	471	43.9
	I don't know	6	.6
Imaging methods include ionizing radiation (Bias risk)	X-ray	273	25.4
	CT scan	228	21.2
	Magnetic Resonance	241	22.4
	Ultrasound	147	13.7
	I don't know	623	58.0
Think that performing more than one X-ray examination for one person increases the risk of radiation	Yes	915	85.2
	no	156	14.5
	I don't know	3	.3

Table 4 shows that a majority of respondents (46.6%) claim to be familiar with the concept of radiation protection, but there is still a significant portion (53.4%) who are not familiar with it. Another important finding is that a majority of respondents (61.0%) claim to know what the warning symbol looks like in the presence of radiation danger. However, a substantial portion (39.0%) still do not. When it comes to the consideration of risks before undergoing X-rays, the data shows that a significant number of respondents (23.4%) never think about the risks of radiation before undergoing X-rays. Furthermore, the data reveals that a large majority of respondents (88.7%) believe adjusting the radiation dose to suit the patient's age is necessary. Additionally, the data highlights a concerning finding regarding the perceived safety of certain imaging techniques for pregnant women. A significant number of respondents (45.0%) believe that ultrasound imaging is safe for pregnant women despite the fact that it is not without potential risks. In terms of protection against the harmful effects of X-rays, the data shows that a majority of respondents (55.9%) understand the importance of not staying in the examination room unnecessarily, while a substantial portion (39.4%) believe in covering sensitive areas with lead plaques. However, a significant portion (29.2%) is still unsure about the best protection measures. Finally, the data reveals that a significant number of respondents (24.1%) choose not to undergo recommended X-ray tests because they do not want to be exposed to radiation.

Table 4. Participants' knowledge about protective measures of radiation (n=1074).

Parameter		No.	Percent
Familiar with the concept of radiation protection	Yes	500	46.6
	no	574	53.4
Know what the warning symbol looks like for the presence of radiation danger	Yes	655	61.0
	no	419	39.0
Repeat unexplained radiology is recommended.	Yes	48	4.5
	no	791	73.6
	I don't know	235	21.9
Think about the risks of radiation before undergoing X-rays in the past	Occasionally	276	25.7
	every time	145	13.5
	Most of the time	170	15.8

	never	251	23.4
	I have never had an X-ray	232	21.6
Think it is necessary to adjust the radiation dose to suit the patient's age	Yes	953	88.7
	no	117	10.9
	I don't know	4	.4
Which is considered safe to use for pregnant women? (Bias risk)	Ultrasound imaging	483	45.0
	Radiography	75	7.0
	Trans-sectional rays	95	8.8
	Magnetic Resonance	93	8.7
	Breast X-ray	104	9.7
	I don't know	478	44.5
Protection against the harmful effects of X-rays (Bias risk)	Covering sensitive areas with lead plaques	423	39.4
	Do not stay in the examination room unnecessarily (for companions)	600	55.9
	Wear thick clothes	207	19.3
	Follow the technologist's instructions to avoid repeat X-rays	506	47.1
	I don't know	314	29.2
Choose not to undergo any of the X-ray tests recommended by a doctor because I do not want to be exposed to radiation	Yes	259	24.1
	no	815	75.9

Figure 1 shows participants' knowledge scores of radiological imaging background as only 9.2% had good knowledge, 48.6% had moderate knowledge, and 42.2% had poor knowledge.

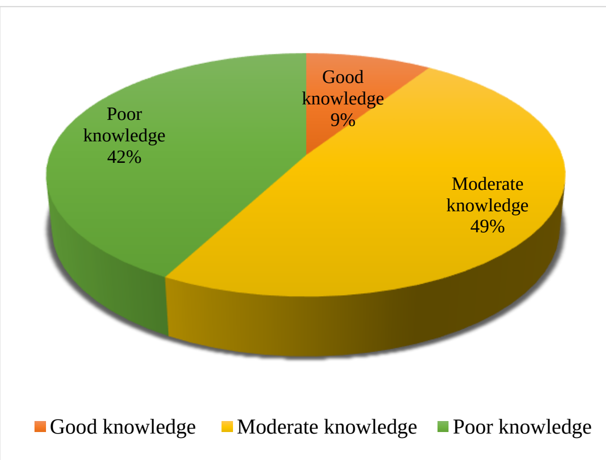

Figure 1. participants' knowledge scores of radiological imaging background.

Participants' knowledge scores about radiation risks in **Figure 2** show that 26.3% had good knowledge, 45.5% had moderate knowledge, and 28.2% had poor knowledge. Participants' knowledge about protective measures of radiation is 24.1% had good perception, 49.2% had neutral perception, and 26.7% had poor perception.

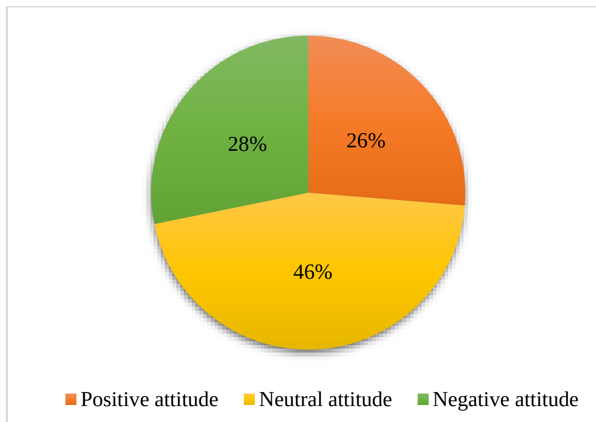

Figure 2. Participants' knowledge scores about radiation risks.

Participants' knowledge about protective measures of radiation is 24.1% had good perception, 49.2% had neutral perception, and 26.7% had poor perception.

Table 5 shows that the majority of individuals fell into the 20-30 age range, and this group had the highest percentage of individuals with poor knowledge scores (47.7%). Interestingly, the youngest age group (less than 20) had a relatively low percentage of individuals with poor knowledge scores (7.7%). However, the study did not find a statistically significant relationship between age and practice score. The study found that single and married individuals had similar percentages of good, neutral, and poor knowledge scores regarding marital status. Divorced and widowed individuals had lower percentages of good and higher percentages of poor knowledge scores, but these groups were relatively small.

Gender was found to have a statistically significant relationship with practice scores, with females having higher percentages of good and moderate knowledge scores and lower percentages of poor knowledge scores compared to males. Location did not have a statistically significant relationship with practice scores, although the West region had the highest percentage of individuals with poor knowledge scores (27%). Education level was found to have a statistically significant relationship with practice score, with individuals with university education having the highest percentage of good knowledge scores (19.3%) and post-graduate education having the highest percentage of moderate knowledge scores (3.4%). Finally, annual income was found to have a statistically significant relationship with practice score, with individuals with an income less than 1000 Saudi Riyals having the highest percentage of poor knowledge scores (29.6%) and those with an income of 1000-29000 Riyals having the highest percentage of good knowledge scores (13.6%). The majority of individuals in the 20-30 age group fall under the moderate knowledge category, while the 31-40 age group has the highest percentage of individuals with a poor knowledge. However, the differences in attitude scores across age groups were not statistically significant. Moving on to marital status, there is a relatively equal distribution of individuals with positive, neutral, and poor knowledge across single and married individuals. The divorced and widowed individuals have a lower percentage of good knowledge, but the differences in attitude scores across marital status were not statistically significant. Gender-wise, there is a higher percentage of females with good knowledge compared to males. However, the differences in attitude scores across gender were not statistically significant. In terms of location, individuals from the South and West regions have a higher percentage of good knowledge compared to other regions. However, the differences in attitude scores across locations were not statistically significant. When considering education level, individuals with a university education have the highest percentage of good knowledge, while those with a post-graduate education have the lowest percentage of poor knowledges. The differences in attitude scores across education levels were not statistically significant. Finally, when looking at annual income, there are no significant differences in attitude scores across income levels. Looking at the age distribution, it is interesting to note that the percentage of individuals with good knowledge decreases as age increases. For example, only 0.7% of individuals less than 20 years old have good knowledge, while this percentage increases to 6.1% for individuals aged 20-30. In terms of marital status, the data suggests that there is a slightly higher percentage of individuals with good knowledge among those who are married compared to those who are single, divorced, or widowed. However, the differences are not significant, as the p-value is 0.057. When considering gender, the data shows that there is a higher percentage of females with good knowledge compared to males. However, the difference is not statistically significant once again, as the p-value is 0.112. The location distribution reveals that there is no significant difference in knowledge scores among individuals from different regions in Saudi Arabia, as indicated by the p-value of 0.975. In terms of education level, the data suggests that a higher percentage of individuals with university and post-graduate education have good knowledge compared to those with lower education levels. Finally, the distribution of knowledge scores based on annual income shows that individuals with lower incomes (less than 1000 Saudi Riyals) have a lower percentage of good knowledge compared to those with higher incomes.

Table 5. Knowledge scores about protective measures of radiation in association with their sociodemographic characters (n=1074).

		Knowledge scores about protective measures of radiation			Total (N=1074)	P value
		Good knowledge	Moderate knowledge	Poor knowledge		
Age	less than 20	20 1.9%	41 3.8%	22 2.0%	83 7.7%	**0.704**
	20_30	130 12.1%	243 22.6%	139 12.9%	512 47.7%	
	31_40	42 3.9%	93 8.7%	59 5.5%	194 18.1%	
	41_50	38 3.5%	98 9.1%	37 3.4%	173 16.1%	
	51_60	22 2.0%	44 4.1%	24 2.2%	90 8.4%	
	more than 60	7 0.7%	9 0.8%	6 0.6%	22 2.0%	
marital status	Single	122 11.4%	239 22.3%	152 14.2%	513 47.8%	**0.266**
	Married	128 11.9%	267 24.9%	119 11.1%	514 47.9%	
	Divorced	7 0.7%	16 1.5%	13 1.2%	36 3.4%	
	widow	2 0.2%	6 0.6%	3 0.3%	11 1.0%	
Gender	Male	101 9.4%	180 16.8%	124 11.5%	405 37.7%	0.033
	Female	158 14.7%	348 32.4%	163 15.2%	669 62.3%	
Location	East	53 4.9%	111 10.3%	64 6.0%	228 21.2%	**0.929**
	Middle	42 3.9%	81 7.5%	52 4.8%	175 16.3%	
	North	42 3.9%	76 7.1%	45 4.2%	163 15.2%	
	South	53 4.9%	114 10.6%	51 4.7%	218 20.3%	
	West	69 6.4%	146 13.6%	75 7.0%	290 27.0%	

Education Level	Illiterate	1 0.1%	3 0.3%	2 0.2%	6 0.6%	**0.320**
	Primary	1 0.1%	2 0.2%	0 0.0%	3 0.3%	
	Preparatory	0 0.0%	8 0.7%	6 0.6%	14 1.3%	
	Secondary	38 3.5%	94 8.8%	58 5.4%	190 17.7%	
	University	206 19.2%	385 35.8%	207 19.3%	798 74.3%	
	Post-graduate	13 1.2%	36 3.4%	14 1.3%	63 5.9%	
Annual Income (in Saudi Riyals)	Less than 1000	80 7.4%	142 13.2%	96 8.9%	318 29.6%	**0.004**
	1000- 4000	59 5.5%	125 11.6%	69 6.4%	253 23.6%	
	5000- 9000	37 3.4%	96 8.9%	68 6.3%	201 18.7%	
	1000- 29000	74 6.9%	146 13.6%	47 4.4%	267 24.9%	
	30000- 59000	6 0.6%	13 1.2%	2 0.2%	21 2.0%	
	60000- 100000	1 0.1%	3 0.3%	0 0.0%	4 0.4%	
	More than 100000	2 0.2%	3 0.3%	5 0.5%	10 0.9%	

As we continue to advance in technology and industry, the use of radiation has become increasingly prevalent in various aspects of our lives. With this increased exposure to radiation, it is imperative that we have a thorough understanding of the potential hazards associated with it, as well as the necessary measures for protection [2].

Knowledge, attitude, and perception regarding radiation hazards and protection play a crucial role in ensuring the safety and well-being of individuals exposed to radiation daily. Individuals need to be well-informed about the sources of radiation, the potential health risks associated with exposure, and the methods for minimizing these risks [9].

The current study shows inadequate knowledge of radiation, its hazards, and protection methods. Participants' knowledge scores of radiological imaging background were found as only 9.2% had good knowledge, 48.6% had moderate knowledge, and 42.2% had poor knowledge. As for radiation risks, 26.3% had good knowledge, 45.5% had moderate knowledge, and 28.2% had poor knowledge. Participants' knowledge about protective measures of radiation was reported as 24.1% had good perception, 49.2% had neutral perception, and 26.7% had poor perception. Previous studies on knowledge of radiation hazards and protection have shown varying levels of understanding among different populations. A study found that only 40% of healthcare workers had adequate knowledge of radiation hazards and protection measures [15]. This is concerning, as healthcare workers are often exposed to radiation in their line of work and need to be well-informed about the risks and how to protect themselves and their patients. Another study showed that there was a lack of awareness among the general population, with many people having misconceptions about the risks associated with radiation exposure. This is particularly troubling given the prevalence of radiation sources in everyday life, such as medical imaging procedures and nuclear power plants [16]. On the other hand, a study found that radiation protection knowledge was higher among radiology technologists, who are directly involved in the use of radiation for diagnostic purposes. This is likely due to radiology technologists' specific training and education regarding radiation safety and protection measures [17].

Having the right attitude towards radiation hazards and protection is equally important. This includes being proactive in seeking information about radiation, being aware of potential risks in one's environment, and taking necessary precautions to minimize exposure. It also involves being vigilant about following safety guidelines and protocols in settings where radiation is present, such as in medical facilities or industrial settings [14].

On the other hand, perception plays a significant role in how individuals approach the topic of radiation hazards and protection. It is important for individuals to have an accurate understanding of the risks associated with radiation and the measures that can be taken to protect oneself from these risks. Misconceptions or misinformation about radiation can lead to unnecessary fear or complacency, both of which can be detrimental to one's overall safety [17].

The study is a valuable contribution to the field of radiation safety. However, it is important to acknowledge the limitations of this study. One limitation is the potential for response bias, as participants may have provided socially desirable answers rather than their true beliefs. Additionally, the study may have been limited by a small sample size or a specific demographic, which could affect the generalizability of the findings. Furthermore, the study may have been limited by the use of self-reported data, which can be subject to recall bias. Future research should aim to address these limitations in order to further our understanding of this important topic.

Future Implications

The study has significant future implications for both public health and policy-making in Saudi Arabia. The findings of this study can be used to inform public health interventions and educational campaigns aimed at increasing awareness and understanding of radiation hazards and protection measures among the general population.

One of the key future implications of this study is the potential to improve public health outcomes by addressing gaps in knowledge, attitudes, and perceptions related to radiation hazards and protection. Public health officials can tailor educational initiatives to target specific knowledge gaps and promote more accurate perceptions of radiation risks by identifying areas of misunderstanding or misinformation. This, in turn, can lead to increased adoption of protective measures and behaviors that can reduce the risk of radiation exposure among the Saudi Arabian population.

Furthermore, the study's findings can also inform policy-making and regulatory efforts related to radiation safety and protection. By understanding the general population's knowledge, attitudes, and perceptions regarding radiation hazards, policymakers can develop more effective regulations and guidelines to ensure the safety of individuals and communities. This may include implementing stricter safety standards in industries that involve radiation exposure, improving public infrastructure to mitigate radiation risks, and enhancing emergency preparedness and response protocols for potential radiation incidents.

In addition, the study's implications can extend to healthcare practices and professional training. Healthcare providers can use the findings better to understand the public's knowledge and attitudes toward radiation, allowing them to communicate more effectively with patients about potential risks and protective measures. Moreover, the study can also influence the development of educational curricula and training programs for healthcare professionals, ensuring that they are equipped with the necessary knowledge and skills to address radiation-related concerns among the population.

Conclusion

In conclusion, knowledge, attitude, and perception regarding radiation hazards and protection are inadequate among the Saudi general population. It is essential for the general population to be well-informed, proactive, and have an accurate understanding of the risks associated with radiation in order to protect themselves and others from potential harm effectively. By promoting education and awareness on this topic, we can work towards creating a safer and healthier environment for all.

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